

**Improving Dietary Behaviour in Low and Middle
Income Countries: Developing an Intervention in
Urban Kathmandu, Nepal**

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Abstract

Instances of non-communicable diseases [NCDs] such as diabetes are on the rise globally with the greatest burden in low and middle income countries [LMICs]. A major contributing factor to diabetes is unhealthy dietary behaviour. This research aimed to establish how healthy dietary behaviour can be improved in LMIC contexts through the development of a feasible intervention(s), with a focus on a specific context – Nepal, to tackle the increase in diabetes. The objectives of the research were to develop an evidence base, identify and develop theory and model potentially feasible interventions to tackle unhealthy dietary behaviour to reduce the impact of diabetes. Initially, I conducted a systematic review and meta-analysis of interventions to improve dietary behaviour in LMICs. I assessed whether behaviour change techniques [BCTs] could be effective in dietary interventions. Building on this evidence base, I then conducted qualitative research in Kathmandu, Nepal. In total forty-two semi-structured interviews and four workshops were conducted with patients, health professionals, policymakers and researchers. I analysed this data to assess potentially feasible dietary interventions leading to the proposal of intervention packages and policy improvements.

In the systematic review, meta-regressions suggested some BCTs (action planning, self-monitoring of outcome(s) of behaviour; demonstration of behaviour) were associated with larger dietary behaviour effect sizes and could be integrated into interventions to improve behaviour. Findings from my qualitative research emphasised the importance of considering socio-cultural context in developing interventions and challenge one-size-fits-all approaches. I used my quantitative and qualitative data in an innovative way to inform practical outputs in the form of: a) a set of potentially feasible intervention packages based on associated rankings and b) macro-level suggestions for policy improvements. This research project represents an attempt to develop solutions to the problem of NCDs and paves the way for further investigations using similar methods.

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List of Abbreviations

BCT	Behaviour change technique
BCW	Behaviour change wheel
BCW-SCC	Behaviour change wheel – Socio-cultural context
CVD	Cardio-vascular disease
FCHVs	Female community health volunteers
GCP	Gender, cultural and political (feasibility)
HBGLs	High blood glucose levels
HERD	Health Research and Development Forum (Nepal)
HICs	High income countries
LMICs	Low and middle income countries
MRC	Medical research council
NCDs	Non communicable diseases
PEN	Package of essential non-communicable diseases
SCC	Socio-cultural context
SDGs	Sustainable development goals
SD	Standard deviation
SE	Standard error
SSIs	Semi-structured interviews
WHO	World Health Organisation

Chapter 1 Introduction

1.1 Background to research

Non communicable diseases [NCDs] are a leading cause of death globally, killing 41 million people every year, equivalent to 71% of all deaths globally (WHO, 2018a). This figure is projected to increase significantly. The burden of NCDs is highest in low and middle income countries [LMICs] where over three quarters of global NCD deaths [30.7 million] occurred in 2015 (WHO, 2017a). Diabetes is the fourth most common NCD after cardiovascular disease, cancer and respiratory diseases (WHO, 2017a). As 80% of global diabetes deaths occur in low income countries (World Health Organisation Country Office for Nepal, 2014) it is a disease which needs tackling in these settings. Low income South Asian countries, such as Nepal, have seen a particularly rapid increase in the prevalence of diabetes in the past two decades. South Asians are at increased risk of diabetes compared with other groups such as Caucasians (Jayawardena et al., 2012). Poor diet (high in salt, sugar and fat and low in fruits and vegetables) is a cause of diabetes (Malik et al., 2010, Jayawardena et al., 2012, WHO, 2014a). A healthy lifestyle consisting of regular exercise, limited alcohol and tobacco use and a healthy diet consisting of fruit and vegetables, less sugar, salt and saturated fats can contribute to the prevention of NCDs such as diabetes (WHO, 2015a). However, with the increasing availability of unhealthy foods high in fat and sugar (Leonhardt, 2010, Milesi, 2017, Mole, 2017, O'Connor, 2016, Phillips, 2016), encouraging sustainable healthy dietary behaviour is an increasing challenge.

1.2 Research problem

1.2.1 Focus on a low income country setting: NCDs in Nepal

The number of deaths in Nepal from NCDs is rising and NCDs accounted for 66.2% of deaths in 2016, clearly signifying a significant issue which needs to be addressed [See Figure 1 (World Bank, 2016)]. The number of deaths from NCDs in Nepal now far outweighs those from communicable diseases (WHO, 2014b). Diabetes is the seventh most common cause of death in low income countries accounting for 24.2% of deaths in 2015 (WHO, 2015b). In Nepal specifically, the rates of diabetes are increasing and 20% of adults over 40 are affected by type II diabetes (Ono et al., 2007). In 2017 there were 657,200 reported cases of diabetes in Nepal and many more reported cases of high blood glucose levels [HBGLs] (International Diabetes Federation South East-Asia, 2017). The number of cases of diabetes in adults which are undiagnosed is predicted to be 324 per 1000 people (International Diabetes Federation South East-Asia, 2017). Under-reporting of the disease is a major concern (International Diabetes Federation South East-Asia, 2017). Several studies have found poor diet to be a cause of type 2 diabetes (Malik et al., 2010, Jayawardena et al., 2012). Increasing urbanisation has been linked with increased incidence of diabetes in Nepal (Singh and Bhattarai, 2003, Ramachandran et al., 2012, Hills et al., 2018). Urban and rural prevalence are 8.1% and 1% respectively (Gyawali et al., 2015). Instances of diabetes have been increasing in Nepal with urbanisation to cities like Kathmandu (Singh and Bhattarai, 2003). A systematic review of diabetes prevalence in Nepal showed that diabetes is more prevalent in urban areas and amongst women and unless urgent and specific focus is given to preventing, treating, and controlling of diabetes, the burden of diabetes will become more severe in Nepal (Gyawali et al., 2015).

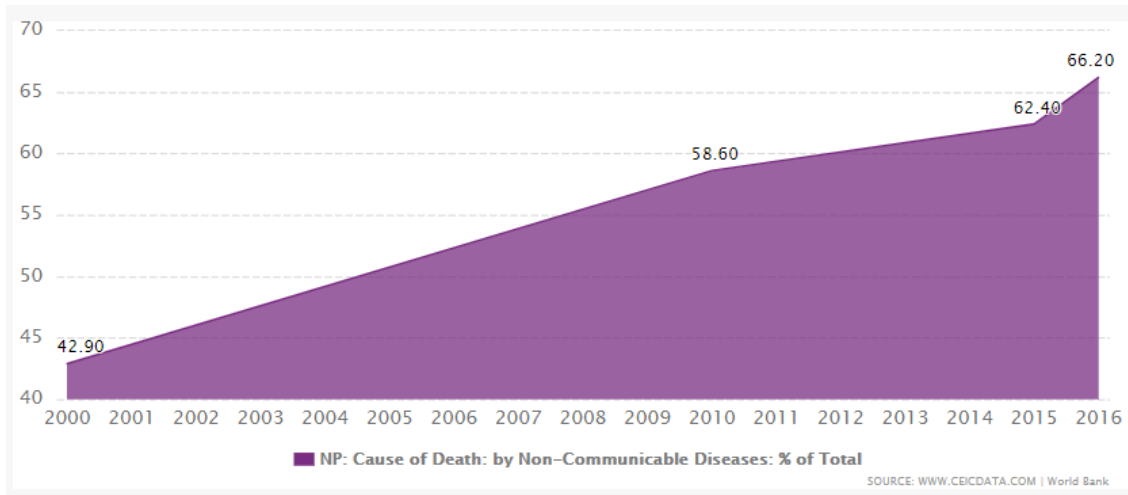


Figure 1: Cause of death by NCDs % of total deaths in Nepal 2000-2016 (World Bank, 2016)

In Nepal, priority is often given to tackling infectious diseases rather than NCDs. NCD mortality is projected to rise substantially (Bhandari et al., 2014), and NCDs will soon become an unbearable burden. NCD prevention therefore needs to be seen as a public health priority. WHO conducted a STEPs survey in Nepal in 2013 which highlighted key issues around NCD risk factors such as those relating to dietary habits and fruit and vegetable intake (World Health Organisation Country Office for Nepal et al., 2013). Analysis of this survey reinforced the issue of low fruit and vegetable intake which put the population of Nepal at greater risk of NCDs (Aryal et al., 2015, Pandey et al., 2015). Since the STEPs survey, the government of Nepal has stated it will implement health promotion interventions to promote use of PEN [package of essential non-communicable diseases] which was implemented in Nepal in 2016 to improve diagnosis, reporting and treatment of NCDs (WHO, 2010, WHO, 2016a). PEN involves many components. These include training of trainers [by PHCRD – Public Health Care Revitalisation Division], improved screening and referral mechanisms, training and counselling for patients on healthy lifestyles (including dietary advice), training of school teachers to disseminate lifestyle advice to school children, presentations to rural communities about the causes and consequences of NCDs and advertisements on TV and radio to promote healthy lifestyle. PEN holds the potential for significant health care change and improvement as has been found in Korea (Hyon et al., 2017) and also in low income countries; the Philippines and Bhutan (Martinez, 2015, Wangchuk et al., 2014). Despite this, PEN is in its infancy and, as will be explored in this thesis, has current limitations in reaching urban populations. As indicated by Figure 2, national NCD targets exist and risk factor surveys have partially been undertaken. However, unhealthy diet reduction measures are limited, with only one measure being fulfilled (marketing of breast-milk substitutes reductions) leaving big gaps in unhealthy diet reduction measures. There is a need to better understand unhealthy dietary behaviour to produce feasible and more effective interventions in Nepal.

NEPAL



Figure 2: NCD Progress Monitor by WHO 2017 (WHO, 2017b)

1.2.2 Dietary behaviour in Nepal

1.2.2.1 Dietary behaviour and policy in Nepal

Poor diet has been linked to the increase in NCDs (Kinnunen and Neupane, 2014, Balarajan and Villamor, 2009, Demographic and Health Surveys, 2016, Simkhada et al., 2011, Subedi et al., 2013, Neupane and Kallestrup, 2013, Oli et al., 2014, Shrestha et al., 2013a, Bhandari et al., 2014, Vaidya, 2008, Vaidya, 2011). Nepal, like many other LMICs, has great problems meeting the WHO target of fruit and vegetable intake; 99% of the Nepalese population do not meet the recommended daily allocation of fruit and vegetable intake (World Health Organisation Country Office for Nepal, 2014). Donor-funded projects such as Suaahara (2011-2016), an integrated nutrition initiative, have tried to improve nutrition in rural districts in Nepal (USAID, 2016). Additionally, some government attempts have been made to tackle the problems of unhealthy diet; the Multi-sectoral Action Plan on the Prevention and Control of NCD in Nepal 2014-2020 stipulates a strategic policy to encourage 'increased consumption of fruits and vegetables, reducing consumption of salt, saturated fat and trans-fat' (World Health Organisation Country Office for Nepal, 2014 p.18.). Furthermore, the Nepal Health Sector Strategy Implementation Plan (2016-2021) makes attempts to promote diversified nutrient dense and culturally appropriate complementary foods and recipes based on Food-based Dietary Guidelines (Government of Nepal, 2017b). The Multi-sectoral Nutrition Plans (2013-2017 and 2018-22) (Government of Nepal, 2013, Ministry of Health Government of Nepal, 2017) are designed to improve nutrition and access to improved diets, as well as reducing traditional harmful practices

such as that in some areas which dictates that adolescent girls and women are not allowed to consume milk, yoghurt or ghee when menstruating (Ministry of Health Government of Nepal, 2017). However, the national nutrition plans consider only maternal and child health and leave out male members of the population. Furthermore, both plans are focused on wasting, stunting and malnutrition but do not adequately address the growth of obesity and diseases such as diabetes which are associated with overconsumption of unhealthy food, a trend which has been alarmingly tracked in children under 24 months old in the Kathmandu Valley (Pries et al., 2016). The 2018-2022 plan promotes meat consumption, despite many ethnic groups in the population, such as Vaishnavas, Jains and Marwaris as well as many Buddhists being vegetarian. It also promotes food fortification by artificial means. Rice fortification has been heavily promoted in Nepal (World Food Programme, 2017), however it does not consider the health impact of consuming large amounts of white rice (even fortified) on those at risk of or with HBGLs or diabetes. Rice fortification is a short-term and not particularly sustainable form of nutrition management and does not address the importance of improving consumption of a varied diet to improve nutrition. Furthermore, fortifying rice does not address determinants of dietary behaviour, such as inequitable distribution of food amongst household members (Harris-Fry et al., 2018).

To address these issues an understanding of the cultural and social behaviours around food consumption is necessary. The Multi-sectoral nutrition plans indicate that government spending on nutrition has increased by \$69 million in 2013 to \$184.9 million in 2017 (Ministry of Health Government of Nepal, 2017) which indicates that there is potential to utilise this funding on better solutions to improve dietary behaviours. Therefore, government efforts to tackle unhealthy dietary behaviour are varied and many do not currently adequately address the determinants of behaviour, indicating a gap in policy and research. Looking at determinants of behaviour is important as doing so identifies potential targets for interventions (e.g. religious or ethnic activities/beliefs) and may lead to behaviour change according to the characteristics of a particular population within a specific context. The reasoning for looking at determinants of behaviour is further explored in 3.1.3. Unhealthy dietary behaviour remains a serious problem in Nepal contributing to the rise in NCDs. More appropriate strategies are required to tackle the problem of unhealthy dietary behaviour which consider the social and cultural context which affect these behaviours. In this thesis, when I refer to healthy or unhealthy diet or eating I do so in relation to a healthy diet for everyone, not just for people with diabetes. I use the WHO advice for healthy diet but account for socio-cultural variation within this generic advice, for example, allowing adapting a generic recommendation for the consumption of pulses to be made specific to the lentils and dahl commonly consumed in Nepal (WHO, 2019). Dietary behaviour can include not only the consumption of, but the preparation or acquisition of healthy food which affects the ability to eat healthily.

1.2.2.2 Food and culture in Nepal

Food cultures have long been studied and linked with dietary behaviours (Fischler, 1988, Mintz and Christine, 2002, Helman, 2007, Goody, 1982). Conceptualising food systems has increasingly illuminated wider societal and cultural processes (Mintz and Christine, 2002, Munn, 1986). As Caplan (1997) states food is not 'just food', it has more than nutritional importance and food consumption is heavily laden with cultural meaning and significance. It is closely linked with social relations, cultural ideas about classification, the human body and meaning of health. Advances in more convenient food consumption are increasingly offset by losses to nourishment – physical and cultural (Hossain, 2016). New food cultures that thrive in bustling cities like

Kathmandu can challenge traditional eating patterns and cultures, replacing them with foods high in sugars and fats (Hossain et al., 2015, Vaidya et al., 2010b). My research delves into this new reality, exploring diabetes in the crowded urban setting of Kathmandu and the extent to which traditional cultural practices around food still determine behaviours in rapidly changing urban areas.

1.2.2.3 Changing food environments and consumption

Nepal is a diverse country in landscape, climate, environment, culture, religion and ethnicity and this diversity has a direct impact on the food consumed in the country. Many groups live in different environments, from the high Himalaya regions to the lowland Terai regions. This means there are difficulties in transporting and storing food, meaning diet changes radically from one geographic region to another. Food supplies are often scarce in remote regions and political complications around Nepal's geographical position between the superpowers of India and China have led to border blockades in recent years, especially in 2015, which have hiked up food prices and led to food shortages (UN News, 2015, BBC News, 2015). A common greeting when walking in Nepal is '*Khaanaa khaiyo?*' which means 'have you eaten?'. This reflects the importance of food in the country. In areas with irrigated plains and terraced fields, such as in the Terai and Hill valleys, the main crops are rice and wheat. In the hills the main crops are maize and millet, whilst in the high mountain areas the major crops include potatoes, millets, and barley. The other crops of importance produced in Nepal are sugar cane, oilseeds, potatoes, and pulses. Districts in Terai produce the largest amount of these cash crops, however the Terai region has higher rates of malnutrition than other regions indicating availability of food does not necessarily mean good nutrition in a region (USAID, 2010).

1.2.2.4 Traditional Nepali foods

Despite the vast diversity in Nepali diets, there are some commonalities nationally. Most Nepalese will be familiar with the national meal of Nepal which is *dal-bhaat-tarkaari* (lentil soup, rice and curried vegetables). Predominantly, rice is the food of choice and is so important to the Nepali psyche that the word for cooked rice – '*bhaat*' is freely interchanged with the word for food – '*khaanaa*'. There are many different varieties of rice eaten in Nepal. *Pokhareli masino* (noted for its flavour) and Basmati (noted for its fragrance) are two well-known and expensive varieties whilst red rice is eaten in the far west of Nepal. Brown rice is available in urban areas like Kathmandu but has been considered by many as a step down from more polished white rice (Burbank, 1995). There are also many different types of bread consumed in Nepal, for example, a thick pancake-like bread called *roti*. These variations indicate the diversity of consumption of staple foods within Nepal.

Refrigeration of meat is often difficult in Nepali homes, especially those outside the main cities, meaning that meat has traditionally only been eaten on special occasions and during festivals such as Dashain, when the slaughter of animals is conducted cooperatively by communities and cooked the same day. Milk, coming from cows (which are sacred to some communities), is often as important to many Nepalese for its religious symbolism as for its health and nutritional value (Burbank, 1995). Milk is a favourite food of one of the most popular Hindu gods Krishna and is often given to Krishna in Hindu religious services. Milk can be drunk hot or as yoghurt (*Dahi or Lassi*). Butter (*makkhan*) and buttermilk (*mahi*) are also used in cooking and enjoyed in traditional deserts. *Barfi* and *peda* are popular milk-based deserts. Research has discussed the many different types of milk products consumed in parts of Nepal (Rai et al., 2016).

1.2.2.5 Nutrition transition in Nepal

Evidence suggests that Nepal is undergoing its own nutrition transition (Popkin, 2015, Popkin et al., 2012, Subedi et al., 2017). The physical environment which provides people with food is changing. Often fast foods are cheap and easily accessible (Ide, 2016). Fast foods can be international such as burgers, fries and sweetened sodas, but they can also be specific to Nepalese culture, for example fried *Momos*, an iconic Nepalese fast food dish, *chowmein*, *kurkure* (packaged puffs of corn with salt and spices), cheese balls (packaged puffs of corn and cheese flavours) and *pani-puri puri* (a street snack that consists of a round, hollow deep-fried wheat bread filled with a mixture of flavoured water, tamarind chutney and potato). Eating 'outside food' in restaurants and outlets is a relatively recent phenomena in Kathmandu. Liechty (2005) reports that such outlets allow for a mixing of castes and cultural food rules which represent a refutation of food customs and ways. However, now, commodified eating has become a marker of a new form of prestige based on class (Liechty, 2005). Higher class Nepalese aspire to eat in restaurants offering new, modern foods. However, some traditional views exist about eating outside the home, especially amongst some women, who argue that eating outside the home opens the door to evil spirits, and that eating establishments cook for money, whereas the woman in the household cooks for love (Liechty, 2005).

The impact of greater economic availability of junk foods must be considered on dietary behaviours in Kathmandu. Links have been found between the low income urban populations, their lack of health knowledge, low consumption of fruits and vegetables and preference for junk food (Oli et al., 2013). This makes the urban poor more susceptible to developing NCDs like diabetes. Fast food has also been associated with higher prevalence of overweight in suburban Nepalese adults (Shrestha et al., 2016). Similarly, young people are eating more junk foods, particularly in urban areas, making the home environment important in fostering healthy eating habits, and giving parents an important role in their children's health. Children's favourite drinks are often sugary beverages such as Fanta and Coke, and though mothers may be aware of the health impacts of unhealthy solid foods, recent research reports that they are less likely to know about the impacts of sugary beverages (Vaidya and Krettek, 2012, Oli et al., 2015b). Advertising can also play a role in influencing such knowledge and subsequent behaviours (Oli et al., 2015a, Léon, 2015, Klepp et al., 2007). Junk food availability and consumption has been increasing in Nepal (Popkin, 2015, Popkin et al., 2012, Subedi et al., 2017, Ide, 2016, Oli et al., 2015b, Shrestha et al., 2017). Additionally, new types of food production add an additional layer on to traditional food practices, with reports that they sometimes involve chemical fertilisers, increasing concerns that foods are chemicalised (Subedi, 2016).

Conversely, older people in Nepal have been shown to be reluctant to make dietary changes, sticking to more traditional and culturally held food beliefs. Some research has found that these older family members, who are highly respected in Nepali culture, often choose traditional eating practices and dictate these for the rest of the household, sometimes presenting a barrier to improving eating practices (Oli et al., 2015b). Traditional eating practices sometimes perpetuate myths, for example that spicy foods and foods with large amounts of masala are unhealthy. Ide (2016) argues that this can lead to people not using spices when cooking but using other, less healthy additives such as oil and salt, therefore missing out on healthy food options (Ide, 2016). Evidently cooking practices vary and are influenced by cultural norms. It is common practice, for example, to cook green vegetables with large amounts of oil and salt raising the question of whether the vegetables lose their nutrients when cooked this way (Khadka, 2006, Uprety, 2014). Furthermore, research has found that the typical way of cooking

meat and fish is to deep fry it in large amounts of oil (Ide, 2016) and many people perceive food as tastier if it is cooked with large amounts of salt or oil (Oli et al., 2015b). Traditional Nepalese cooking has been found to use large amounts of oil and salt (Khadka, 2006, Uprety, 2014, Ide, 2016, Oli et al., 2015b). Despite this, many people see homemade food as healthy regardless of the way it is prepared, which should be considered when assessing the determinants of dietary behaviour. The preparation of healthy foods specifically for diabetes patients in the home was found to be problematic in one study, with confusion amongst patients about whether they should eat meals separately from their families (Ide, 2016). Such issues are further explored in Study 2 and discussed in Chapter 4.

1.2.2.6 Food and health

There are also cultural associations in Nepal between healthy food and sick people and certain foods are provided to people when they are sick. In a study from the 90s, Foster found that often specific foods are seen as important for the treatment of illness, for example some foods have traditionally been categorised as *garmi* (hot) and *sardi* or *thandi* (cold), with some being *Na garmi na sardi* (neutral). What constitutes hot and cold foods has been found to vary by region (Foster, 1994). More recent research supports these findings (Subedi, 2018). Keeping a balance between 'hot' and 'cold' food is believed by many to be important to maintain good health in Nepal. Coughing has been found to be generally understood as a cold condition which needs to be regulated and cold foods such as fruits and curd are to be avoided by people with cold conditions (Subedi, 2003). These are important contextual beliefs which could influence food choice.

1.2.2.7 Cultural stigmas around body size

In Nepal cultural links exist between body size and prosperity, with a clear connection between being overweight and being prosperous with *moti* meaning 'fat' and many people using the term healthy as a translation for *moti*, indicating a link for some between *moti* and healthy (Simkhada et al., 2011). Some thin diabetes patients have complained that if they followed the recommended diet from the doctor, they would be left feeling hungry after every meal (Ide, 2016). *Dublo* (skinny/weak) is associated with a weak and vulnerable state, unattractive and vulnerable to illness (Subedi, 2003, Vaidya et al., 2010a). Some research reports that such cultural stigmas are likely to have contributed to obesity and overweight becoming increasing problems which have led to calls for health interventions to tackle overnutrition as much as undernutrition (Cunningham et al., 2016a, Lang and Heasman, 2015).

1.2.2.8 Religious food practices

Religious practices around the main religions in Nepal; Hinduism and Buddhism, have an impact on eating behaviours. Beef is a well-known prohibition of the Hindu religion due to the sacred place of the cow in Hinduism. However, Buddhist groups traditionally from the Middle Hills and high Himalayas have been found not to have such taboos. In Kathmandu, Subedi (2010) found that some Muslims disliked entering Hindu homes due to the non halal meat being eaten (Subedi, 2010). In general, the consumption of beef remains a contentious issue in Nepal (Jolly, 2009, Sherwell, 2015, Samiti, 2019).

Fasting or partial fasting form an important part of religious practice, particularly around Hinduism. Traditionally, Burbank (1995) found, that after the death of the father in a Hindu household, the sons must fast and abstain from eating salt, oil, lentils and meat for thirteen days and on the death of the mother, all her children must stop drinking milk for a year. Furthermore,

fasting is part of common feasts and festivities, for example the Gaura festival of womanhood which involves women fasting for a week whilst men fast on the main day of the festival (Bhattarai, 2018). Regional religious festivals also occur which involve fasting, such as the Madhav Narayan festival in Sankhu near Kathmandu (Narayan, 2016).

Traditionally in Hindu culture, food and utensils used in the preparation of food must be ritually clean (*chokho*). The only way to make an item *chokho* is by washing it in water, so plates are rinsed in water before use. Connected to these concepts of ritual purification is the concept of *jutho* which is the Hindu taboo associated with pollution or contamination of food or drink. To be *jutho* is to be unfit to eat or place food in. Food or utensils can become contaminated when touched by any of the body's excretions (e.g. saliva) or if touched by someone who is contaminated by definition such as a lower caste person, for example if a low caste person drinks from a glass or uses a plate in a restaurant, they must wash it themselves and set it to dry. Whilst *jutho* has still been found to be influential in Nepal, particularly in rural areas (Tamang, 2016), further investigations are needed about current attitudes towards *jutho* in urban Kathmandu.

Religious festivals have been shown to influence dietary behaviour in Nepal - much research has found that religious festivals often lead to eating large amounts of specific, culturally-defined foods in celebration (Lipner, 2012, Sapkota et al., 2017, Smith, 2013, Subodh, 2013, USAID, 2010, Oestgaard, 1999). Evidently, religious eating practices have been found to vary between religions (Subedi, 2010). Religion has been reported as a clear determinant of dietary behaviour by previous research (Lipner, 2012, Sapkota et al., 2017, Smith, 2013, Subodh, 2013, USAID, 2010, Oestgaard, 1999). Religious practices in Nepal are diverse and varied and the extent to which these dictate dietary practices will be explored further in Chapter 4.

1.2.2.9 Ethnic food practices

Different groups in Nepal have differing food cultures. Depending on a person's cultural beliefs in Nepal, some foods are seen as taboo, for example it has been reported that the majority of Brahmin, Newar and Janajati participants in one study would not eat a vegetable dish if it contained potato (Ide, 2016). Conversely, potatoes have been found to be a very important aspect of the Sherpa (ethnic group) diet. Ghee is another ingredient which traditionally has been found to affect the way food is seen, it is a butter-like substance which comes from cows which are sacred for some groups in Nepal, for this reason it is said to have purifying properties, (unlike those foods cooked in vegetable oil). Foods traditionally prepared with ghee are called *kachcha* (as opposed to *pakka* foods which are not), and *kachcha* foods traditionally should only be eaten if they have been prepared by a member of the person's own endogamous group (Subedi, 2011, Tamang, 2009). In the 1990s Burbank (1995) found distinct variations in food consumption between groups, for example, some people from the Brahmin and Chhentri caste did not eat water buffalo meat and were forbidden by caste to drink alcohol. Some Brahmins were reported as not eating chicken or duck while some Buddhist Newars did not eat chicken but would eat duck and some Tamangs did not allow uncooked garlic, nettles or buffalo meat into their houses, though they were happy to consume it outside their homes (Burbank, 1995). However, it is unclear the extent to which these stipulations remain the case today. Other more recent research has found that the Rai and Magar communities in the mid-hills were found to have a diet dominated by fat-laden pork (Vaidya and Krettek, 2012). Evidently, different groups have been shown to consume differing diets, so food consumption in Nepal is diverse and varied and dependent on cultural background. Due to rapid urbanisation, Kathmandu represents a melting pot of different ethnicities and religious groups, and my research attempts to explore food cultures in different groups to understand the complexity of dietary behaviour.

1.2.2.10 Rice in Nepali culture

Perhaps the most culturally significant food in Nepal is rice. White rice is predominantly seen as the best food to consume, an essential component of the Nepalese diet (Dahal et al., 2005, Oli et al., 2015b). Wholegrains like millet and buckwheat are commonly not seen as good enough compared with rice (Uprety, 2014). The cultural significance of rice and its complex meaning must be explored within the context of diabetes and healthy eating behaviour. In Chapter 4 I explore the challenge of ensuring cultural sensitivity around the importance of rice consumption for diabetes patients for whom eating large amounts of white rice can make their diabetes worse.

1.2.2.11 Eating patterns and routines

It has been reported that people usually start the morning with a glass of sweet milk tea (Ide, 2016, Burbank, 1995). If there is no sugar, black tea with salt might be drunk, though people prefer sugar and milk in their tea where it is available (USAID, 2010). The traditional daily eating routine is to have two meals a day (at 9 or 10am and then 7 or 8pm) with a snack in the afternoon called *kaaja*, sometimes in English known as 'tiffin' (Burbank, 1995). Evening meals in urban areas tend to be later than 7 or 8. Eating the evening meal is usually the last activity of the day, after which people go to bed. Sudo et al. (2009) found that men frequently skipped lunch and regularly consumed snacks during the day. I look further at the differences in daily eating times, and how these effect dietary behaviours, in Chapter 4.

1.2.2.12 Gender and food

Gender is an important dimension when assessing the determinants of dietary behaviour. Gender specific behaviour change interventions have been found to be necessary to improve dietary behaviour, with men often found to have more unhealthy dietary practices than women (Shrestha et al., 2013b, Rausch Herscovici et al., 2013). Women have been reported to be increasingly working outside the home in urban areas of Nepal such as Kathmandu. This has reportedly placed increased strain on women who are traditionally the members of the household who cook (Hossain et al., 2015, Mish, 2007). This can lead to less time being spent on food preparation in the home, and more convenience foods being consumed (Hossain et al., 2015). With more women bringing income into households, there is debate about to what extent women control financial decisions about the food bought for the household (Muller and Mobarak, 2013, Oli et al., 2015b).

The role of the woman in the Nepali household in relation to cooking is traditionally dependent on her status. Often daughters-in-law are tasked with cooking for the entire household, and take the last position in household serving order (Gittelsohn, 1991, Gittelsohn et al., 1997, Ohno et al., 2005, Sudo et al., 2006, Uprety, 2014) with women often eating only once men have finished (Uprety, 2014). Daughters-in-law play a significant role in households by cooking and providing food for their husband and his family, showing a continuation of cultural traditions even in a modernised urban environment (Gittelsohn, 1991, Gittelsohn et al., 1997, Ohno et al., 2005, Sudo et al., 2006, Uprety, 2014). The extent to which these traditions are still adhered to and affect dietary behaviour will be considered in Chapter 4.

Food and dietary behaviour in the context of Nepal is a complex and multi-faceted topic. Evidently, the food people like to eat depends largely on cultural factors which include ethnicity, religion and the complex social structures which dictate behaviour. Certain foods are associated with specific groups (e.g. potatoes with Sherpas). An individual's identity (e.g. female, Hindu)

can dictate how they interact with food and this can differ from how other groups interact with food. The way food is cultivated and prepared varies with region, availability of food, climate and tradition. Food in Nepal is inextricably linked to social relationships, communal processes and ritual behaviours. The power of social influences on eating behaviours should be considered as research has found that family responsibilities are culturally very important in Nepal (Oli et al., 2015b). Social influences have also been found to be important in other contexts (Robinson et al., 2014, Deutsch and Gerard, 1955, Reno et al., 1993, Robinson and Higgs, 2012, Schultz et al., 2007), particularly the influence of family and friends (Pachucki et al., 2011). The connection between showing love through presenting loved ones with food has been previously explored (Liechty, 2005). Such social influences will be explored further in this thesis, particularly in Chapter 4. In my analysis of dietary behaviour in urban Kathmandu I draw further on the diversity in dietary practices in Nepal identified by the myriad of issues I have discussed in this section. I assess these issues when considering importance of socio-cultural context in influencing dietary behaviour.

1.2.3 Diabetes and HBGLs in Nepal and Kathmandu

1.2.3.1 Pluralised health system

The health system in Nepal is a complex and pluralised one comprising several intersecting components. Within the health system there are public, private and NGO elements. This plurality makes analysis of health care services in Nepal complex and multifaceted. Nepal has taken positive steps towards universal access to free health care with the 2017 National Insurance Act (Government of Nepal, 2017a) and the National Health Institution Quality Authority Act (Thapa et al., 2017). Despite this, the public health care in Nepal has developed against the backdrop of multiple donor programmes over the past decades. This has led to public healthcare being a patchwork of programmes which include scarce resources for addressing the rising burden of NCDs, mental health and other emerging conditions (Sharma et al., 2018). Private health care and NGO led health programmes supplement the fragmented public health system. Private clinics, for example, provide diabetes treatment in more modern and less crowded facilities than those provided by the public health system. International organisations such as UNICEF provide resources (e.g. nutrition kits) to vastly underfunded public health facilities. Such a pluralised system affects diabetes care in Kathmandu, which I consider in this research.

1.2.3.2 Inadequate diabetes care

As discussed, public health care services supporting diabetes in Nepal are variable and limited in many ways. Various diabetes treatments are not readily available in health facilities; only 14% of facilities have glibenclamide, 20% have injectable insulin, 34% have Metformin, and 55% have injectable glucose solution (Government of Nepal Ministry of Health, 2015 p.187.). These lacking clinical capacities are combined with ineffective levels of support, such as dietary counselling provided by public health services. Health information and knowledge given to diabetes patients is not always delivered in the most effective way (Gautam et al., 2015). This can have a direct impact on a patient's awareness of healthy dietary behaviour and therefore contribute to a lack of lifestyle changes to improve their condition.

1.3 Addressing the research problem

An overview of the research problem has revealed the need to improve dietary behaviour amongst people with or at risk of developing diabetes in Nepal to tackle the rise in diabetes. In this thesis I explore the potential of dietary behaviour interventions to bring about behaviour change. I now discuss how I will address the research problem by developing an intervention(s) to improve dietary behaviour in Nepal, specifically in Kathmandu.

1.3.1 Using critical theory to inform research

1.3.1.1 COM-B and the behaviour change wheel

This project draws on behaviour change concepts developed by Michie et al. (2011). Specifically, I consider the behaviour change wheel which is a model consisting of three main layers in the shape of a wheel which aim to provide a systematic way of identifying relevant intervention functions and policy categories based on what is understood about the target behaviour. The behaviour change wheel is linked to a range of psychological theories and was built taking into consideration existing theories of behaviour from different behavioural traditions. Michie et al. (2011) built the wheel after a robust synthesis of existing behavioural approaches (Michie et al., 2011, Fishbein et al., 2001). The behaviour change wheel is particularly appropriate for this research because it was created to characterise and design behaviour change interventions and designing such an intervention is a central aim of this thesis. As can be seen in Figure 3, the three layers of the wheel are; 1. COM-B (capability, opportunity and motivation) of individual behaviour; 2. Nine intervention functions (e.g. education, persuasion) to be chosen according to the COM-B analysis undertaken; 3. Seven policy categories that can support the delivery of intervention functions (e.g. guidelines, regulations).

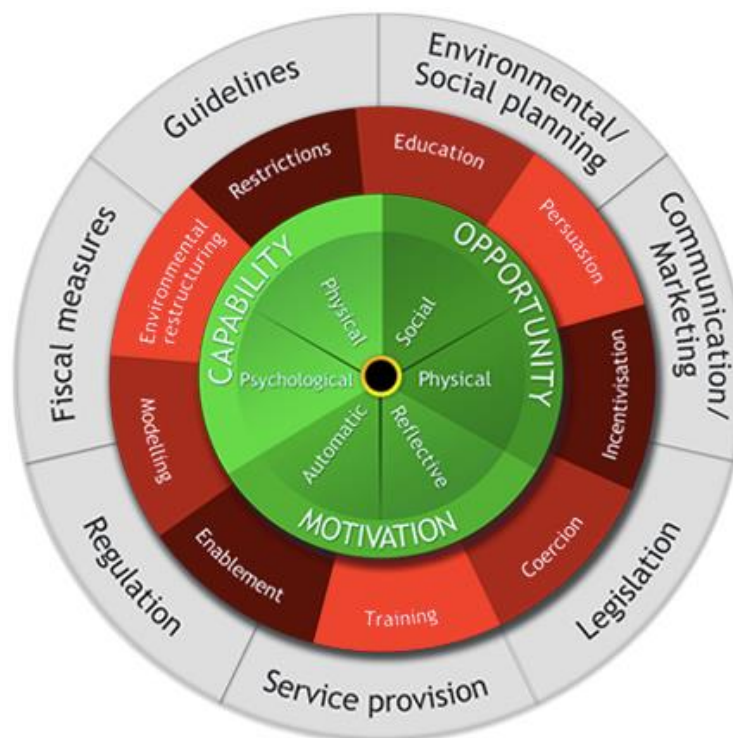


Figure 3: Behaviour change wheel including COM-B at its centre (Michie et al., 2011)

The wheel recognises behaviour as part of an interacting system involving components at these three layers. The hub of the wheel consists of three sources of behaviour which could prove effective targets for an intervention; capability, opportunity, motivation. These, in short, address the capability and motivation of individuals and the opportunities available to them which affect behaviour. The behaviour change wheel advocates that interventions need to target and change one or more of the COM-B components. I draw on COM-B in Study 2 to structure interview guides and assess the capability, opportunity and motivation of individuals with HBGLs/diabetes which affect their dietary behaviour. As the thesis unfolds, my data provides evidence to suggest that the behaviour change wheel needs modification. I therefore then use data from Study 2 to present a critique of the behaviour change wheel and make suggestions for its adaptation in Chapter 6.

1.3.1.2 Using behaviour change techniques [BCTs] to understand effective interventions

Closely connected with the behaviour change wheel are behaviour change techniques [BCTs]. Whereas the behaviour change wheel can be seen as providing a theoretical basis for behaviour change interventions and the recipe for compiling components of an intervention targeted at changing behaviour, BCTs can be seen as specific tools, or ingredients, which can make up the intervention. BCTs are designed to be used in interventions to actively change behaviour (Michie et al., 2013) and include, for example, health education, action planning or demonstration of behaviour. Using BCTs to interpret, understand and explore dietary behaviours is potentially of great value when assessing which interventions could be successful. Potentially effective BCTs have been identified for dietary behaviour change within people living in High Income Countries [HICs] (Brannon and Cushing, 2015, Michie et al., 2009, Lara et al., 2014). However, a gap in the research exists because similar investigations have not been conducted to assess BCTs used in dietary interventions in LMICs. This thesis begins to fill this gap by exploring the use of BCTs in dietary interventions in LMICs in a systematic review in Chapter 1. Consideration of BCTs runs throughout the thesis and they are embedded in the final proposed intervention packages in Chapter 9.

1.3.1.3 Health systems theory

This thesis also draws on the recent rise in the conceptualisations of health systems which acknowledge and embed overarching social and political context as important (Sheikh et al., 2011). Health systems thinking has evolved to consider the values and interests of people, including perspectives on gender. Sheikh et al. (2011) categorise influences on the health system into 'hardware' – concrete and tangible expressions of aspects of the health system (e.g. finance, medical products, information systems etc. as outlined in the WHO building blocks (WHO, 2007)) – and 'software' – the ideas and interests, values and norms and power aspects which guide actions among system actors and elements. Inspired by such existing research, I provide a new conceptualisation of contexts within the Nepali health system specifically which influence the supply of and demand for interventions to improve dietary behaviour amongst people with HBGLs/diabetes in Nepal in Chapter 5.

1.3.1.4 Gender theory

Gender-transformative approaches aim to address gender bias and inequalities and are advocated by WHO policy guidance (World Health Organisation, 2017). These approaches have been used in global health initiatives (Barker et al., 2010, Dworkin et al., 2015, Greaves et al., 2014) and are essential for achieving the sustainable development goals [SDGs], specifically

SDGs 4 (quality education), SDG 6 (gender equality) and SDG 8 (decent work and inclusive economic growth) (UN, 2015). On an individual level, gender can affect how vulnerable people are to health conditions and the power they may have about how household resources are spent. On a broader, structural level, gender can affect how systems operate and who they prioritise. As discussed in 1.3.1.3, health systems thinking has evolved to consider how the values and interests of people, including perspectives on gender, and power relations affect the ways health systems operate. I use a gender analysis framework [Figure 4] that synthesises existing research and is outlined by Research in Gender and Ethics (2016). The framework considers gender as a power relation and driver of inequality. It focuses on who has and does what, how values are defined (including consideration of social norms, beliefs) and who makes decisions. I consider these questions broadly in the context of multiple levels (e.g. individual, structural) to ensure gender-sensitivity in my work.

What constitutes gendered power relations	
Who has what?	Access to resources (education, information, skills, income, employment, services, benefits, time, space, social capital etc.)
Who does what?	Division of labour within and beyond the household and everyday practices
How values are defined?	Social norms, ideologies, beliefs and perceptions
Who decides?	Rules and decision-making (both formal and informal)
How power is negotiated and changed	
Individuals/ People	Critical consciousness, acknowledgement/ lack of acknowledgement, agency/apathy, interests, historical and lived experiences, resistance or violence
Structural/ Environment	Legal and policy status, institutionalisation within planning and programs, funding, accountability mechanisms

Figure 4: Gender analysis framework from (Research in Gender and Ethics, 2016)

Gender is also shaped by other hierarchies related to sexuality, class, race, ethnicity, education, age and (dis)ability (Bottorff et al., 2011, Hankivsky, 2012, Larson et al., 2016). These hierarchies overlap to influence individual behaviour, constituting intersectionality. Intersectionality has become increasingly important in health research (Bowleg, 2012, Krieger et al., 1993, Schulman et al., 1999, van Ryn and Burke, 2000, Waldman et al., 2018) and considers the interaction of different social stratifiers (e.g. gender, ethnicity) and the power structures which reinforce them (Larson et al., 2016). Considering intersectionality allows us to better understand types of inequity and disadvantage that occur. Focusing on just one stratifier (e.g. age, ethnicity) may lead to missing problems that are unique to specific groups. Therefore, this thesis takes an intersectional lens on the research problem to incorporate intersectionality in understanding the multi-dimensional influences on individuals and groups which determine their behaviour. Understanding these factors can help us to build more effective and equitable health systems. There is an ethical imperative that health researchers ‘do no harm’ to the people they seek to serve through their work and gender-sensitive analysis which considers intersectionality can help with this (Research in Gender and Ethics, 2016). Participatory methods are a way of generating data which gives voice to gender and intersectional differences and I use these methods (e.g. food diaries, participatory mapping) in this research. I include gender-sensitive questions into data collection tools and ensure that I am gender-sensitive when collecting data

and reflecting on data collection. To ensure analysis is sensitive to intersectionality and gender in this research I disaggregate data by sex and other social markers such as ethnicity. Consideration of gender theory in this research helps to further contribute to positive movements in Nepal in recent years which have made it a global leader in gender equality and social inclusion (International Development Partners Group Nepal, 2017, UNDP Nepal, 2017, Asia Foundation, 2017).

1.3.2 Intervention development

My research combines an investigation of BCTs which have been used successfully in LMICs with an in-depth investigation of a specific LMIC context - Nepal. Consideration of context in detail is advocated by the MRC guidance for developing and evaluating complex interventions (Medical Research Council, 2006). From this guidance, my research draws on the suggestions for development of a complex intervention for dietary behaviour as part of the development-evaluation-implementation process. According to the guidance, as illustrated in Figure 5, it is important to identify the evidence base, ideally by carrying out a systematic review. The MRC guidelines have been used successfully in intervention development. Examples of the successful development of interventions relevant to this research, in relation to NCDs include Smith et al. (2012) and in relation to diabetes (Paul et al., 2007). The guidelines therefore provide a loose framework on which to structure my intervention development. Therefore, in Part 1 of the thesis, findings from a systematic review into dietary interventions in LMICs (Study 1) are reported and involved 1. Identifying the evidence base and 2. Identifying/developing theory.

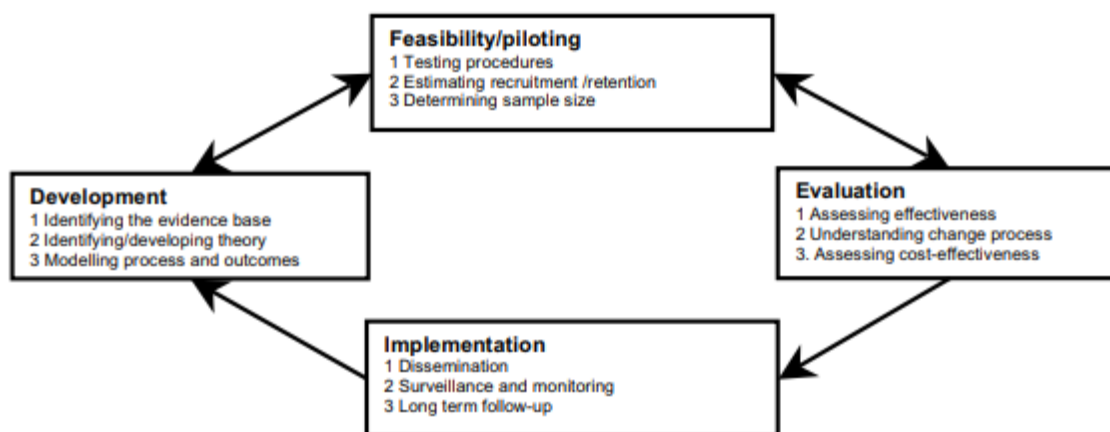


Figure 5: Key elements of the development and evaluation process (Medical Research Council, 2006)

The guidelines advocate identifying/developing appropriate theory by identifying relevant theories to understand what might result in a feasible and effective intervention. I identify and develop theory throughout this thesis. In Part 2, I draw on existing evidence and theory including ecological models, supplemented by new primary research in the form of two studies (Studies 2 and 3). In these studies, I use qualitative methods to garner the views of key stakeholders – patients, health workers, policymakers and researchers, who are both targeted by the intervention and involved in its development/delivery. A further component of the MRC guidance for developing an intervention is to model process and outcomes, that is, modelling an intervention prior to full scale evaluation which can provide useful information about the design of the intervention. I begin the modelling process of an intervention in Part 3 of the thesis to establish how the intervention may be best delivered. My research does not pilot an

intervention, though it will propose detailed intervention proposals (Part 3) based on the findings from the earlier sections of the thesis (Parts 1 and 2). My thesis is predominantly structured around the MRC guidance for complex interventions as this framework fits the order of my objectives well and my research addresses all of the three main intervention development activities (Medical Research Council, 2006). However, my research also will draw on the six steps in quality intervention development (6SQuID) (Wight et al., 2015). 6SQuID outlines six steps in intervention development starting with defining and understanding the problem and its causes, then clarifying which factors are malleable and have greatest scope for change, identifying how to bring about change (the change mechanism), how to deliver the change mechanism, testing and refining the intervention on small scale and finally collecting sufficient evidence of effectiveness to justify rigorous evaluation/implementation. 6SQuID has begun to be used for intervention development (Araújo-Soares et al., 2018, Matthews et al., 2017, van Rooyen et al., 2016). Though my research will not address all six steps, I draw on its suggestions for intervention development specified in step 1 (define and understand the problem and its causes), step 2 (clarify which causal or contextual factors are malleable and have greatest scope for change), step 3 (identify how to bring about change: the change mechanism) and step 4 (identify how to deliver the change mechanism).

1.3.3 Gaining an in-depth understanding of context for intervention development

An in-depth understanding of cultural contexts incorporating cultural sensitivity and understanding has been shown to be important in implementing health interventions (Helman, 2007, Sharma and Karki, 2014, Dutta, 2008). However, often cultural considerations are not prioritised in public health interventions in LMICs where Euroamerican or HIC constructed theories and methodologies have often been seen as easily transferable (Airhihenbuwa, 1995). Where I group LMICs together I do so for these reasons; a) providing a focus for a neglected group of countries in theories and methodologies, in the case of my systematic review [Part 1 of this thesis] b) to ensure that a sufficient number of previous studies could be identified to represent a usable evidence base to contribute to the development of possible interventions. However, throughout the thesis I stress the need to consider cultural context of and within individual countries with many individual differences and characteristics and not to treat LMICs as a homogenous block. The development process I present in this thesis therefore goes on from an overarching review of LMICs to be refined through the lens of the Nepal context.

There have been increasing attempts to make interventions contextually sensitive, for example in Nepal where community participation and mobilisation have made interventions relevant and appropriate to specific communities (KC et al., 2011, Shrestha et al., 2011), and in relation to nutrition and dietary interventions which have involved dietary advice tailored to culture and ethnic identity (James, 2004, Resnicow et al., 2009). In recent years there has been growing discussion about the importance of locally context-specific, person-focused approaches to public health services (Macfarlane and Irwin, 2009, Airhihenbuwa and Webster, 2004, Kreuter et al., 2003, Kline, 2007, Parks and Kreuter, 2007, Kreuter et al., 1999, Mishra et al., 2015b, Toobert et al., 2011, Mier et al., 2010, Card et al., 2011, Barrera et al., 2013, Wainberg et al., 2007). Panter-Brick et al. (2006) go one step further than culturally appropriate to argue that interventions should be culturally compelling, that is, engage local communities in ways which they find exciting and interesting and sit within social and ecological environments. Throughout the early chapters of the thesis I consider the meaning of culture, complex in its nature, and how concepts such as socio-cultural context can be used to consider the complex web of social norms and cultural fabric interwoven into societies which influence behaviour.

Furthermore, gender has been found to be important in social interactions (Lindsey, 2015) and is closely tied to cultural context. Gender differences have been documented in research on risk factors of NCDs in Nepal (Adhikari et al., 2014) and the position of women in the household has been related to dietary behaviours in Nepal (Diamond-Smith et al., 2017, Katz et al., 2001). Gender has also been shown to be influential in food preferences (Muller and Mobarak, 2013, Smith, 2013, Sudo et al., 2009, Uprety, 2014) in perceptions of healthy diet (Oli et al., 2018, Oli et al., 2015b) and in the care of type 2 diabetes in Nepal (Shrestha et al., 2013b). For these reasons, my research pursues an in-depth investigation of the importance of cultural aspects, including a consideration of gender, in developing a dietary intervention in Nepal. I explore how culturally compelling interventions can be developed to engage people in effective behaviour change. This will address the current gap in our knowledge about how behaviour change interventions can be best understood and used in LMIC contexts and made culturally sensitive and highly effective.

1.3.3.1 Ecological Modelling

To gather an in-depth understanding of a research context, I use and report in the thesis an ecological model (Chapter 4). Ecological methods are used to consider the determinants of dietary behaviour (Bronfenbrenner, 1992, Egger and Swinburn, 1997, McLeroy et al., 1988, Sallis et al., 2008, Stokols, 1992). Determinants of health, especially social determinants of health have been shown to be important by recent research (Marmot, 2015) particularly in relation to NCDs (Marmot and Bell, 2019). Ecological models can help to better understand different levels of influence between environments such as cultural, social and political environments which determine behaviour (Biddle, 2008, Sallis et al., 2008, Story et al., 2008, Stokols, 1992, Bronfenbrenner, 1992, Bronfenbrenner, 1979). They explore multi-level options for policy and interventions and have a track record of success on an international scale (WHO, 2004b). I combine an ecological investigation of my research context with a detailed assessment of factors influencing diabetes support within the health system, exploring what is being done and where there are gaps in support, thereby combining an investigation of top-down systematic factors and bottom-up determinants of health (Chapter 5). These assessments are then put together to construct intervention proposals.

1.4 Gaps in the existing evidence

In summary, dietary behaviour interventions have the potential to tackle the increase in NCDs such as diabetes in LMICs, though no research has yet assessed how such interventions can be feasible and most effective in this context. My research begins to fill this gap by exploring aspects of dietary interventions which have been effective in LMIC contexts. It does so by starting with a systematic review (Study 1) which investigates the characteristics of successful dietary interventions in LMICs. There is also a gap in existing evidence showing how dietary behaviour can be improved with a consideration of socio-cultural context in Nepal for people with diabetes/HBGLs to reduce the impact of their disease. Though there has been a review of obstacles facing diabetes care in Nepal (Ide et al., 2018), it considered multiple varying settings, its conclusions are generalised and therefore not tailored to individual communities or populations. Ide et al. (2018) do not look at the impact and influence of context or delve into the impact of socio-cultural context on behaviour as I do in this thesis. Such an exploration would provide a much deeper layer of understanding on the problem, which would talk in terms of cultures, habits, behaviours, skills and knowledge needed for dietary change. Furthermore, there is a gap in the evidence which explores socio-cultural influences not only on people with

diabetes/HBGLs but also within policy-making environments. By beginning to fill these gaps in evidence it would be possible to gain a deeper, more contextually sensitive understanding of which interventions to improve behaviours could be most feasible. My research aims to fill these gaps in the existing evidence.

1.5 Aim and objectives of research

1.5.1 Aim of research

The overarching aim of this research is to establish how dietary behaviour can be improved in LMIC contexts through the development of a feasible intervention package(s), with a focus on a specific LMIC context – Nepal, to tackle the increase in diabetes.

1.5.2 Objectives of research

The objectives of this research are:

1.5.2.1 Part 1: Identifying the evidence base *and* Identifying and developing theory - systematic review and meta-analysis

1. To synthesise the findings from studies testing the effect of interventions (vs. comparison conditions) on dietary behaviours of people living in LMICs
2. To identify the behaviour change techniques [BCTs] and other elements that influence the effect of interventions on dietary behaviour

I use the findings from Part 1 as a base on which to build the second part of my thesis. In Part 2 I further investigate the factors which can impact upon the effectiveness of a dietary intervention. I investigate the context in a specific LMIC (Nepal) to explore how contextual factors affect dietary behaviour and the delivery of support for a specific NCD (diabetes).

1.5.2.2 Part 2: Identifying the evidence base *and* Identifying and developing theory

My objectives of Part 2 are to:

1. Identify the determinants of dietary behaviour of people with diabetes/HBGLs in Kathmandu
2. Propose how an understanding of the determinants of dietary behaviour can be used to inform feasible interventions
3. Consider the existing supply of and demand for interventions to improve dietary behaviour amongst people with diabetes/HBGLs
4. Understand which factors affect the supply of and demand for interventions to improve dietary behaviour amongst people with diabetes/HBGLs
5. Consider how suggestions can be made to improve the supply of interventions to improve dietary behaviour amongst people with diabetes/HBGLs

Next, I draw together my findings from Parts 1 and 2 about the factors which influence the potential feasibility of dietary interventions and begin to develop intervention proposals by modelling potential interventions and testing their feasibility. I then present my findings in the form of potentially feasible intervention packages, alongside additional suggestions for policymakers for improving the delivery of dietary support for those with HBGLs/diabetes.

1.5.2.3 Part 3: Identifying and developing theory *and* Modelling process

My objectives for Part 3 are to:

1. Consolidate and justify the proposal of potential interventions to improve dietary behaviour
2. Conduct an initial feasibility assessment of these interventions
3. Conduct a secondary feasibility assessment of key interventions
4. Rank and identify the overall most feasible intervention proposals to take forward
5. Present interventions [intervention packages] for development or piloting
6. Present broader, long-term, macro suggestions for improvements to provision for people with diabetes/HBGLs

The findings of this research considered to be transferrable are; a) findings from systematic review into dietary behaviour (Study 1) and b) the process through which I develop the intervention package (which can be applicable to other NCDs, contexts and risk factors). These aspects are transferrable to other parts of Nepal, rural and urban, and potentially to other LMIC and HIC contexts (with contextual modifications). This research provides guidance and suggestions for researchers who are interested in implementing similar culturally sensitive and appropriate interventions to bring about tangible change.

1.6 Approach

Figure 6 provides an overview of the structure of this research. The three sections will inform each other.

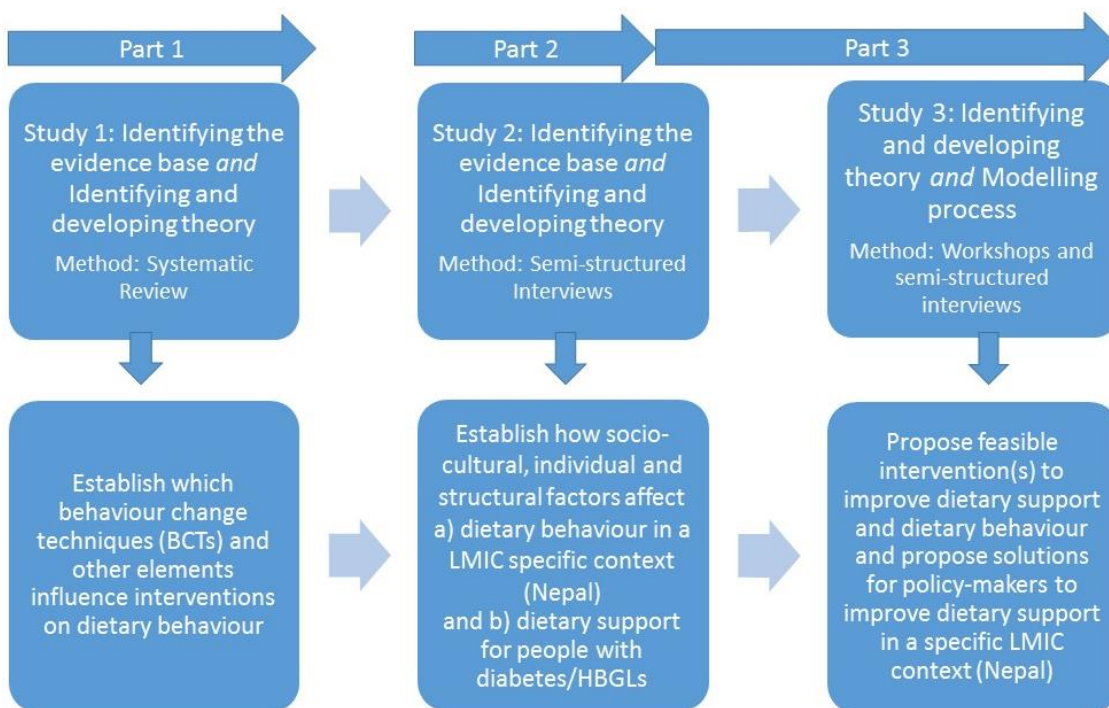


Figure 6: Structure of project

1.7 Research paradigm – Pragmatism

Throughout this research I take a pragmatic approach (Feilzer, 2010). That is, an approach which supports the use of a mixture of methods and analysis (qualitative and quantitative). A pragmatic

approach involves a continuous cycle of abductive reasoning (that is reasoning which refers to the logical connection made by researchers between data and theory – when researchers move back and forth between induction and deduction – converting observations into theories and then addressing those theories through action (Morgan, 2007)) at the same time as being guided by the desire to produce socially useful knowledge. I chose this approach because of the mixture of methods I use (quantitative with a systematic review and meta-analysis [Study 1], and qualitative with an in-depth investigation of an LMIC context [Studies 2 and 3]). By advocating a mixed methods approach, pragmatists are anti-dualists (Rorty, 1999) which question the dichotomy between positivism and constructivism and call for a convergence of both methods, suggesting that the most important question is whether the research has helped to find out what the researcher wants to know (Hanson, 2008).

I also adopt this approach as it best represents my view that there are multiple realities which are open to empirical enquiry and the pragmatic approach orientates itself towards solving practical problems in the real world (Creswell and Clark, 2017, Dewey, 1925, Rorty, 1999). Taking a pragmatic approach views an experimental world with different layers, some objective, some subjective, some a mixture of the two. My aim of this research is to produce useful research relating to tackling the growing problem of diabetes with tangible solutions and using this notion of utility is central to the pragmatic paradigm.

1.8 Researcher positionality in relation to the research

I worked from 2012 – 2017 as a learning advisor at the University of Leeds. This involved teaching students and researchers research skills including how to find literature for literature reviews and systematic reviews using databases such as Medline. I taught Masters students on the Master of Public Health course at the Nuffield Centre for International Health and Development and through interactions with these students, many of whom were from low- and middle-income countries, I developed an interest in global public health research. I combined this interest with my academic background in social sciences to develop a PhD proposal with the Nuffield Centre. This proposal was successful in being granted a University of Leeds Anniversary Scholarship, and I began studying for the PhD in 2015.

1.9 Study timeframe

I was enrolled as a PhD student in October 2015 and worked part time for the University of Leeds until I transferred to a full time PhD candidate in April 2017. My first phase of field research took place in 2017. I took a period of suspension in 2018 of 4 months and completed my second phase of field work in summer 2018.

1.10 Thesis Outline

This research combines findings from the systematic review (Study 1), with those collected in the field in two studies (2 and 3) in Kathmandu to propose culturally sensitive, tailored and appropriate intervention packages which promote improved dietary behaviour. The first part of this thesis addresses identifying the evidence base and identifying/developing theory by documenting the process and results of my systematic review (Study 1) into dietary interventions in LMICs. The second part of this thesis (Part 2) further identifies the evidence base and identifies/develops theory. Part 2 is made up of four chapters; Chapter 3 considers the methods I used for Study 2; Chapter 4 provides results and preliminary discussion of the determinants of dietary behaviour; Chapter 5 provides results and preliminary discussion

relating to factors which affect delivery of diabetes care; Chapter 6 consolidates my findings of Study 2. The final part of the thesis, Part 3 addresses identifying and developing theory and modelling process and outcomes. It is also split into three sections. Chapter 7 explores the process of initial feasibility assessment in selecting potential interventions for improving dietary behaviour; Chapter 8 describes the methods used and presents results from Study 3; Chapter 9 lays out my final intervention proposals with justification and provides suggestions for improvements to government policy. I conclude with a summary of my findings and ways in which this thesis offers a valuable and original contribution to the literature.

PART I

Chapter 2 How effective are interventions in improving dietary behaviour in Low and Middle Income countries? A systematic review and meta-analysis

2.1 Introduction

This review plays a crucial part in laying the groundwork for this PhD by developing an understanding of which elements of dietary interventions were effective, and which may be least effective in bringing about positive behaviour change. It aimed to fill the gap in the evidence base to consider the effectiveness of BCTs and other intervention elements for dietary behaviour changes in LMICs. I grouped LMICs together as no review had been conducted of BCTs in dietary behaviour in LMICs and I wanted to collate studies which had been conducted in locations other than the relatively well-researched HIC context. Though I group LMICs together in this review, I make efforts in this thesis not to treat LMICs as a homogenous category, acknowledging the diversity of such contexts and the need for interventions to be carefully considered dependent on contextual factors.

I chose to conduct a systematic review as they are regarded as the most thorough method for investigation and they follow clear and known guidelines (Higgins and Green, 2011). It was important to initially establish whether behavioural interventions to improve dietary behaviour have been effective before in LMIC contexts. If such interventions were shown to be effective, it would then be possible to investigate how I could develop a potentially feasible dietary intervention in a specific LMIC context.

While numerous interventions to improve dietary behaviour have been assessed in LMICs (Aira et al., 2013, Bhurosy and Jeewon, 2013, Cakir and Pinar, 2006, Paes-Barreto et al., 2013, Pan et al., 1997, Wang et al., 2015) they have not been meta-synthesised and it is not known which element(s) of the intervention have the greatest impact on behaviour. This is not the case for HICs where reviews have identified potentially effective dietary BCTs such as self-monitoring of behaviour, problem solving, social support and goal setting (Brannon and Cushing, 2015, Michie et al., 2009, Lara et al., 2014).

One previous review has synthesised evidence regarding the effects of interventions to improve healthy eating, physical activity and smoking behaviours amongst low income groups, finding a positive but small effect on all three behaviours (Bull et al., 2014). Although this review is useful in highlighting that such behaviours can be changed in low income groups, it did not elucidate the elements of the interventions or studies that influenced the magnitude of the effects. Furthermore, of the sixteen interventions assessed, the majority were in the USA and only one was in a LMIC [Chile].

Focusing solely on interventions carried out in LMICs to improve dietary behaviour is important due to likely differences in the content of effective interventions delivered to HIC and LMIC populations, as well as the contexts they are delivered in. For example, behaviour change interventions in LMICs may not always be able to rely on written communications since key populations may have low literacy and/or there may be several local languages. With fewer tests and a lack of evidence synthesis, there is a risk that interventions shown to be effective in HICs are applied in LMICs. Cultural considerations are often not prioritised in public health interventions in LMICs where HIC-constructed theories and methodologies may not be appropriate (Airhihenbuwa, 1995). However, there have been increasing attempts to make interventions contextually sensitive, such as in Nepal (KC et al., 2011, Shrestha et al., 2011), and

in interventions designed to improve dietary behaviour within HICs (James, 2004, Resnicow et al., 2009).

In sum, previous reviews have not looked specifically at the effectiveness of BCTs in improving dietary behaviour of individuals residing in LMICs or identified other elements of the study associated with effect sizes. Such elements include the intensity or duration of the intervention and characteristics of the sample, setting, comparison group or outcome measures used (Dombrowski et al., 2016, Prestwich et al., 2017a). Some elements have been shown previously to be associated with the magnitude of health behaviour intervention effects such as the length or intensity of the intervention (e.g., Greaves et al. (2011)) who delivers the intervention and the mode of delivery (e.g., Prestwich et al. (2017b)). Identifying such elements should enable the production of more successful interventions.

A further issue, as noted by Peters et al. (2015) is that few reviews have taken into account the potential confounding between the elements of the intervention that appear to influence the treatment effect. Thus, certain elements of the intervention, such as specific BCTs, may only be related to treatment effect sizes because the element is delivered consistently with other elements. However, a small number of recent reviews of BCTs (e.g., Prestwich et al. (2016), Prestwich et al. (2014a)) have identified potentially effective Study elements (e.g., specific BCTs or modes of delivery), assessed their co-occurrence and, when they co-occur, statistically controlled for each variable when testing the association between study elements and intervention effect sizes. If the elements remain significant predictors of effect sizes when controlling for one another, the elements are unlikely to be confounded. If the elements are rendered non-significant, the element(s) may be confounded. Taking these additional steps presents a more rigorous test of study and intervention elements and addresses in some way the issue of potential confounds.

2.2 Aim

To fill the gap in the evidence base to consider the effectiveness of BCTs and other intervention elements for dietary behaviour changes in LMICs.

2.3 Objectives

1. To synthesise the findings from studies testing the effect of interventions (vs. comparison conditions) on dietary behaviours of people living in LMICs
2. To identify the BCTs and other elements that influence the effect of interventions on dietary behaviour
3. To conduct a series of sensitivity analyses to test the impact of:
 - a) The category of outcome variables used as a basis for effect size calculations;
 - b) Outliers;
 - c) Potential confounds between seemingly effective intervention elements and
 - d) Risk of bias (including publication bias).

2.4 Method

This review was pre-registered in PROSPERO (registration number CRD42016035769).

2.4.1 Search Strategy

A systematic search of the following eight databases was initially run in November 2015 and re-run in October 2017: Medline (Ovid), Embase (Ovid), PsycINFO (Ovid), Web of Science, The Cochrane Central Register of Controlled Trials (CENTRAL), CINAHL, Popline, Global Health (Ovid) (see Appendix A.2). The search terms were based on established filters used in Ovid databases to identify RCTs (Scottish Intercollegiate Guidelines Network, 2014, Higgins and Green, 2011, The Cochrane Collaboration, 2016) and studies conducted in LMICs (The Cochrane Collaboration, 2012, Brown et al., 2014). Additional search terms were used for healthy eating. Keyword searches were transferred between databases where possible, though I adapted search strategies to the specific controlled vocabularies used in every database. Subject heading searching was used in every database where this was possible. Techniques such as truncation were also used to maximise search results. The search was not limited by English language to provide the widest coverage possible and all databases were searched as far back as they allowed (start dates ranged from 1971 to 1996).

The titles and abstracts were double-screened using the eligibility criteria. Studies identified as eligible for inclusion were full-text double-screened. Any discrepancies were resolved through consensus. I contacted authors to obtain further details of papers containing insufficient information to make a decision about eligibility. If no response was provided, up to two reminders were sent and when possible one co-author was contacted.

2.4.2 Eligibility criteria

To be included in the review, studies had to: (1) use a Randomised Controlled Trial (RCT) design; (2) test the effects of an intervention to promote healthy eating or dietary behaviour even if this was not listed as the primary outcome; (3) assess dietary or healthy eating behaviour after at least some of the intervention had been delivered; (4) be tested in a LMIC [as defined by the World Bank economy classifications (World Bank, 2017)]. Studies were excluded if they: (1) were not peer reviewed; (2) were protocols; (3) compared one type of diet against another; (4) promoted dietary supplements, vitamins, fasting, drugs or medical interventions; (5) included women who were pregnant or trying to conceive; or (6) were related to undernutrition.

2.4.3 Data Extraction

Studies were coded based on the published main trial paper and associated papers (e.g., protocol papers). The BCTs used in the interventions were coded by one reviewer using Michie et al's taxonomy of behaviour change techniques (2013) and checked by a second reviewer, with discrepancies discussed between the two reviewers to meet consensus. Both reviewers had completed the online BCT taxonomy training ((BCT Taxonomy, 2015)). Checks of statistical information (e.g., effect size calculations; corrections for clustering) were conducted by a co-author. Extracted data on bias were checked by a second reviewer and any discrepancies in decisions resolved by discussion and consensus. All coders were experienced in extracting data for systematic reviews. Statistical information were checked for all 76 studies; checks of other information were conducted on the first 55 studies (i.e., all studies identified in the initial search).

2.4.4 Characteristics of Interventions

The following data were extracted from the papers associated with each study: the specific BCTs used (according to Michie et al's (2013) taxonomy); the mode of delivery (face-to-face,

Internet/PC, telephone, mail, printed materials, video based); the duration of the intervention (from first to last delivery, not including follow up); the time between the end of intervention and follow up where relevant; the setting (including country and city); characteristics of the sample (including any pre-existing condition of the sample population). This data was extracted for intervention and control groups.

2.4.5 Assessment of risk of bias in included studies

The Cochrane Collaboration's tool for assessing risk of bias (Higgins and Green, 2011) was used. Data were extracted on randomisation, blinding, allocation concealment, selective outcome reporting and other bias concerns. Randomisation sequence generation was coded as low risk when randomisation methods such as coin toss were recorded (otherwise, high risk). Blinding was assessed as adequate when a suitable method of blinding was employed. If blinding was not claimed, or it was judged that it could be easily broken, it was rated inadequate (high risk). Allocation concealment was coded as low risk of bias when it was judged that participants and researchers were unable to predict their allocation to a particular intervention. If an unconcealed procedure was used, it was coded as high risk. Selective outcome reporting was judged as low risk where the study protocols (or related papers) were available and expected outcomes were documented. Selective outcome reporting was classified as high risk where there were differences between measures specified pre-intervention and those reported after the intervention. For all of these risk of bias variables, a code of 'unclear' was assigned when relevant methods were not adequately described. Other bias concerns related to steps taken to reduce contamination, not obtaining informed consent or ethical approval, not using inclusion/exclusion criteria and attrition rates.

2.4.6 Data Synthesis

Comprehensive Meta-Analysis (Borenstein et al., 2005) was used to calculate dietary and related outcome effect sizes (Hedges' g , based on means and standard deviations, SD). If SDs were not reported then standard errors (SE) or 95% confidence intervals were used to calculate standard deviations. If means or the aforementioned variability statistics were not available, means and standard deviations were estimated using medians and interquartile range (Wan et al., 2014). If these statistics were not available, other statistics were used (such as p values and sample sizes). For cluster trials, where the reported analyses did not take into account clustering, corrections were employed. For continuous outcomes, the effective sample sizes (derived by dividing sample size by the design effect) were employed (the means and standard deviations remained the same). For proportion data, the standard errors for effect sizes were corrected (by multiplying the original standard error by the square root of the design effect) to avoid issues linked with rounding participants to whole numbers. In these calculations, the design effect was calculated using the formula: $1 + (M - 1) ICC$, where M = the average cluster size (total sample size divided by the number of clusters) and ICC represents the intracluster correlation coefficients (Higgins and Green, 2011 p.16.3.4). When reported, the original ICCs were used, otherwise ICCs were estimated to be 0.05 (see Michie et al. (2009)).

Effect sizes were calculated based on five types of dietary behaviour outcome: (1) self-reported behaviour and physiological measures closely linked with behaviour (e.g., blood sugar; cholesterol) which I treated as the primary outcome; (2) self-reported behaviour only; (3) self-reported behaviour, physiological measures closely linked with behaviour and more general outcomes linked with dietary behaviour (e.g., weight, fat mass); (4) self-reported fruit and

vegetable intake; (5) self-reported fat intake. Physical outcomes (BMI/weight; waist and hip sizes; blood pressure; cholesterol) were also assessed as additional secondary outcomes.

Random-effects meta-analyses and random effects meta-regressions were conducted in STATA version 13.1 to ascertain overall effects and the association between study/intervention elements and effect sizes. In the meta-analyses, Hedges' g was used as the index of effect size as it is more appropriate than Cohen's d for small sample sizes. Effect sizes of .20, .50 and .80 are interpreted as small, medium and large effect sizes respectively (Cohen, 2013). Heterogeneity was assessed using the I^2 statistic; interpreting values of 25%, 50% and 75% as low, moderate and high levels of heterogeneity respectively (Higgins et al., 2003). In the meta-regressions, B reflects the change in the outcome variable (treatment effect sizes relating to diet) with one-unit increase in the predictor variables. For BCTs, a positive B indicates that studies that incorporate the specific BCT only in their intervention condition yield larger positive changes in diet effect sizes than studies that do not incorporate this BCT only in their intervention condition. A negative B indicates that studies using the specific BCT only in their intervention condition yield smaller positive changes in diet effect sizes than studies not using this BCT uniquely in their intervention condition.

A series of sensitivity analyses were conducted to test the impact of (a) the choice of dependent variables used as a basis for effect size calculations (listed above) (b) removing outliers based on the Sample-Adjusted Meta-Analytic Deviancy (SAMD) Statistic (Huffcutt and Arthur, 1995) (c) potential confounding between seemingly effective elements; (d) risk of bias (including publication bias assessed using Egger's regression, (Egger et al., 1997)).

2.5 Results

The numbers of studies considered at each stage of the review are shown in Appendix A.3 with a full list of references provided in appendix A.1. Studies were included following guidance provided by the PRISMA checklist (PRISMA, 2009).

2.5.1 Study characteristics

Across the 76 included studies, in roughly half participants had a pre-existing condition ($k = 39$). Most commonly, participants were overweight or obese ($k = 17$), had diabetes or impaired glucose intolerance ($k = 10$), or hypertension ($k = 6$). Thirty-seven studies were conducted on individual adults, 29 on individual children, 9 on family groups and one on a group of children. Educational ($k = 37$), medical ($k = 20$) and community ($k = 15$) settings were used most often. The studies were conducted in Asia ($k = 26$), South America ($k = 21$), the Middle East ($k = 16$), Africa ($k = 10$), Europe ($k = 2$) and the Caribbean ($k = 1$). The country with the most interventions was Brazil ($k = 12$), followed by Iran ($k = 11$) and China ($k = 9$). The average sample size of the studies was 267. The methodological quality of the studies was mixed. In 49 studies, randomisation was adequate. Furthermore, only 6 studies clearly reported that they used allocation concealment, 19 reported any form of blinding and 3 studies took measures to protect against contamination. Appendix A.4, summarises the major characteristics of each study.

2.5.2 Syntheses of results

The primary meta-analyses were based on a combination of self-reported dietary behaviour and physiological outcomes directly linked with diet such as blood sugar and cholesterol, henceforth referred to as the 'primary outcome' ($k = 67$). Of these studies, most comprised general measures of diet quality or combinations of multiple facets of diet (41 studies, 61.2%). The

remaining studies comprised physiological measures directly linked with diet only (9 studies, 13.4%), self-reported measures of fruit and vegetable intake only (11 studies, 16.4%) or other (e.g., salt intake only, 6 studies, 9.0%). This index was chosen as the primary outcome as it reflects dietary behaviour defined broadly which maximises the number of studies included in the analyses. Moreover, comparing the sub-groups of measures in random effects meta-analysis suggested the effect sizes were similar across the measures ($g = .35$, $g = .33$, $g = .35$, $g = .33$, respectively). Meta-regressions formally revealed no association between the use of these 4 sub-types of dietary outcome (which were combined to create the primary outcome) and study effect size (all p 's $> .81$; with outliers excluded all p 's $> .38$). Overall, meta-analyses of 67 studies revealed small-to-medium sized improvement in the primary outcome attributable to the intervention ($g = .35$, 95% $CI = .27, .42$), and high heterogeneity in effect sizes ($I^2 = 76.6\%$, $\chi^2(66) = 281.63$, $p < .001$) (see Appendix A.9). When outliers were removed, the effect size was smaller ($g = .31$, 95% $CI = .24, .37$) with moderate-to-high heterogeneity ($I^2 = 62.0\%$, $\chi^2(63) = 165.72$, $p < .001$).

2.5.3 Effect of BCTs on dietary behaviour

Across all studies, 50 out of the 93 BCTs listed in the BCT Taxonomy v1 were not differentially employed across the experimental and comparison groups; thus these BCTs were not testable. For reasons of power, reducing multiplicity and ease of interpretation, the reported analyses are based only on BCTs used differentially across the experimental and comparison groups in at least 4 studies ($> 5\%$ of all studies). Regarding ease of interpretation, for example, social support (emotional) emerged as being associated with larger effect sizes in some of the analyses. However, this BCT was used solely in the intervention in one study. Evidence supporting the use of this BCT to promote healthy dietary intake in LMICs, therefore, remains particularly limited. Applying the 5% criterion left 20 testable BCTs.

After removing the outliers, action planning (BCT 1.4) and self-monitoring of outcome(s) of behaviour (BCT 2.4) were significantly associated with the primary outcome such that studies that incorporated these BCTs within their intervention conditions (and not in the comparison conditions) produced greater improvement in dietary behaviour than those which did not (see Appendix A.5).

2.5.4 Effect of other intervention elements/study characteristics on dietary behaviour

On the primary outcome, larger effect sizes were generated in studies targeting adults rather than children, individually randomised trials (versus cluster trials) and in studies not reporting any form of blinding and in those specifically failing to blind the data analyst. Larger effect sizes were also reported in studies conducted in the Middle East and in hypertensives, with smaller effects in face-to-face interventions but none of these predictors were robust when outliers were removed (see Appendix A.6).

2.5.5 Sensitivity analyses 1 and 2: Effect of category of dependent variable and Outliers

Outliers were identified using scree plots (see Appendix A.7). Removing these outliers impacted the findings in several ways (the results with the outliers removed are presented in parentheses). Compared to the effect sizes based on the primary outcome, the overall improvements in dietary behaviour arising from intervention were similar when based only on self-reported dietary outcomes, $g = .36$, 95% $CI = .27, .44$ ($g = .31$, 95% $CI = .24, .38$). When the outcomes were expanded to the broadest index (self-reported dietary outcomes, physiological outcomes directly linked to diet (e.g., blood sugar and cholesterol) and more distal outcomes

(e.g., weight, shape and blood pressure) combined), $g = .32$, 95% $CI = .25, .39$ ($g = .26$, 95% $CI = .21, .31$) or focused on self-reported fruit and vegetable intake only, $g = .30$, 95% $CI = .20, .41$ ($g = .24$, 95% $CI = .16, .32$), the effect sizes representing the extent to which dietary behaviour improved following intervention were slightly smaller. These effect sizes were smallest when based on self-reported fat intake, $g = .21$, 95% $CI = .07, .35$ ($g = .13$, 95% $CI = .03, .24$). In all instances, heterogeneity was high prior to outlier removal: broadest index of diet, $I^2 = 75.9\%$, $\chi^2(75) = 310.70$, $p < .001$; self-reported diet, $I^2 = 78.7\%$, $\chi^2(57) = 267.39$, $p < .001$, fruit and vegetable intake, $I^2 = 75.4\%$, $\chi^2(28) = 113.87$, $p < .001$; fat intake, $I^2 = 81.5\%$, $\chi^2(23) = 124.04$, $p < .001$, and more moderate when outliers were removed: broadest index of diet ($I^2 = 47.6\%$, $\chi^2(71) = 135.56$, $p < .001$); self-reported diet ($I^2 = 64.4\%$, $\chi^2(54) = 151.48$, $p < .001$), fruit and vegetable intake ($I^2 = 49.4\%$, $\chi^2(27) = 53.34$, $p = .002$), and fat intake ($I^2 = 61.9\%$, $\chi^2(21) = 55.08$, $p < .001$).

The effects of action planning (BCT 1.4) were robust across all secondary behavioural outcomes except fat intake for which there were fewest tests (See Appendix A.5). Self-monitoring of outcome(s) of behaviour (BCT 2.4), which was positively associated with the primary outcome, became non-significant across all of the other outcomes. However, demonstration of behaviour (BCT 6.1) was at least marginally positively associated with effect size for three of the secondary outcomes. A few other BCTs were positively associated with effect size (e.g., goal setting, BCT 1.1) but these effects were driven by a small number of outlier studies on the secondary outcomes (with their effects becoming non-significant when the outliers were removed). Two BCTs (social support (practical) BCT 3.2; re-structuring the physical environment, BCT 12.1) were negatively associated with fruit and vegetable outcomes suggesting interventions that comprised these BCTs for this particular type of outcome yielded smaller effects than interventions not comprising these BCTs.

Aside from the fat intake outcome (which consisted of the fewest tests), the effects of non-BCT study characteristics on the secondary outcomes were similar to those on the primary outcome. Specifically, the effects of the intervention target (adults versus children) and randomization type (cluster versus individual) were robust across the three remaining secondary outcomes (self-reported diet, combining all outcomes, self-reported fruit and vegetable intake). Studies targeting hypertensives also generated larger effect sizes on two secondary outcomes (the combined outcome and fruit and vegetable intake). Blinding (data analyst; intervention deliverer) reduced two secondary outcome effect sizes (combined outcome; self-reported diet). Studies conducted in the Middle East again produced larger effect sizes only when outliers were included (and only on the self-reported fruit and vegetable intake outcome).

2.5.6 Sensitivity analysis 3: Confounding between potentially effective elements

Given the impact of outliers on the effects of BCTs on dietary outcomes, the analyses controlling for confounders were conducted only on outcomes with outliers removed. The associations between effective study elements were examined using the Chi-square test (applying Fisher's exact test where appropriate; see Appendix A.7).

Action planning (BCT 1.4) was more likely to be applied uniquely in the intervention condition within individually randomized trials than cluster trials. When accounting for this in multivariate meta-regressions, action planning was a marginally significant predictor (the primary outcome: $B = .14$, $SE = .08$, $p = .09$; self-reported diet: $B = .14$, $SE = .08$, $p = .09$; fruit and vegetable intake: $B = .25$, $SE = .13$, $p = .07$). Self-monitoring of outcomes of behaviour (BCT 2.4) and demonstration of the behaviour (BCT 6.1) were unrelated with other significant elements and thus were at limited risk of confounding.

In addition, children were more likely to participate in cluster trials than adults. When these variables were entered together, the pattern of results varied across measures. They rendered each other non-significant (for the primary outcome and self-reported diet) or only intervention target (for the 'all outcomes' index, $B = .07$, $SE = .03$, $p = .03$) or type of randomization (for fruit and vegetable intake, $B = .19$, $SE = .09$, $p = .03$) were significant.

2.5.7 Sensitivity Analysis 4: Risk of bias (including publication bias)

Studies that claimed blinding (any form, of the data analyst or of the person delivering the intervention) yielded smaller effect sizes in at least some of the analyses. However, these risk of bias elements were unrelated to other elements of the studies that were found to be positively related with study effect size (see Appendix A.8). Thus, risk of bias was not co-varied alongside other study elements that influenced effect sizes.

Egger's regression suggested that there was a risk of publication bias ($p = .004$) (see Appendix A.10). When accounting for this using trim-and-fill analysis, the effect of dietary interventions on dietary behaviour was reduced to a small but still significant effect size ($g = .19$, 95% CI = .10, .27).

2.5.8 Physical outcomes

Several studies examined intervention effects on a number of physical outcomes. These revealed largely small effects. Where the effect sizes were heterogeneous these were checked for outliers (results with outliers removed are presented in parentheses).

Overall, small, homogenous effects were detected for the effect of interventions on BMI/weight, $g = .15$, 95% CI = .09, .21, $k = 41$, $I^2 = 25.7\%$, $\chi^2(40) = 53.86$, $p = .07$; waist size, $g = .20$, 95% CI = .11, .29, $k = 17$, $I^2 = 0\%$, $\chi^2(16) = 13.92$, $p = .61$, and hip size, $g = .20$, 95% CI = .02, .37, $k = 6$, $I^2 = 45.7\%$, $\chi^2(5) = 9.21$, $p = .10$. Larger but highly heterogeneous effect sizes were detected for blood pressure, $g = .52$, 95% CI = .28, .75, $k = 16$, $I^2 = 92.0\%$, $\chi^2(15) = 187.87$, $p < .001$ ($g = .31$, 95% CI = .16, .46, $k = 15$) and cholesterol, $g = .40$, 95% CI = .22, .58, $k = 17$, $I^2 = 80.9\%$, $\chi^2(16) = 83.7$, $p < .001$ ($g = .43$, 95% CI = .25, .61, $k = 16$).

2.6 Discussion

Approximately half of the studies (33/67) produced effects of interventions on the primary dietary behaviour outcome that were reasonably small ($g < .30$), rising to more than half of the studies (44/76) based on the broader index of dietary behaviour. While suggesting a reasonably high proportion of studies have found changing dietary behaviour in LMICs to be challenging, the overall effect size was small-to-medium on average and the effects were significantly heterogeneous. As such, under certain circumstances, larger (and smaller) effects can be achieved. Significant heterogeneity could be partly attributable to variations in the behavioural outcomes across studies but the average effect sizes for the four different types of behavioural outcomes were remarkably similar ($g = .33 - .35$). The heterogeneity could also be reflective of meaningful differences in intervention content, participant or other study characteristics. Indeed, my findings suggest action planning (BCT 1.4), self-monitoring of outcome(s) of behaviour (BCT 2.4) and demonstration of the behaviour (BCT 6.1) may increase the effects of the interventions on dietary behaviour. Other BCTs emerged as significant predictors in some analyses but were driven by outliers. Studies that did not use blinding, randomized individuals

or targeted adults also produced larger intervention effects. However, these elements were unrelated or had little impact on the three potentially effective BCTs (1.4, 2.4 and 6.1) suggesting the effects of the BCTs on dietary outcomes were not confounded with other (non-BCT) study elements. The effects of the interventions on specific physical outcomes (BMI/weight, waist- and hip-size) were consistently small, displaying non-significant heterogeneity.

While it is difficult to compare across studies given variations in inclusion/exclusion and other characteristics, the findings of this review are somewhat consistent with the findings from reviews which have looked at the effectiveness of BCTs in dietary interventions, or behaviour more broadly, in high income country contexts. The BCTs found to be most effective in my review have received similar support in diet and other health behaviour reviews focused primarily in HICs (self-monitoring: (Michie et al., 2009) demonstration of the behaviour: (Brannon and Cushing, 2015, Lara et al., 2014, Hartmann-Boyce et al., 2014); action planning: (Adriaanse et al., 2011, Prestwich et al., 2015a)).

In some of my analyses, larger effects were seen in hypertensives, which may suggest a more urgent desire for such populations to improve their dietary behaviour. Intensity, duration, mode of delivery or the type of personnel delivering the intervention had little impact on the magnitude of dietary intervention effects. Although caution is necessary when interpreting null effects, similar effects across different modes of delivery and levels of intensity suggest governments and health departments could consider implementing the effective BCTs identified in my review even when resources are scarce, selecting contextually and culturally appropriate modes or methods that meet feasibility criteria for public health interventions in LMICs ((Walley and Wright, 2010)). Similarly, as effect sizes were equivocal when the intervention targeted multiple health behaviours or just diet, it may be more beneficial to target dietary behaviours alongside other health behaviours, especially where doing so requires little or no extra cost.

Due to the potential risk of confounding and the use of multiple combinations of different elements within complex interventions (although analyses were conducted to identify and control the most important confounds), my analyses are best described as hypothesis-generating rather than hypothesis-confirming. The present review highlights potentially effective BCTs to improve dietary behaviour of people living in LMICs but further testing using full- or fractional-factorial designs is warranted. Moreover, lack of support for a particular BCT is potentially attributable to limited power and/or small effect size. Some techniques such as goal setting outcome (BCT 1.3) may be effective in these contexts but no study in this review explored them. These unexplored BCTs might, or might not, prove effective when used on their own, or in combination with other techniques, to improve dietary behaviour in LMICs. Specifically, despite including 76 studies in the meta-analysis, 50 out of a possible 93 BCTs were not testable for the primary outcome and only 20 BCTs were utilized uniquely in either the intervention or comparison condition in at least 4 studies. Thus, most BCTs were used very infrequently, if at all. A lack of evidence of use of these BCTs does not mean that they might not prove effective in other interventions.

In the absence of systematic coding of the theoretical basis of the dietary interventions and its application using a suitable method (e.g., the Theory Coding Scheme, Michie and Prestwich (2010)), and the potential difficulties of analysing such data such as poor reporting in the primary studies (see Prestwich et al. (2015b)), I can only offer tentative suggestions about the utility of specific types of theory. Theories which are consistent with the use of action planning (as a specific form of goal-setting) and monitoring of goal progress such as Carver and Scheier's (1982) Control Theory may provide a useful basis for dietary interventions in LMICs. However,

experimental tests of such theories are needed to confirm its potential in LMICs, taking account of other Control Theory-consistent BCTs including feedback on current performance versus set goals which can catalyse improved performance.

The review has further limitations. First, there is a possibility that coding errors were made as coding BCTs according to Michie et al's taxonomy (2013) can be subject to errors due to the subjectivity of coders (Wood et al., 2015). However, this review took measures to minimise potential coding and/or interpretative errors by ensuring all coding was checked by a second reviewer and that components within *comparison* conditions were also coded and accounted for within the analyses. Taking account of the content of the comparison condition has not always been done in other reviews looking at whether BCTs can positively affect health behaviours (Dombrowski et al., 2012, Michie et al., 2009). There is also the assumption that what is reported in the articles accurately represents what actually happened in each RCT. This may not be the case because of inadequate fidelity and/or reporting which would serve to potentially reduce the strength of the detected associations between study elements and effect size. I attempted to minimise the impact of inadequate reporting by also taking into account in my coding of any materials (e.g., protocols, secondary outcome papers) reporting additional methodological or statistical details.

Second, unpublished studies were not considered. A lack of unpublished studies may mean that the effects calculated in this review have been overestimated on the basis that unpublished studies may be more likely to show non-significant effects. However, non-published articles lack peer review and, when incorporated into BCT reviews, may be more likely to contain incomplete or insufficient information which reduces the reliability of coding. Furthermore, despite evidence of some publication bias in this review, the effect of interventions on dietary behaviour remained significant when publication bias was accounted for in the effect size estimate.

Third, varied outcome measures were used to assess the wide-ranging interventions. To control for this issue, I categorised the outcomes in five ways: 1. self-reported measures only (e.g., portions of fruit consumed daily); 2. Self-reported measures plus physiological measures closely linked with dietary behaviour (such as blood glucose levels); 3. Self-reported measures, dietary behaviour-related physiological measures and other physiological measures (such as blood pressure) combined; 4. Self-reported fruit and vegetable intake only; 5. Self-reported fat intake only. I then considered the impact of these categorisations in sensitivity analyses. Moreover, the sub-types of outcome which were combined for the primary outcome did not differ in their effect size according to meta-regression analyses.

Fourth, my approach is imperfect because it uses a BCT taxonomy which was created from Euroamerican theories and HIC concepts and has been applied to LMIC contexts. However, I have made attempts with this review to find BCTs that are specifically effective in LMICs and assess which BCTs work better than others in these LMIC contexts.

Fifth, this review did not seek to explore the impact of gender or intersectionality on the potential effectiveness of BCTs. The data presented in the studies was not split by gender, therefore it was not possible to consider the moderating effect of gender on BCT-dietary behaviours in this review. It may be that some BCTs may be more effective if used for one a specific gender, or on groups which have certain intersecting characteristics (e.g. a specific religion, age and gender combined). Investigation of these factors would require further research. This review provides a strong basis from which to make these further investigations, as will be developed in the rest of my thesis.

Finally, I did not examine the effects of combinations of BCTs. Statistical approaches (e.g., meta-CART; Li, Dusseldorp & Meulman, (2017) can consider interactions but require large number of studies that include interventions that combine the desired BCTs.

This review is, to the best of my knowledge, the first to consider the effectiveness of BCTs and other intervention elements for dietary behaviour changes in LMICs and has several key findings. First, the interventions produce, on average, small-to-medium sized improvements in dietary behaviour. Second, *how* the intervention is delivered (the BCTs utilized, the type of randomization) can influence the degree of dietary behaviour change; future dietary interventions conducted in LMICs may benefit from utilising action planning, demonstrating the behaviour and self-monitoring of the outcome(s) of behaviour. Third, the effects may vary depending on to *whom* the intervention was delivered (with larger effects for hypertensives and adults). Fourth, other intervention or study characteristics (such as mode of delivery) were largely unrelated with dietary intervention effects. Fifth, the majority of BCTs from Michie et al's (2009) taxonomy were not testable within the meta-analyses and thus warrant further examination. Finally, comparing across reviews, BCTs which improve diet in HICs may be similarly effective in LMICs. This review, therefore, may aid those who wish to develop more effective dietary change interventions in LMICs and highlights evidence gaps.

2.7 Conclusion and next steps

This review has found that dietary interventions delivered in LMICs achieved, on average, a positive effect on dietary behaviour. It has also been possible to ascertain from the review that some aspects of intervention delivery can improve the potential for dietary change. These findings provide a solid base of evidence on which to build the rest of my PhD. I do not assume from the findings of this review that the identified effective BCTs would be effective in all LMICs. However, this evidence found that dietary interventions hold the potential for effective change in LMICs and provides the basis on which to build further evidence about what type of intervention would be potentially feasible in a specific LMIC context (Nepal), as the diversity of LMIC contexts requires consideration of individual circumstances for intervention development. To do this, in the next part of my thesis (Part 2) I undertook investigatory research in Kathmandu, Nepal amongst a population with diabetes and HBGLs. I then used the evidence I collected from Kathmandu to establish the determinants of dietary behaviour for a specific population (Chapter 4), including consideration of gender and intersectionality. Study 2 also allows for the exploration of the context of the health system and how it affects the supply and demand of dietary support for my target population (Chapter 5). This leads me on to consider the development of a dietary intervention to improve behaviour, using the findings from this review in combination with other findings from my research context (Part 3). This systematic review and meta-analysis therefore offers a valuable contribution to existing knowledge about dietary behaviour interventions in LMIC contexts and provides the evidence on which I develop the rest of this project.

PART II

Chapter 3 Research design and methods for Study 2

3.1 Introduction

Part 2 of this thesis focuses on Study 2: a qualitative investigation into a) the determinants of dietary behaviour amongst people with diabetes and HBGLs, and b) the factors influencing diabetes-related policy in Nepal. In this chapter I provide an introduction to the research context and present an overview of the methods and sample used for Study 2, as well as articulating why this research is necessary. In both Chapter 4 and Chapter 5, I provide preliminary discussion and analysis incorporated with the results. Subsequently, implications for this research project and broader discussion is provided in Chapter 6 where I draw findings from Study 2 together. As already discussed, numerous interventions have been trialled in both LMICs and HICs to improve dietary behaviour. In Study 1, I found that of 76 RCTs which aimed to improve dietary behaviour in LMICs, only 7 of these addressed diabetes (Caperon et al., 2018) and none of these were in Nepal. Very few studies [(Kaiser and Razurel, 2013, Ouyang et al., 2015, Marcy et al., 2011)] have considered the determinants of dietary behaviour in diabetes patients specifically and none have been conducted in LMICs. Study 2 now begins to fill the gap in existing evidence by considering the determinants of dietary behaviour amongst people with diabetes or HBGLs in a specific LMIC context.

3.1.1 Nepal: country context

Nepal is a low income country of 28.7 million people and an average life expectancy of 69 years for men and 72 for women (World Health Organisation, 2019). For years Nepal struggled with political unrest which badly damaged the country's economy and development activities. This unrest in the 1990s and early 2000s caused social upheaval and displacement of its peoples. Since the early 2000s Nepal has stabilised politically, however it remains one of the world's poorest countries, and it gets much of its income from aid and tourism. In April 2015 an earthquake devastated parts of the country, and since then billions of dollars in aid have been pledged to the country. However, much of the reconstruction has been delayed due to political infighting (BBC News, 2017). Public services in Nepal face an ongoing battle for funds in difficult post-earthquake times.

3.1.1.1 Ethnicity and social exclusion

Nepal is ethnically and religiously diverse, with over 90 languages spoken and about 103 ethnic/caste groups (Central Bureau of Statistics, 2014). Social hierarchies and exclusion based on ethnicity/caste is not uncommon and this has affected the use of public services, with some low caste groups historically considered untouchable by others, especially upper castes (Shrestha, 2002). Nepal's controversial constitution drawn up in 2015 declared Nepal as a secular republic, seeing secularism as 'religious and cultural freedom including protection of religion and culture prevalent since ancient time' (Ministry of Law, 2015 p.8.). The constitution also introduced proportional representation in its electoral system at federal and state levels to better include women, lower caste groups, tribal groups and people from the southern plains. Despite these changes, a culture rich in religious and ethnic traditions runs deep in Nepal's society and continues to affect many aspects of life. This research considers the ethnic and social diversity of Nepal in relation to dietary behaviour to establish to what extent these aspects influence behaviour.

3.1.1.2 Gender and health

The consideration of gender in the context of health has evolved since the 1980s. Early gender-related research conducted by researchers, people working in health systems, policymakers and feminist activists moved research towards being more inclusive of women and not focusing solely on the male experience (Read and Gorman, 2010, Laslett, 1992). Research has found that though women generally live longer than men, they suffer more elevated morbidity rates across a range of conditions. However, recent scholarship has shown that mainly quantitative research including a focus on demographers, for example empirical examinations of trends and explanations for sex differences in disease incidence and mortality and sex-specific disease patterns and corresponding attention given to men's and women's health issues (Springer et al., 2012) has led to gender being treated as an individual attribute rather than a system of inequality (Nii-Amoo Doodoo and Frost, 2008). Read and Gorman (2010) advocate the use of mixed methods to more accurately consider a comprehensive framework to deal with gender in health research. Such a framework involves considering the experiences of men and women using an intersectional lens at all levels of the health system, as recent research has conceptualised (Hankivsky, 2011, Hankivsky et al., 2009, Gkiouleka et al., 2018).

Contemporary feminist theory (e.g. (Connell, 2009, Ridgeway, 2009, Schofield et al., 2000) questions the outmoded binary constructions of sex (male v female) and gender (masculine v feminine) and that treats sex and gender as separable (Springer et al., 2012). Biosocial research also adds to our multi-faceted awareness of gender as it refers to approaches which examine and/or prioritise gender and health as connected biological and social phenomena (e.g. (Fausto-Sterling, 2005).

As Connell (2012) states, gender is a multidimensional structure of embodied social relations and these are dynamic, with the potential to create new social realities and health effects. Connell (2012) further argues for the adoption of more global, intersectional and biosocial approaches to researching gender which acknowledge that gendered distribution of power and resources continues to produce persistent differences between men and women. This distribution of power is influenced by stereotypical thinking (Ellemers, 2018), the association of harmful gender norms (McCarthy et al., 2018), patriarchal behaviours and entrenched structures which work to reinforce binary male/female categories (Springer et al., 2012). It is important to account for the patriarchy-tainted power dynamics in societal structures in all health research as they are linked to negative experience for women and girls globally (Carter, 2015, Scott-Samuel, 2009, Antai, 2011) including in Nepal (Chapagain, 2006). I consider these nuances and power dynamics in my project by, for example, showing awareness of the socio-cultural structures which can subjugate women, the workings of social institutions, the interactions and power relations which can influence individual dietary behaviour. I also do so by assessing how social and cultural norms of everyday behaviour can affect the presentation, development and/or treatment of the condition of HBGLs/diabetes in different ways depending on gender.

Encouragingly, positive steps have been made to integrate gender into health research. One example of this is an intervention to strengthen participation in health systems which contributes to social transformation by integrating women into Village Health, Sanitation and Nutrition Committees in India (Scott et al., 2017). Such social transformation initiatives indicate the potential for integrating women in strategies to improve health, sanitation and nutrition, the latter being an important focus of my thesis.

3.1.1.3 Gender and development

More recently, the gender and development approach [GAD] has led to the development of a methodology for gender policy and planning (Moser, 2012, Moser, 1989). GAD enables scholars to investigate the reasons and processes that lead to conventions of access and control including considerations of gender roles identification, gender needs assessment, disaggregating control of resources and decision-making in the household as well as planning for balancing the triple role of women. The triple role of women includes reproductive, productive and community-managing activities. By considering such approaches to gender and development it is possible to understand how, for example, the determinants of dietary behaviour can be influenced by gender roles and power dynamics. Such gender roles and power dynamics include the traditional role of women in cooking and preparing food and the role of women in making decisions about which food to buy for the household. This is particularly important in the context of my research when considering diabetic women and how they can be provided with support in the form of an intervention. Given gender expectations in the context of Kathmandu, I will consider how interventions can be developed which improve dietary behaviours and therefore health outcomes. This research may involve focusing on examples of women who have successfully challenged gender norms in the household to create improved health outcomes for themselves and their families. Using such examples, it may be possible to propose contextually appropriate interventions to disaggregate control of resources and decision-making in the household as well as planning for balancing the triple role of women. Balancing the triple role of women is increasingly important as urbanised lives in cities like Kathmandu have seen an increase in women working outside the home. These activities presenting a challenge to the woman's traditional expected reproductive activities and household responsibilities such as preparing food for all members of the household.

However, the gender and development approach has been challenged. Kabeer (1995) has argued that the triple role concept obscures the difference between activity and outcome, so that, for example, the outcome of healthy food being served in the home could be achieved by a number of different activities and models of organising housework, for example by the female members of the household only, by male members of the household only or by several members of the household together – male and female. A further criticism of Moser's framework is that it only addresses gender inequality, not other types of inequality which could be contributed to by intersecting factors such as caste or class. I consider these intersecting aspects in my analysis, specifically in Chapter 4.4 and Chapter 9.2.6.3.

3.1.1.4 Gender as a power relation and a driver of inequality

In this research I consider the importance of gendered power relations which proliferate through all levels of society, in order to construct interventions that either work with, or disrupt, the effects of these relationships and produce positive health outcomes (specifically to improve dietary behaviour). These power relations dictate access to resources, including education. I consider, for example, how some dietary interventions can be adapted for women who have not had access to education and are illiterate. This could be done by providing dietary messages displayed via posters/leaflets which are shown via visual images without text.

Power relations also dictate how values are defined through gender and social norms, ideologies, beliefs and perceptions. I explore these in relation to social and cultural influences, for example in Nepal the traditional role of the daughter in law in the household as the member of the household responsible for preparing food. Addressing these gender roles and power

dynamics is important for all genders and can lead to improvements in health outcomes. An example of this in the context of my research is how, if men accept it is socially appropriate to cook healthy food at home, then they might be less likely to buy and consume unhealthy food outside the home.

Gender relations also dictate division of labour, within and beyond the household and everyday practices. Such relations are influenced by gender norms within a society which can be important influences on behaviour. Some research has demonstrated that it is possible to challenge gender norms in Nepal to deliver improved social outcomes, for example in encouraging gender equality in children undertaking household chores and activities which are traditionally gendered (Lundgren et al., 2013). I consider the prevalence of gender norms in the context of women's role in the household and assess how preparation of food is often gendered. I also consider if men go outside the household to seek food that is not prepared for them within the household. I consider how such behaviour is acceptable for men, but less common and acceptable for women. I assess the potential for changing gender norms, particularly between different age groups which may have different levels of willingness to change. A willingness to change gender norms has the potential to make some interventions more practical to implement. In considering such examples of potential changes to gender norms to improve health outcomes, I explore the challenges involved in making these changes given their often entrenched nature in Nepalese society.

Power relations also involve considering decision-making. In this thesis, I provide a critical assessment of rules and decision-making in the household in relation to dietary behaviour, for example who decides which food to buy and which food is cooked. This involves considering how power is negotiated and changed. Later in the thesis (Chapter 7 – 9) I consider how feasible interventions can be designed to improve dietary behaviour in the context of gender roles; and how interventions can be adapted to ensure that unequal gender relations are challenged in a gender-sensitive approach. These are important considerations for future policy-led suggestions for intervention implementation within the wider structural and policy environment where gender also operates as a power relation and it is important to guide more gender responsive health systems (Morgan et al., 2016).

3.1.1.5 The importance of developing gender responsive health systems

Research has found that health systems can reinforce patients' traditional gender roles and neglect gender inequalities in health (Gupta et al., 2019, Hay et al., 2019). Such patriarchal power dynamics have been shown to run throughout whole health systems (Cornwall et al., 2007) posing an ever-present challenge of bringing about changes to gender norms, practices and power dynamics. Gender has been shown to be a fundamental factor which predetermines and shapes health systems and outcomes (Hay et al., 2019, Morgan et al., 2018). The influence of gender norms, male involvement in healthcare, reliance on unpaid female carers within the health system and gender's role in policy and practice have all been shown to influence health systems (Morgan et al., 2018). These factors must be addressed to move towards greater gender equity in health.

There is evidence that female health workers have less authority than male health workers (Hay et al., 2019). Research has found that unless this changes and women obtain leadership roles throughout the health system, equitable health systems and promoting universal health coverage will be unattainable (Vong et al., 2019). Institutional support and respect for female health workers and women's empowerment collectives can increase health care access for

women. Universal health coverage, including ensuring people with NCDs in LMICs have access to treatment such as dietary advice for diabetes, depends on making health systems more responsive and addressing gender inequalities at all levels (Heise et al., 2019). This will involve leaders of national governments, global health institutions, civil society organisations, academic settings and the corporate sector engaging actors across sectors and working together to shift gender norms and reduce gender inequality (Gupta et al., 2019).

Heymann et al. (2019) found four mutually reinforcing factors underpinning change to reduce gender inequality – multi sectoral action, multi-level, multi stakeholder involvement, diversified programming and social participation and empowerment. These factors should be accompanied by key methods for promoting gender equality. Examples of these key methods have been categorised by Cornwall and Rivas (2015) who argue that the ensuring accountability, inclusion and non-discrimination should refocus engagement in health to ensure global justice in relation to gender norms. As discussed in 3.1.1.6, Nepal has taken steps towards these goals, for example, inclusion of a quota of women in political processes. Such contextual changes, as well as underlying gender power dynamics are be considered in the context of this research, for example in relation to the provision of tailored health care support for all genders where appropriate. Similarly, I consider multi-sectoral approaches in the health system which can diversify provision for dietary support and include all genders (Chapter 5). As observed by Weber et al. (2019), designing effective gender-transformative health policies and interventions needs to be context-specific. My research considers how context-specific interventions can be developed considering the gender relations in Nepal.

3.1.1.6 Gender in Nepal

Gender equality and women's rights are still being fought for in Nepal and in a society where women are traditionally seen as homemakers, changes towards gender equality have been slow and gradual. The 2015 earthquake affected 1.4 million women of reproductive age, including 93,000 pregnant women (UNFPA Nepal, 2015). Since then, political instability (along the border with India-Nepal border) and institutional incapacity impeded Nepal's ability to rebuild devastated areas and many women and girls have had poor access to reproductive health services, education and family planning (News Deeply, 2016). However, the gender gap in Nepal has been closing over time. The government has taken steps to improve the position of women, for example a gender responsive budget has been financed since 2005 to ensure gender monitoring of development policy (Government of Nepal Ministry of Finance, 2008). Many recent health policies have shown support for women; the Multi Sectoral Nutrition Plan (Government of Nepal, 2013) for example, was focused on maternal health. In recent years Nepal has become a global leader in striving for Gender Equality and Social Equity (International Development Partners Group Nepal, 2017). Intensive campaigns for women's engagement in politics were carried out by the Election Commission Nepal in 2017 and the Local Level Electoral Act 2017 reserved two seats on each of the nearly 7000 ward committees for women [one of which was for women of the marginalised Dalit caste] (UNDP Nepal, 2017). In 2017, 35,041 local representatives were elected, of which 14,352 or 40.96% were women (Asia Foundation, 2017). Clear shifts indicate movement towards greater political gender equity.

3.1.1.7 Poverty and the growth of urbanisation

The share of the population of Nepal below the poverty line is significant at 25.2% in 2016 and for every 1000 babies born, 29 die before their first birthday (Economic Research and Regional Cooperation Department, 2016). However, nationally, poverty incidence has been falling, using

the international poverty line of \$1.25 per day, the incidence of poverty has declined from 68% in 1996 to 24.8% in 2011. Rural poverty (27.4% in 2011) is higher than urban poverty (15.5 % in 2011). However urban poverty is increasing, while rural poverty is in slow decline (ADB, 2013). As more people move to urban areas, poverty rates have increased and conditions in cities are often cramped and crowded. Water and sanitation provision is not currently enough to cope with the increasing rates of urbanisation (Muzzini and Aparicio, 2013). As a result, these areas are more susceptible to disease epidemics such as influenza and diarrhoea. Such health problems drain health resources which could be used to tackle NCDs. In Kathmandu valley 1.5 million people live in one of the most densely packed areas in the world and the population of the valley is rising fast - the annual growth rate is 6.5% (World Population Review, 2018). Urban populations of Nepal in 2017 consisted of 5.6 million inhabitants out of a population of 28.7 million (Worldometers, 2019), thereby the urban population making up nearly 20% of the population. The demand for better NCD policy for this growing urban population is urgent and vital. This project addresses this demand in relation to diabetes in the increasingly crowded urban space of Kathmandu.

3.1.2 Health care in Nepal

As stated in Chapter 1 [1.2.3.1], the health system is pluralised, containing public, private and NGO components which provide a variety of treatment and services. This plurality makes analysis of health care services in Nepal complex and multifaceted. Many people in Nepal do not have easy access to basic healthcare facilities; 61.8% of Nepalese households have access to health facilities within 30 minutes (Mishra et al., 2015a). However, the Constitution of Nepal 2015 stated that healthcare was a fundamental right to every Nepalese citizen; *'every citizen shall have right to get basic health care free of cost from the state'* (Ministry of Law, 2015 Article 35). Positive changes are reinforcing the constitution; the National Health Insurance Act [NHIA] by the Parliament of Nepal was passed in October 2017 (Thapa et al., 2017, Asia Insurance Review, 2017). This Act aims to make healthcare affordable for all. Additionally, since 2017, political restructuring has decentralised powers in Nepal. This has devolved powers from central government into the hands of local bodies which includes District Health Offices. Decentralisation of power could do much to devolve power into the hands of local officials and deliver the contextually appropriate and compelling health solutions, as this project strives to seek out.

Localised healthcare is available in most areas of the country. On average there is at least one health facility in each village development committee (VDC), one primary healthcare centre in each electoral constituency and one hospital at the district level (Government of Nepal Ministry of Health, 2015 p.6.). Figure 7 illustrates the organisational structure of the government supply of health services in Nepal. Nepal's health system faces heavy pressures. In the first comprehensive assessment of health facilities in Nepal, the Nepal Health Facility Survey (NFHS) (Government of Nepal Ministry of Health, 2015) found that half of facilities have electricity and only one fifth of facilities have communication equipment. The health system faces a double burden of disease having to cope with both communicable and non-communicable diseases (Bhandari et al., 2014). Others see this burden as, in fact, threefold; the problems of communicable and NCDs further compounded by threats from natural disasters, the adverse effects of climate change, and injuries and accidents (Government of Nepal Ministry of Health, 2015). The number of services in the health system offered for specific NCDs is variable, for example, only one in five facilities offer services for the diagnosis and/or management of diabetes. This presents a challenge, especially as Nepal is signed up to the sustainable

development goals (SDG) which state the aim that by 2030 there will be a reduction by one third of premature mortality from NCDs through prevention and treatment (UN, 2015). Nepal's public health care services have a long way to go before they can achieve this goal. This research does not provide an in-depth analysis of the health service in Nepal in relation to a particular NCD – diabetes. Instead, it offers an assessment of the supply of and demand for dietary support for people with diabetes/HBGLs in relation to health policy, with a consideration of the health system. It also focuses on the determinants of dietary behaviour, influences on behaviour and potential ways of improving this behaviour with context-specific interventions. However, an understanding of the wider health system context is important because it provides a backdrop for the services I will explore, and the institutional potential of integrating interventions into existing political structures.

Organizational Structure of the Department of Health Services

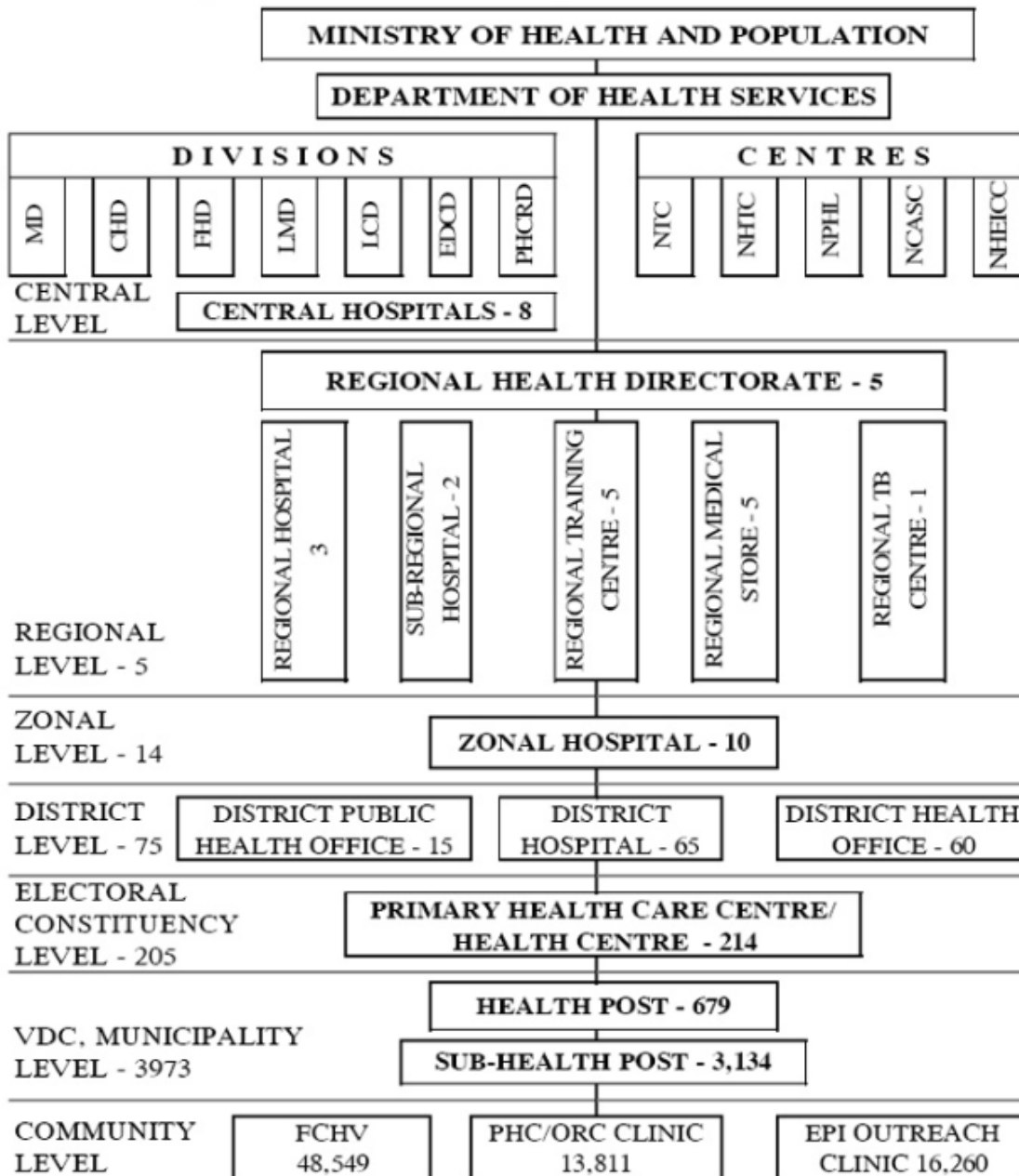


Figure 1b.1

Source: Administration Section, HMIS/MD, DoHS

Acronyms

MD	Management Division	NHTC	National Health Training Centre
FHD	Family Health Division	NTC	National Tuberculosis Centre
CHD	Child Health Division	NCASC	National Centre for AIDS and STD Control
EDCD	Epidemiology and Disease Control Division	NPHL	National Public Health Laboratory
LMD	Logistics Management Division	FCHV	Female Community Health Volunteer
LCD	Leprosy Control Division	PHC/ORC	Primary Health Care Outreach Clinic
PHCRD	Primary Health Care Revitalization Division	EPI	Expanded Programme on Immunisation
NHEICC	National Health Education, Information and Communication Centre		

Figure 7: Public health service delivery organisational structure. Source: (Department of Health Services Government of Nepal, 2018)

In summary, key aspects of the Nepalese context of relevance to this project are; an ethnically diverse and rich population, a shift towards greater gender equity, increasing rates of urban poverty and demand on health services, particularly in increasingly crowded urban areas such

as Kathmandu and a health system taking positive steps towards change but still facing serious burdens and challenges. Further aspects of the national context are discussed, as relevant, within subsequent chapters.

3.1.3 Exploring the determinants of dietary behaviour amongst people with diabetes/HBGLs

As stated in Chapter 1, there is a need to fill the gap in research into the determinants of dietary behaviour amongst people with diabetes/HBGLs in specific LMIC contexts. Filling this gap is important as it identifies potential targets for interventions and may provide some indication of which BCTs are most likely to lead to behaviour change according to the characteristics of a particular population within a specific context. This therefore builds on the identification of potentially effective intervention characteristics in BCTs (Chapter 1) and allows for in-depth contextual analysis of a particular LMIC context. Determinants of NCDs have been found to be multiple and varied (Pandey et al., 2015, Aryal et al., 2015, Chhetri and Chapman, 2009, Vaidya, 2012). Such determinants can be understood and conceptualised in ecological models. These help to understand how behaviours can be improved by addressing multiple factors in different environments, as opposed to only looking at one type of determinant, such as social determinants (Short and Mollborn, 2015). In Chapter 4, I therefore develop an ecological model to illustrate the influence of multiple determinants of dietary behaviour on people with diabetes or HBGLs in Kathmandu, Nepal.

3.1.4 Investigating the influences affecting the delivery of dietary support for people with diabetes/HBGLs

It is also important to understand the influences which dictate the dietary support that is made available to individuals with diabetes/HBGLs. This understanding allows for the proposal of suggestions for appropriate interventions which can improve dietary support for those with diabetes/HBGLs at a broader, more macro and policy level. I did not set out to explore the reasons for the functioning or lack of functioning within the health system. However, following an exploration to understand the factors affecting the supply and demand for dietary support for people with diabetes/HBGLs, themes emerged which considered socio-cultural, organisational and political aspects which influence policymaking. Chapter 5 therefore explores my findings in relation to these influential contexts in Nepal.

By combining an understanding of the factors which influence health policy to support people with diabetes/HBGLs, and the determinants of dietary behaviour I provide a detailed analysis of the key issues around dietary behaviour change. This paints a holistic and multi-faceted picture of the specific research context which can be used to propose and develop an intervention (Part 3), as is the overall aim of this thesis.

3.2 Aims and objectives of Study 2

3.2.1 Aims

To

- a) consider the determinants of dietary behaviour amongst people with diabetes/HBGLs [Chapter 4]
- b) explore factors which influence the support provided for people with diabetes/HBGLs [Chapter 5]

3.2.2 Objectives

1. Identify the determinants of dietary behaviour of people with diabetes/HBGLs in Kathmandu [Chapter 4]
2. Propose how an understanding of the determinants of dietary behaviour can be used to inform feasible interventions [Chapter 4]
3. Consider the existing supply of and demand for interventions to improve dietary behaviour amongst people with diabetes/HBGLs [Chapter 5]
4. Understand which factors affect the supply of and demand for interventions to improve dietary behaviour amongst people with diabetes/HBGLs [Chapter 5]
5. Consider how suggestions can be made to improve the supply of interventions to improve dietary behaviour amongst people with diabetes/HBGLs [Chapter 5]

3.3 Study Design

Qualitative research was conducted in Study 2. A range of methods including focus groups and surveys have previously been used in other research to establish dietary determinants in HIC settings (Deliens et al., 2014, Marques-Vidal et al., 2015, Marcy et al., 2011, Ouyang et al., 2015). However, to the best of my knowledge, little research has used semi-structured interviews [SSIs] to establish dietary determinants in either HIC or LMIC settings. I used SSIs which is a method involving the compilation of a semi-structured interview guide which provided a clear set of instructions for interviewers, but with the opportunity for interviewers to explore emerging themes from the data in a flexible way. My intention with using SSIs was to provide reliable, comparable qualitative data. Using SSIs, I aimed to produce socially useful knowledge using a pragmatic approach (Feilzer, 2010) whereby I oriented my study to address the problem of unhealthy diet to impact policy and practice. Conducting SSIs with patients and their families or partners allowed me to investigate the behaviours of people with diabetes and HBGLs at least three months after they were diagnosed with this condition so that there was enough time since diagnosis to explore changes in dietary behaviour. I was interested in understanding any behaviour change which patients had undertaken since diagnosis and in what form this change (or lack of change) had taken and why. To encourage discussion with patients I used participatory methods such as mapping their daily eating habits according to time of day (Sheridan et al., 2011, Kolar et al., 2015, Berends, 2011), and mapping their access to people and places from their homes (Umoquit et al., 2008, Kesby, 2000), such as to health facilities or friends' houses. I also used a Nepali calendar which listed cultural festivals and events as a prompt to encourage discussion of eating practices at different times of the year, examples of these methods can be seen in Appendix B.5. In addition to patients and their partners, I interviewed health workers, researchers, policymakers and senior clinicians. With these stakeholders, I wanted to better understand the context surrounding patients which influenced their dietary behaviours including an exploration of the existing dietary support available in the form of the supply of and demand for interventions.

I selected patients from a public hospital in Kathmandu because of the difficulty of locating and identifying patients with diabetes\HBGLs in Kathmandu. With so many cases undiagnosed, many people with the condition do not know they have it, especially in lower income populations where diagnosis in laboratory facilities is very difficult. Therefore, a public hospital provided a pragmatic setting in which to select an otherwise unsystematised population. This public hospital also provided a pragmatic location for sourcing health worker participants. However, health workers in these public facilities often also worked in private facilities, which enabled

cross-over and gathering information from such health workers about the differences of experience and treatment in private facilities.

I therefore purposively selected patients and their partners (n = 22) from one public hospital in Kathmandu, health workers (n = 9) from both public and private health sectors, policymakers (n = 3), researchers (n = 2) and senior clinicians (n = 2) from various institutions and public bodies. Participants were approached directly by the researchers (lead researcher Lizzie Caperon [LC] or research assistants Puja KC [PK] or Jyoti Kuikel [JK]) either in a healthcare setting or via a phone call to their place of work. Low and low-middle income patients were chosen because; a) deaths from NCDs have been found to be highest in lower middle income groups (World Health Organisation, 2008) and b) I wanted to understand the challenges facing diabetes patients with limited resources and the majority of Nepal's urban population fall into the categories of 'poor' (13%), 'vulnerable' (35%) or 'middle class' (47%) (Tiwari, 2016). I categorised income groupings according to data in the Nepal Household Survey which found the average Nepali household to be earning 30,121 Nepali Rupees (NPR) per month (Nepal Rasta Bank, 2016) and taking advice from Nepali colleagues at the health research organisation HERD International in Kathmandu about average incomes in Kathmandu. I classified low income as earning less than 50,000 NPR, low-middle income as earning 50-75,000 NPR per month, middle income as earning 75-100,000 NPR and high income as earning more than 100,000 NPR per month (Nepal Rasta Bank, 2016).

I purposively sampled people with diabetes and HBGLs to include people of different ages, genders, religions, ethnicities, income groups and time since diagnoses in line with a gender-sensitive and intersectional approach. To add richness to the data, I included some interviews conducted with both partners in a couple when one partner was diabetic or with HBGLs. I chose some couples where wives were the patient, and some where husbands were the patient to provide a variety of responses (See Table 1 for a breakdown of the patient characteristics). This methodology has been used successfully before (Bruce et al., 2014, Haahr et al., 2014, Kendall et al., 2009, Matheson et al., 2010, Mellor et al., 2013, Miller and Caughlin, 2013, Morgan et al., 2013, Sakellariou et al., 2013), allowing partners to encourage each other to provide further information. Maximum variation sampling was used within the catchment of the area patients were recruited from (Palinkas et al., 2015). Maximum variation was sought across age, gender, ethnicity, condition and religion to demonstrate important shared patterns which cut across the cases, as well as critical differences. I chose health workers from public and private health settings to gather an understanding of care in various settings. Additionally, I chose policymakers from key governmental departments involved in NCD policy, researchers involved in investigating NCDs in Kathmandu, and senior clinicians who were involved in implementing NCD policy in clinical settings (see Table 2). These stakeholders were selected through consultation with colleagues at HERD International allowing us to select individuals I thought most appropriate to interview under the projects aims and objectives.

An iterative approach was taken when developing the SSI guides which consisted of open questions structured around the COM-B framework (Michie et al., 2011) using topics derived from literature reviews of previous research about dietary behaviour amongst people with diabetes (see appendix B.6 for results of literature searches and appendix B.7 for an example search strategy used to find relevant research). I chose the COM-B framework to structure interview guides because this seemed an appropriate way of exploring the capabilities, opportunities and motivations of people with diabetes/HBGLs to eat healthily. It also allowed me to explore the capabilities, opportunities and motivations of health workers and policymakers to provide support for people with diabetes/HBGLs. Furthermore, COM-B was

developed as part of the behaviour change wheel by Michie et al. (2011) taking into consideration existing theories of behaviour (Fishbein et al., 2001) meaning it provides a robust framework in which to consider behaviour. COM-B fits within the wider behaviour change wheel which was created to characterise and design interventions, a central aim of this research. Therefore, using COM-B to structure my interviews fit within the theoretical frameworks which underpin my research (see Chapter 1, 1.3.1). Embedding COM-B in my themes allowed me to consider the factors affecting the **C**apability of the target population to eat healthily such as cooking skills or knowledge, factors affecting their **O**pportunity to enact such behaviours (affected by environmental influences) such as social or cultural pressures encouraging them to adopt particular dietary behaviours, and factors that influence their individual **M**otivation to have a healthy diet. COM-B also allow for the consideration of multiple components which may act on an individual and influence their behaviour and has been successfully applied in other contexts (Alexander et al., 2014, Barker et al., 2016, Jackson et al., 2014).

The themes used in patient interviews included: dietary change since diagnosis, current and previous eating habits, social aspects of eating (who does participant eat with), purchase of food (who makes these decisions in the household), mapping dietary habits to annual calendar and discussion of festivals, support received since diagnosis (including mapping of support activity) and support desired. The themes for health workers included: description of service provided for people with diabetes/HBGLs, communication with patients, dietary patterns observed amongst patients, perceptions of patient's capacity to change their dietary behaviour, what motivates patients' dietary behaviour, capacity of health workers to provide better support for patients and factors affecting health workers' abilities to do this. The themes used to interview policymakers/researchers included: aspects of their work which encourage healthy eating in people with diabetes/HBGLs, what has been effective in providing dietary support, barriers and obstacles to improve dietary behaviour amongst people with HBGLs/diabetes.

The interview guides were also designed to consider intersectionality (e.g. questions about religion, ethnicity, gender) and be gender-sensitive (including questions about decision-making in the household, tailoring interventions to different genders). Two patient interviews were undertaken as pilots. These were transcribed from audio recordings first in Nepali, and then they were translated into English. Next, the research team reflected on the pilot interviews and revised and improved the interview guides (see Appendix B.1 and B.2 for an example of the interview guides used).

3.3.1 Data Collection

Data collection was coordinated by HERD International in Kathmandu which specialises in health research and has worked on the topic of diabetes before, meaning they had awareness of the issues around diabetes care in Kathmandu. Interviews were conducted in the homes of patients (n=22), in health care facilities (n=9), government offices (n=2) schools (n=1) or in the HERD International offices in Kathmandu (n=4). All locations provided privacy and quiet space to allow participants the opportunity to speak calmly and openly. Patient interviews were conducted by two Nepalese researchers from HERD International undertaking postgraduate training in health research methods [JK &PK]. Health worker and policymaker interviews were undertaken by the lead researcher [LC], a PhD researcher with experience in qualitative research collection. When it was not possible to conduct health worker interviews in English, the lead researcher [LC] was assisted by Nepali researcher [JK &PK] acting as a translator. Interviews lasted for approximately one hour each. Health workers were not present during patient interviews to allow patients to speak freely. Reflective field notes were taken by researchers straight after the interviews in

English to inform the subsequent interview. Field observations were also taken by researchers alongside reflective field notes. These observations noted down key aspects of the setting which related to dietary support provision for people with diabetes/HBGLs such as the facilities available. All interviews in Nepali [n=22] were transcribed from audio recordings first in Nepali, and then they were translated into English. All interviews in English [n=12] were transcribed from the audio recordings in English. In line with both UK and Nepali ethical requirements, information sheets and consent forms were provided to all participants. In total 38 interviews were conducted which was the maximum number that could pragmatically be conducted within the time and budget constraints of the project.

3.3.2 Data analysis

Like the sampling and data collection process, the data analysis took an iterative form. Data was constantly analysed as it was collected, with the majority of the data analysis conducted in-depth at the end of the study. Data was managed in NVivo and analysed using the Framework Approach (Gale et al., 2013). This approach was pragmatic and selected to allow themes to emerge inductively from the data, and also to allow pre-determined objectives to lead to deductive analysis (Feilzer, 2010). The interviews were first coded according to the main themes explored in the SSI interview guide [COM-B]. The coding framework from this initial analysis can be found in appendix B.9. Following this it became clear that key themes were emerging from the data around environmental influences on behaviour (e.g. physical environment shown by access to particular food, socio-cultural environment shown by cultural influences on dietary behaviour). Therefore, a second round of coding took place which developed these emergent themes further and moved away from the COM-B framework and towards the themes I propose in my ecological model. In line with these emergent themes, three members of the research team (LC, Rebecca King [RK], Remco Peters [RP]) independently coded a sample of three interviews and then through discussion reached a consensus on a coding frame including *a priori* and emergent codes. LC then coded the other interviews, discussing any amendments to the coding framework with RK and RP. The major themes appeared repeatedly in interviews and carried importance in the interview discussions. The ecological model I propose in Chapter 4 emerged from the classification and discussion of the key themes.

3.3.3 Ethical approval

This Study received ethical approval from:

1. Nepal Health Research Council, RamShah Path, Kathmandu, PO Box 7626, Nepal
2. Faculty of Medicine and Health Research Ethics Committee, University of Leeds, Worsley Building, Leeds, LS2 9LJ (see ethical approval documents in appendix B.3 and B.4)

Ethical approval involved ensuring that participants were allowed to withdraw from the study at any point, anonymity of their data was maintained by anonymising transcripts and any subsequent quotations used from these and that all participants (including partners interviewed) gave informed consent.

3.3.4 Data management and protection

In line with the ethical approval process for this project, data (specifically anonymised translated transcripts and typed up field notes) produced from Study 2 will be stored long-term using the University of Leeds Research Data Leeds Repository. In this repository, data will be retained for a minimum of ten years, in accordance with recommendations from the University of Leeds

School of Medicine Research Ethics Committee and will be deposited within three months following completion of this PhD. Data placed in the University of Leeds Research Data Leeds Repository will be available for sharing to make it discoverable, reusable and citable as is good practice in academic research. If a researcher would like access to the data from the Leeds Repository, they will need to request access from the project lead (Lizzie Caperon [LC]), and clearly stipulate their conditions for using the data. The data would then be protected by an end user agreement that specifies the terms under which the data can be used. This agreement will be created with the advice of the University of Leeds research data management team. Nvivo projects created following the data collection will only contain anonymised interview data and will be exported as a 'whole project' including raw data, coding tree, coded data, and associated memos and notes, as outlined in guidance from the UK Data Archive and stored securely on the University of Leeds' secured and regularly backed-up, on the university M-drive until no more than three years after the project when they will be deleted. Management of all qualitative data was the responsibility of LC. All data was backed up in secure University locations.

3.4 Characteristics of the respondents

SSIs were held with 22 patients - 11 males and 11 females, aged 33 to 63 (see Table 1). Of these 22, 6 were patients with HBGLs and 16 had diabetes. The majority were Hindu, and some were Buddhist or Christian. The majority of patients were in the low income (n=11) or low-middle income (n=5) brackets, with 1 patient earning middle income and five with high income. Seven patients were interviewed with their partners. An interview with each partner separately was conducted. However, the rapport and recall was noticeably better when both partners were interviewed together and were able to respond to comments the other made and this also showed the dynamics between them [See Appendix B.8 for detailed researcher reflections]. SSIs were also conducted with 9 health workers and 7 policymakers/researchers/senior clinicians. I defined senior clinicians in this group as distinct from the health worker group as they were clinically trained individuals who had close links with policymakers and were active in government policy implementation or formation. They therefore offered a more overarching view on policy. Of the health workers, 7 were female and 2 were male, 2 were clinicians and 3 were dieticians. The majority of health workers were from the public sector (n = 7) with two from the private sector. Of the policymakers, 1 was female and 2 were male, of the researchers, 1 was female and 1 was male and of the senior clinicians 1 was male and 1 was female (see Table 2).

Table 1: Characteristics of patients who participated in individual patient interviews (May – June 2017)

ID	Age	Gender	Interviewed with Partner (P) or single (S)	Education level	Socio-economic group (Average earnings per month in Nepal Rupees)	Ethnicity	Religion	Employed	Occupation/previous occupation	Diagnosis	Time since diagnosis	Other medical conditions	No. of people in household
35	51	F	S	4 class	Rs. 50,000-75,000	Chhetry	Hindu	No	Housewife	Diabetes	9 years	Thyroid, heart related disease and high blood pressure	4
34	55	F	S	Has not attended the formal education but can write her name	Less than Rs. 50,000	Sherpa	Buddhist	No	Housewife	Diabetes	5 years	Cancer patient but recovered, operation of stone recently, diabetes	5
45	52	M	P	Intermediate	75,000-100,000	Brahmin	Hindu	Yes	Service	Diabetes	2 years	No	5
44	33	M	S	School Leaving Certificate	50,000-75,000	Chhetry	Hindu	Yes	Driver	Diabetes	4 years	Low BP	3
46	60	F	S	5 class	50,000-75,000	Brahmin	Christian	No	Housewife	HBGLs	14 years	High BP, Gastritis	4
38	54	F	S	School Leaving Certificate	More than 1,00,000	Magar	Hindu	No	Housewife	HBGLs	1 year	Thyroid, High BP	5

ID	Age	Gender	Interviewed with Partner (P) or single (S)	Education level	Socio-economic group (Average earnings per month in Nepal Rupees)	Ethnicity	Religion	Employed	Occupation/previous occupation	Diagnosis	Time since diagnosis	Other medical conditions	No. of people in household
33	59	F	P	School Leaving Certificate	less than Rs. 50,000	Newar	Hindu	Yes	Business-shopkeeper	Diabetes	1.5 years	High Cholesterol, Eye problem	4
32	62	F	P	Primary level	less than Rs. 50,000	Brahmin	Hindu	No	Housewife	Diabetes	12 years	Kidney Dysfunction, Eye and Ear Problem(after diabetes) and High Blood Pressure	3
26	45	M	S	Bachelors in political science	50,000-75,000	Chhetry	Hindu	Yes	Journalist	Diabetes	5 years	No	4
68	51	M	S	Masters in Public Administration	More than 1,00,000	Brahmin	Hindu	No	Previous-Bank Officer	HBGLs	2 months	No	3
73	38	F	S	School Leaving Certificate	More than 1,00,000	Brahmin	Hindu	No	Previous-Shopkeeper	Diabetes	4 years	High cholesterol, Ulcer	5
75	35	F	S	Primary level	less than Rs. 50,000	Chhetry	Hindu	Yes	Housemaid	Diabetes	11 years	Low B.P.	5

ID	Age	Gender	Interviewed with Partner (P) or single (S)	Education level	Socio-economic group (Average earnings per month in Nepal Rupees)	Ethnicity	Religion	Employed	Occupation/previous occupation	Diagnosis	Time since diagnosis	Other medical conditions	No. of people in household
1	46	M	S	7 class	Less than 50,000 NRs	Newar	Hindu	Yes	Business	Diabetes	9 month	Cholesterol	5
6	39	F	S	8 class	50,000-75,000 NRs	Chettri	Hindu	No	Housewife	Diabetes	10 years	No other	7
10	55	M	S	4 class	Less than 50,000 NRs	Rai	Hindu	Yes	Security guard	Diabetes	9 years	No other	6
8	49	M	P	7 class	Less than 50,000 NRs	Chettri	Hindu	Yes	Business(cafe)	Diabetes	13 years	Thyroid	4
11	56	F	P	Literate	Less than 50,000 NRs	Magar	Hindu	No	Housewife	Diabetes	5 years	Asthma, High blood pressure	5
12	55	M	P	Literate	More than 1,00,000	Brahmin	Hindu	Yes	Business(cafe)	Diabetes	7 months	High blood pressure	6
7	63	M	S	10 class	Less than 50,000 NRs	Chettri	Hindu	No	Business(Brick and construction factory)	Diabetes	8 years	Urine infection	7
23	52	F	S	5 class	Less than 50,000 NRs	Newar	Hindu	No	Housewife	HBGLs	2 years	No	4
82	57	M	S	Masters	More than 1,00,000	Brahmin	Hindu	Yes	Private sector job	HBGLs	10 months	No	4

ID	Age	Gender	Interviewed with Partner (P) or single (S)	Education level	Socio-economic group (Average earnings per month in Nepal Rupees)	Ethnicity	Religion	Employed	Occupation/ previous occupation	Diagnosis	Time since diagnosis	Other conditions	medical	No. of people in household
83	44	M	S	Literate	Less than 50,000 NRs	Chettri	Hindu	Yes	Government job (office supporter)	HBGLs	3 months	Neuro problem		5

Table 2: Characteristics of health workers, researchers, senior clinicians and policymakers who participated in individual interviews (May – June 2017)

ID	Type of Interviewee	Gender	Occupation
01HW	Health worker	Female	Dietician
02HW	Health worker	Female	Dietician
03HW	Health worker	Female	Dietician
04HW	Health worker	Female	Community health centre worker
05HW	Health worker	Female	Community health centre worker
06HW	Health worker	Female	Community health centre worker
07HW	Health worker	Female	Clinician
08HW	Health worker	Male	Clinician
09HW	Health worker	Male	Community health leader
01SH	Senior clinician	Male	Clinician
02SH	Researcher	Female	Researcher
03SH	Senior clinician	Female	Clinician
04SH	Policymaker	Male	Government official
05SH	Policymaker	Female	Government official
06SH	Researcher	Male	Researcher
07SH	Researcher	Male	Researcher

3.5 Presentation of findings

Having specified the methods used to gather data in Study 2, and the sample recruited, I will now present my findings from the data in two sections:

- a. determinants of dietary behaviour and creating an ecological model (Chapter 4)
- b. factors influencing the supply of and demand for dietary support (Chapter 5)

Following the exploration of the themes and findings in these sections, I consolidate them in Chapter 6 to look at the overarching implications and reflect on the methods used.

Chapter 4 Developing a Socio-Ecological Model of dietary behaviour for people living with diabetes or high blood glucose levels in urban Nepal: a qualitative investigation

4.1 Introduction

In this chapter I develop an ecological model to illustrate the influence of multiple determinants of behaviour and to improve understanding of these. Ecological models have incorporated multiple determinants into different levels of influence on behaviour (intrapersonal, interpersonal, organisational, community and public policy) and consider the interaction of behaviours across these different levels of influence, which leads to multi-level suggestions for interventions to change behaviour (Biddle, 2008, Sallis et al., 2008, Story et al., 2008, Stokols, 1992, Lang and Rayner, 2012).

Levels of influence used in models previously include individuals, groups and organisations (McLaren and Hawe, 2005) for an example of an ecological model which uses these levels see (Fisher et al., 2005). This thesis, however, considers dimensions of influence in the form of environments, such as the physical environment, and socio-cultural context. Culture includes conscious and unconscious assumptions and informs individuals' interpretations of their experiences (McMullin, 2017). There is much debate across disciplines about the definition of culture and it is a complex term to define with anthropologists, political scientists and psychologists having different views on its definition (Bourdieu, 1977, Engelke, 2017, Hruschka and Hadley, 2008, McMullin, 2017, Taylor, 2007). In this research I define culture as a shared, adaptive and changing system of meaning which is always changing. Embedding cultural understanding in global health has been shown to be important in developing effective health strategies (Nichter, 2008, Edberg, 2013). However, culture has often been used as if it is static and a barrier to health improvement, often conflated with related concepts such as race and gender. To better consider the influence of culture on health, I do not treat it as an independent and time-dependent categorical construct. Instead, because culture is also affected by, and affects, social contexts, I consider social and cultural context together. I consider social contexts to include environments made up of conditions which include socially acceptable standards and customs. These conditions are influenced by groups or social circles with whom individuals interact within the context. This interaction can be by individuals on their socio-cultural context or on individuals by the socio-cultural context surrounding them. Therefore, I have chosen to categorise *socio-cultural context*, drawing on elements of the socio-cultural psychological approach (Vygotsky, 1980). This approach emphasises that cultural factors such as language, art and shared practices/traditions (e.g. fasting/feasting) can play a significant role in the development of cognitive abilities and defining behaviours. I draw on this approach to consider factors such as social norms (informal understandings that govern the behaviour of members of society (Scott and Marshall, 2009)) and social structures (e.g. family, communities) as playing an important role in behaviours. Socio-cultural context incorporates social factors (social relationships – including gender relations, social support) with cultural aspects (traditions, ethnicity, gender roles, religion, shared practices) to reflect values, norms, customs, influences and traditions. Often these factors are intersecting, hence the importance of considering intersectionality as an influence on individual behaviour. I use the term socio-cultural context as interchangeable with the term socio-cultural environment, in the context of my ecological model.

Environmental influences on dietary behaviour are increasingly discussed in the literature (Egger and Swinburn, 1997, French et al., 2001, Giles-Corti et al., 2003), one recent paper making clear different features of the environment which can influence dietary choices (Hollands et al., 2017). However, many studies focus on the obesity epidemic rather than dietary behaviour more generally, my focus being the latter. Some social ecological models in particular, see culture as important in interventions (Bonell et al., 2011, Panter-Brick et al., 2006). I use my ecological model to better understand the research context in-depth and argue that one-size-fits-all thinking about intervention design is not appropriate. Though there is a plethora of global advice about healthy eating and diet, it is rarely tailored to context (WHO, 2019, WHO, 2009, WHO, 2016b). I hope that my model can be used to aid the development of feasible interventions to tackle risk factors associated with diabetes/HBGLs.

4.1.1 Aims

To

- a) consider the determinants of dietary behaviour amongst people with diabetes/HBGLs

4.1.2 Objectives

1. Identify the determinants of dietary behaviour of people with diabetes/HBGLs in Kathmandu
2. Propose how an understanding of the determinants of dietary behaviour can be used to inform feasible interventions

4.2 Results: Key themes emerging from the analysis

My data analysis involved grouping key codes into important themes. These themes revealed three levels of influence according to the scope and broad nature of their influence. The first theme was those factors which related to the environment around the individual; second and third were intermediate environments - political and physical; and finally, the environment with the broadest influence was the socio-cultural environment. I discuss these four different themes; individual characteristics and behaviour, physical, political and socio-cultural. The themes, their level of influence (see ecological model for a visualisation of these levels) and codes/sub-codes associated with each theme are displayed in Table 3 and then italicised in the text in the following section.

Table 3: Levels of themes emerging from the analysis

Level of influence	Theme	Sub-code (where appropriate)	Code of specific influencing factor
Individual	Individual environment	Personal psychological capabilities	Individual's motivation Individual capacity for change
Intermediate	Physical environment		Access to 'outside' food and fast food Consumption of food in the home Availability of healthy food and junk food
	Political environment		Government campaigns and policy Political will
Higher/broader	Socio-cultural context	Cultural practices	Culturally appropriate food Ethnic dietary practices Religious dietary practices, festivals and fasting rituals
		Social support	Support from family (household), friends, community
		Gender constructs	Socio-culturally constructed gender roles

4.2.1 Individual Environment

Within the individual environment are *personal psychological capabilities such as the internal capacity for, and motivation to change one's behaviour*. These are the C and M of the COM-B framework (Michie et al., 2011). My data indicates a lack of *motivation* to eat more healthily:

'I even have things like sweets that I am not supposed to have. It does make an impact on me.' Female Diabetic 15

Predominantly I found that patients had not known about healthy eating before they were diagnosed with diabetes or HBGLs. Some patients found it hard to change their dietary habits even after receiving advice to eat a healthy diet following their diagnosis. Often controlling diet was hardest during festival periods, showing that their socio-cultural environment affected individual behaviour:

'I can eat what I want for 1-2 days. After all, Dashain [annual festival in Nepal] is a festival of only 4-5 days so I eat everything during Dashain.' Male diabetic 06

Those who did resist cultural norms were aware that they were not participating in these practices, and of the possible social consequences of not participating. Understanding such cultural nuances appears to be vital when considering individual motivations and abilities to change behaviours. There is tension between cultural determination and individual agency in relation to dietary behaviour as has been found in other research (Kashima et al., 2005, Chirkov et al., 2010). Further research is needed into this tension, and the determinants within socio-cultural context and individual agency which affect ultimate decision-making. My findings also corroborate other research as they suggest that knowledge and awareness alone is not sufficient to action behaviour change. Michie et al. (2011)'s behaviour change wheel attempts to tackle the problems associated with only providing dietary advice to patients by suggesting that interventions should trigger action (which affect opportunities, motivations and capabilities) rather than simply imparting knowledge about how to behave. My findings suggest that such interventions should trigger action by incorporating socio-cultural context which influences behavioural decision-making. These are important considerations for developing an effective intervention.

4.2.2 Physical Environment

The physical environment presented challenges regarding the acquisition and *availability of healthy foods*. One patient raised concerns about the chemical fertilisers in fresh foods brought from the outside:

'I try to bring home as much green leafy vegetables as possible. I eat it only after all the germs in it dies after we put it on the fridge. That is because the foods these days are not as good as it was before. Everything has [chemical] fertilizers in it.' Female Diabetic 75

Patients in Study 2 had genuine fears about the way fruits and vegetables are produced, and this indicates people may be reluctant to eat them unless they have put them in the fridge which they believe will kill the germs. Such attitudes could be detrimental to healthy eating, especially

if no refrigeration is possible, as it is not in many Nepali homes (Subedi, 2016). Furthermore, some patients who were aware of the impact of *unhealthy junk foods* on their health, stated that they found it difficult to eat outside due to the oily nature of '*outside*' food, and the lack of healthy options for diabetic or HBGL patients. Several patients stated that they ate fast foods such as *momos* and *chow mein* outside of the home:

'I eat this [momo's and chow mein] outside. No one can make this in home.'
Male diabetic 10

This finding suggests that unhealthy fast foods are often not *served in the home* and therefore 'outside' and 'inside' eating represent different spheres of influence on dietary behaviour; the home being traditional, and outside it being a new and potentially exciting space for consuming unhealthy junk food. Such new and fashionable outside spaces, and a fashion around inhabiting them, is likely to be a reason why many people are now choosing to consume these tasty foods high in saturated fat and salt. This is corroborated by other research findings that eating 'outside food' in restaurants and outlets is a relatively recent phenomenon in Kathmandu, supporting evidence of a nutrition transition in Nepal (Popkin, 2015, Popkin et al., 2012, Subedi et al., 2017). These findings are consistent with other research which has shown that junk food availability and consumption has been increasing in Nepal (Popkin, 2015, Popkin et al., 2012, Subedi et al., 2017, Ide, 2016, Oli et al., 2015b, Shrestha et al., 2017). Also, as junk food becomes more affordable, there have been recent increases in vegetable prices, making healthy foods harder for poorer households in Nepal to afford (Chitrakar, 2017).

4.2.3 Political environment

The political environment had the potential to influence behaviour with *government campaigns or policies* and legislative moves. An example of this was the government campaign 'My Year' or 'Mero Barsha', launched after Nepalese new year 2017 which aimed to encourage self-motivation adherence to five commitments; stopping consumption of alcohol, tobacco or tobacco-related products; exercising regularly; eating healthy and nutritious foods; having routine check-ups; and watching the health of family members. One health worker stated that the 'Mero Barsha' campaign had the potential to influence her patients, but until then had not been effectively disseminated:

'Mero Barsha has a lot of potential to encourage my patients to eat more healthy foods but so far my patients have not heard of it and I have not been told to promote it to them.' Health worker 03

Health workers we interviewed were not familiar with the government campaign to promote healthy lifestyle, though government officials stated that the campaign was active and should be widely known about. Here discrepancies were evident between the presence of and dissemination of campaigns to improve dietary behaviour. One government official, when asked about policies which could improve dietary behaviour in Nepal, showed willingness to implement a sugar tax in the country:

'We have been through a series of discussions with other stakeholders and we have received positive feedback from them and most probably the government will do something about increasing the tax on the sugar and sugar-related products.' Policymaker 02

The same policymaker discussed government commitments to introduce a ban on junk food in schools. Evidently, *political will* is in place to bring about changes to improve the political environment surrounding patients in Nepal. However, this political will was not evidently

translated into political action. Therefore, though potential existed to bring about positive change in policy, the opportunities for the political environment to influence dietary behaviour positively appeared limited. The area of political change and policy warrants further research and this investigation can be found in Chapter 5.

4.2.4 Socio-cultural context

As outlined in the introduction I see socio-cultural context as incorporating social factors (social relationships, social support) with cultural aspects (ethnicity, religion) to reflect society's values, customs, influences and traditions. Cultural practices greatly influenced patients' views on whether they should adopt healthy eating practices. The cultural consumption of certain foods was central to dietary behaviours. White rice was evidently vital to Nepali identity and eating practices:

'We are Nepali and we should eat rice. I do not care if you give me that list [from the doctor of foods which diabetic patients should/should not eat] or not but I will not follow it.' Male diabetic 17

Here it is important to consider why the participant feels he should eat rice. It was a commonly held cultural belief amongst participants that rice is a necessary part of every meal and it made them feel full. A meal without rice was seen as no meal at all. Rice is a filling food and therefore made participants feel full after eating it. Participants interviewed in Study 2 would always try to eat rice:

'Everyone [all my friends] used to be Sardar [an ethnic group belonging to Indian caste] and they used to agree to eat chapatti so I used to feel awkward if I didn't eat it with them, so I did. However, once I said I will go out for a while and went to a hotel and eat rice and came back. I always have to eat rice.' Male Diabetic 17

Meals without rice are often seen as incomplete and a large helping of rice is seen as essential for health and well-being. It was clear that rice is heavily laden with cultural significance in Nepal, and consumption of it is central to being part of Nepali culture. The term 'bhat' for rice, was used by many participants to mean 'meal', and 'mam' was a term used by participants for the rice that is fed to a baby, illustrating its embedded nature in culture from infancy. Patients found it difficult to break the cultural code of eating white rice and replace it with alternative carbohydrates such as roti. White rice ranks very high in the glycaemic index which means it can cause a spike in blood sugar levels and consumption of it has been linked to diabetes (Hu et al., 2012). For these reasons people with diabetes or HBGLs are warned against consuming large amounts of white rice. The statement above about a participant [Male diabetic 17] seeking to eat outside the home to satisfy his need for a particular food also shows that outside eating establishments provide an outlet for satisfying food needs, particularly for men (Liechty, 2005). In this case it is to eat rice, however other male participants stated that they ate fast foods outside the home such as *momos* and *chow mein* because they enjoyed them and these were not eaten in the home:

'I like to go out and enjoy momos, a typical Nepali food. My wife does not like to cook them in the house.' Male diabetic 44

This also could indicate the power of the woman in deciding which food she will or will not prepare for her husband in the home, though this can be countered by the man's ability to seek alternative food outside. These 'outside' spaces were mainly used by male participants, and this

could be due to women's roles being seen as traditionally culturally placed in the domestic private sphere of the home (Liechty, 2005), thereby illustrating a gendered cultural aspect of eating behaviours.

Despite the challenge involved in eating meals without rice, many patients stated that they had managed to reduce their white rice intake to improve their health:

'I eat less rice now because I know it will make me sick. I try to eat roti instead.'
Female diabetic 08

To aid this transition, some dieticians advised their patients that they could still eat small amounts of white rice as part of their diet. This allowed them to retain some of the cultural practice, which was so central to their identity, whilst still maintaining a healthy diet. These findings are supported by the literature which has found that white rice is predominantly seen as the most filling and healthiest food to consume, an essential component to the Nepalese diet (Dahal et al., 2005, Oli et al., 2015b). Meals without rice are often seen as incomplete and a large helping of rice is seen as essential for health and well-being. Wholegrains like millet and buckwheat are not seen as good enough compared with rice (Uprety, 2014). The cultural significance of *culturally appropriate foods* such as rice and its complex meaning must be explored within the context of diabetes and healthy eating behaviour.

Cultural practices around mealtimes and daily consumption of food varied amongst participants interviewed. Participants in Study 2 reflected the diversity in dietary practices and eating times:

'I eat "lunch" every day at 9:00 am and after that "coffee" at 2-2:30 pm. And I also eat cucumber, carrot in between. Also, at the "gap" when I feel like eating something I eat carrot, cucumber and other light food. After that, I eat dinner at 6.30 - 8 pm.' Female HBGLs 38

Other participants ate at different times of day:

'After waking up in the morning I drink black tea with gram flour at 7.30am. If I do not have that then I eat gram and egg, separating the yolk. And for lunch at 12 o'clock I eat normal food - spinach and lentil a little more. Rice, lentil and spinach in an equal amount. I do not eat much rice. These days I eat half stomach, earlier I used to eat enough. Now I have controlled a lot. At 9pm I eat share chyakhla [food made up of corn or wheat flour] with my family.' Male Diabetic 44

Diabetes is a condition which requires regular small intakes of food to regulate sugar levels, and therefore traditional eating patterns involving long gaps between meals can cause problems if patients do not eat for long periods of time. Several participants, such as those above indicate an awareness of needing to eat small amounts regularly, limiting their portion sizes and eating smaller amounts more frequently, though at different times. The participants' responses illustrate that multiple meal patterns are common in Kathmandu and these must be considered when developing dietary interventions.

In addition to the importance of rice in Nepalese diets, in certain *ethnic groups different eating practices were important* due to varying ethnic and cultural traditions and rituals. Fasting for long periods is harmful to people with diabetes and HBGLs who need to eat regularly to regulate their blood sugar levels (Scimex, 2018). However, fasting can be a vitally important cultural practice in Nepal. Eating practices around festival times were particularly challenging. One patient described a *religious festival* which was observed by Hindu women called Teej, in which

she did not eat food to honour her husband. She described how she felt like something was wrong when she tried to stop fasting:

'I stopped fasting because I was told it was bad for me. But when I'm not fasting I don't feel good and I feel like something is wrong...I've decided to fast again to feel better.' Female patient, HBGLs 14

This feeling of something being wrong expressed by the patient is tied to the individual's cultural beliefs about culturally 'appropriate' behaviour and illustrates the power of cultural factors over behaviour. Patients were mostly aware of the physical problems that fasting could cause them if they had diabetes. Evidently, some patients still took part in the practice due to social and cultural pressure to do so despite knowing it was bad for their health. Such pressures have also been found in other research (Lipner, 2012, Sapkota et al., 2017, Smith, 2013, Subodh, 2013, USAID, 2010, Oestgaard, 1999). However, some patient's health problems overrode their desire to adhere to socio-cultural pressures:

'I used to do fasting for Lord Shiva. Saturday I did not eat meat but I had to work. It is difficult to stay hungry for a whole day and it also causes gastritis. I fasted for 3-4 months and I could not continue.' Male Diabetes 44

Clearly, the ill effects of fasting made this patient stop the practice. Though fasting was important for some Hindus interviewed, one participant observed relief at not having to fast now that she and her husband had converted to Christianity:

'My husband and I, we both are Christians now...Maybe because I have known that there are no benefits of staying hungry and fasting, I do not feel bad about not fasting anymore. I might feel frustrated if I was Hindu like I was before...' Female HBGL 46

The patient states that if she was Hindu as she used to be, she could feel frustrated at having to fast. However, now, as a Christian, she did not feel the socio-cultural pressure to fast. Evidently the practice of fasting for religious purposes is not without challenges, and though this participant did not discuss her reasons for converting to Christianity it is clear that she and her partner feel happy that the burden of the expectation of fasting is no longer on them.

Religious festivals are closely linked to ethnic dietary traditions. In addition to different religious practices influencing dietary behaviour, different staple foods were also important for different groups for ethnic reasons. Sweet foods, potatoes and other foods such as salt and ghee are highly significant in Sherpa communities:

'I have Khapse [a food common in Sherpa community which is made with sweet ingredients]. They use sugar to prepare it but what I can do about it? I still like having it...We Sherpas also eat a lot of potatoes....I used to add ghee to the black tea and add milk and salt to it.... We are the community that is used to eating things like that.' Female Diabetic 34

As this participant indicates, foods such as ghee are highly culturally significant to Sherpa communities, which is confirmed by other research (Vaidya and Krettek, 2012). The powerful statement made by the participant that 'we Sherpas' states a clear link between the participant, her social identity and the food she consumes. This illustrates that the complex web of ethnic cultures in Kathmandu gives different cultural significance to different foods which has a powerful influence on dietary behaviour. Ethnically significant foods listed by participants such as ghee can be detrimental to patients with diabetes, making their condition worse.

My patient sample reflected the rich diversity of ethnicities in Kathmandu. Patients from the ethnic groups Newari and Chettri, both of which follow the Hindu religion, demonstrated particularly distinct ethnic dietary traditions throughout the year, often linked to festivals. Newari are the second largest ethnic group in Kathmandu (after Brahmin), making up approximately 22% of the population and Chettri make up 20% of the population (World Population Review, 2018). During discussion of one of many festivals the Newari people celebrate, one patient stated:

'There was Sithi [Newari festival]. Then we cook bara [spiced lentil patties], varieties of potato and black eye bean curry. The lentils are soaked in water a day before and the next day the covers are peeled off, the lentils are ground and breads are made out of them. They are cooked in oil...The potato is boiled and then deep fried...I eat little bit of everything.' Female diabetic [Newar] 20

This discussion indicates the dietary practices followed by members of the Newari group. These include food preparation in a particular way for certain Newar festivals, including deep frying food which is an unhealthy dietary behaviour and could worsen her diabetes. However, the participant wanted to eat this food due to it being part of an important ethnic practice. These traditions differed from patients from other groups such as Chettri, who have different dietary traditions surrounding their ethnic festivals. For example, even common foods, such as chapatti, were made differently by different ethnic groups:

'We Chettris make chapatti differently to other people. Our [chettri] chapatti is made up of Gyan chakki atta [all-purpose type of flour used to make chapatti]. The doctor has suggested me not to eat anything made from all-purpose flour, which is why I eat only wheat flour now.' Male diabetic [Chettri] 09

This patient has demonstrated that he has been able to change an ethnic dietary practice to eat healthier flour as his doctor has recommended. However, as demonstrated by the Newari patient, and others interviewed, many found it difficult to make such changes, cultural pressures around ethnic practices being strong. There was also variation in the foods eaten at festivals, as expressed by patients, roti was eaten in some religious festivals:

'We have fruits and prepare roti [to observe the festival Maghe Sankranti]. We prepare roti, sel roti. At that time, my family prepares some without sugar since I am a sugar patient. Apart from that I have the regular dal [pulses], rice and vegetables.' Male Diabetic 10

Evidently, diversity in practices lead to a variety of different foods being consumed. Further festivals were discussed by participants:

'During Shrawan month, there will be Sankranti [name of festival] during which daughters and sisters are invited, meat is eaten.' Female, Diabetic 11

Some festivals, such as Sankranti described were specifically for certain members of the household. Others were observed by whole households:

'this festival [Dashain] is something that has been observed by our ancestors. It is the puja [act of worship] of our Kul Devta [the family God]. At this time we eat foods like the samay [a traditional plate consisting of rice, meat, beans and vegetables], meat, beaten rice and alcohol.' Male Diabetic 1

Dashain, referred to by the participant, is the most widely observed religious festival in the Nepali calendar and occurs in September or October every year. As demonstrated by the participant above, individual rituals during Dashain vary, including worshipping of specific family Gods and consuming special dishes. However, religious practices were not observed by everyone, even if their religion stated they should be observed. There was evidence from patients from Study 2 that some Nepalis no longer adhere to the Hindu ritual fasting following death:

'I do not believe in all those funeral rights. If I hear a news of someone's death while having a food, first I finish my food... The person has already died but why other people have to suffer. Foreigners after doing funeral rituals come and eat, but being a Hindu we should restrict our food for the religion. Male diabetic 44

Evidently, interventions would benefit from considering the variety of practices and the extent of adherence to them. Though some people choose not to observe traditional practices, my data shows that others do choose to adhere to them. Therefore, interventions could strongly benefit from being sensitive to cultural pressures to adopt certain dietary behaviours and could consider transmitting messages about healthy dietary behaviour through prominent cultural leaders. These findings are consistent with other research which suggests that culturally defined eating patterns affected behaviours (Sudo et al., 2009). Other research has found that patients still take part in fasting due to cultural pressure to do so (Lipner, 2012, Sapkota et al., 2017, Smith, 2013, Subodh, 2013, USAID, 2010, Oestgaard, 1999) and religion has been explored as a determinant of dietary behaviour in other research (Lipner, 2012, Sapkota et al., 2017, Smith, 2013, Subodh, 2013, USAID, 2010, Oestgaard, 1999). Religious festivals often lead to eating large amounts of unhealthy, culturally defined foods in celebration (Lipner, 2012, Sapkota et al., 2017, Smith, 2013, Subodh, 2013, USAID, 2010, Oestgaard, 1999). This illustrates the importance of understanding the varied religious and ethnic cultures in Kathmandu and how they create, form and reinforce culture. Such cultures vary between communities and households making it important to tailor interventions to incorporate this understanding. Furthermore, acknowledging the importance of these traditions does not mean that they cannot be adapted to improve health outcomes to ensure they still meet the same goals, in the case of Teej, honouring the husband, though not to the detriment of the wife. Such cultural adaptation has been demonstrated in LMIC contexts previously (Meegan et al., 2001).

4.2.4.1 Social support

Social support appeared to be an important determinant of the dietary behaviour of patients interviewed. Patients very often attended medical appointments with family members showing the importance of family. Additionally, many people felt the pressure of caring for their families as well as their own health; with some patients, this acted as a motivating factor in ensuring adherence to control their diet and limit the intake of foods such as deep fried or oily foods. One dietician asked patients to act as role models for their children, explaining that now the patient was diabetic, their children were already at risk. One patient indicated he was conscious of taking care of his family now he had diabetes. He demonstrated this by ensuring they all eat healthy food:

*'Interviewer: That means you all eat the same food?
Participant: Yes, it will be the same because I am conscious that maybe my children will also have sugar [south Asian term for diabetes] because I have it.*

So I have given them knowledge so that they will not suffer from sugar for a long time and they are also aware of their eating habits.’ Male Diabetic 05

This supportive behaviour shows the powerful positive influence *social support from family* in the social environment surrounding patients to bring about behaviour change. Patients appeared to receive a lot of support from their social relationships. These relationships were found with family and friends and within communities. Several participants described their family as the main factor which helped them to manage their diabetes:

‘The main thing is the “help” provided from the family members. When the family members “help” then half of the “health” problems are solved. So, I think family plays the vital role to direct about what to eat, how to eat.... The whole family eats the food that is of my preference. I have to “lead” and tell them my choice of food which is then prepared.’ Male diabetic 45

Support from a partner was often very important to patients. Sometimes the wife was the dominant partner in helping to control diet, mainly due to her responsibilities of cooking and providing food:

‘I have changed [my (diabetic) husband’s diet] myself. He used to like potato and oily food but now I cook it much less even if he asks to cook. I make potato for the children and more green leafy vegetables for us..., today I made cauliflower, pumpkin shoot and Lattey sagg [Refers to the green leafy vegetable] ...we do not eat oily food but we eat green leafy vegetables a lot.’ Male diabetic 12

Evidently, this woman has decided to help her husband by preparing healthier food for him, indicating the powerful positive role a woman can have in using her culturally specified gender role (to conduct the cooking in the household) to improve the health of her partner. In addition to family, friends also play a central supportive role in determining patients’ behaviour, they often offered advice to patients, though sometimes this advice was inaccurate. Sometimes friends acted as a negative influence on dietary behaviours:

*‘Wife: I must say that he is compelled to drink.
Participant: I drink at the parties to get involved with my friends but the amount I drink is very little. And I have often experienced this thing so in order to make friends happy I drink in the parties.
Wife: He didn’t used to drink.’ Male diabetic 45*

This indicates that the male patient feels peer pressure to consume alcohol, an activity which could worsen his diabetes, due to pressure from his friends. This illustrates the social forces which can influence dietary intake amongst the population interviewed. This corroborates findings from other settings showing the power and influence of social relationships (Robinson et al., 2014, Deutsch and Gerard, 1955, Reno et al., 1993, Robinson and Higgs, 2012, Schultz et al., 2007). Other research has found that family responsibilities are culturally very important in Nepal (Oli et al., 2015b). Family bonds and responsibilities, often multi-generational in nature are vastly important in Nepal, and these traditional structures often act as key drivers in behaviours (Goldstein and Beall, 1986). The connection between showing love through presenting loved ones with food has been previously explored (Liechty, 2005). The power of social influences on eating behaviours have been found in HIC’s (Robinson et al., 2014, Deutsch and Gerard, 1955, Reno et al., 1993, Robinson and Higgs, 2012, Schultz et al., 2007), particularly the influence of family and friends (Pachucki et al., 2011). Evidently social factors in the socio-cultural environment can affect dietary behaviours.

4.2.4.2 Gender constructs and roles

Socio-culturally constructed gender roles were another important influence on determining dietary behaviours and were discussed amongst all participants interviewed. I found gender roles to be entrenched in Nepalese society. Patients stated that *male/female involvement in food and cooking* varied. A minority of female participants interviewed stated that they prepared food with their husbands:

'We prepare the rice in the pressure cooker itself. We prepare the dal [pulses] in the pressure cooker as well. Then, the pickled tomatoes are made out of boiled tomatoes. Sometimes we also prepare it on open fire and add coriander on it.' Female Diabetic 10

This indicates that in some households the responsibility of cooking was shared equally between men and women. However, in the majority of households participants indicated that women prepared the food. One example of female involvement in food and cooking, referred to by several participants, was the role the daughter in law played in providing food for the household. Daughters-in-law played an important role in households by cooking and providing food for their husband and his family, showing a continuation of cultural traditions even in a modernised urban environment. However, daughters-in-law did not always prepare healthy food:

'Our daughter in law cooks all types of meat like a roast and we eat that. I just eat a little because I get scared because that is very oily.' Female Diabetic 07

The role of preparing healthy food, that is for example, vegetables cooked with small amounts of oil, often sits in the hands of specific female members of the household. There was evidence in some households that women had been made aware of the importance of cooking healthy food for diabetic family members, and that this had a positive effect on the dietary behaviour of the diabetes patient. Sometimes the male in the home helped to cook, particularly during times when the female cook was menstruating (usually if there was no other female who could cook in the home, which there often was not):

'I was menstruating on that day, so I did not have to participate in any of the work. They gave me rice, meat, vegetables and pickles.' Female Diabetic 04

This links to the Nepalese cultural practice of ensuring menstruating women do not enter the kitchen so as not to pollute or dirty the food. This poses a real challenge for diabetic women who are not permitted to enter the kitchen when they are menstruating, yet they do not feel that they can ask for special food which is suitable for them. Traditional cultural practices are influential practices in daily life. Other diabetic female participants stated that they faced a double burden; that of their illness and cultural pressure to provide (often unhealthy) food for their family as well as healthy food for themselves so they can manage their condition. Female diabetic participants were regularly cooking their family one (unhealthy) meal and themselves another (healthier) one. My data found that in households where the husband cooked, he generally only cooked foods desired by the other members of the household, and not separate healthy meals for his diabetic female partner. The reverse was not commonly the case, suggesting that female diabetic patients had to cook healthy foods for themselves, or not eat them at all, placing an addition burden on them because of their socially constructed gender role:

'It gets difficult to prepare separately for me when there are lot of people. So, I say "I have "sugar" so give me just a little." I cannot ask them so prepare separately for me.' Female Diabetic 11

Despite the difficulties women faced, some strong-minded participants stated that they had changed the food they cooked for the whole family so as to ensure that the rest of the family would not suffer from diabetes. Women were key gatekeepers into household dietary behaviour. Therefore educating them about healthy eating practices has great potential to improve the dietary behaviour of entire households (Smith, 2013, Oli et al., 2015b, Sudo et al., 2006). This was demonstrated in a few cases:

'Wife of patient: After he was diagnosed, I started giving him steamed rice as everyone used to say that it is beneficial for the diabetic patient. But what I noticed after 2-3 months was, he was getting weaker as the food is not of good "quality." Then without the consultation with the doctor, I started increasing the foods rich in "protein." I came to know that the amount of food should be less, but it should be of good quality.' Male Diabetic 45

The supportive influence of women in the household also indicates the importance of social support as a determinant of dietary behaviour but also represents a challenge to gender norms and power dynamics as the female represents a challenge to male authority – supplying her husband with the food she thinks will make him healthier. This corroborates other findings that females in the household are influential in providing food, healthy or unhealthy (Uprety, 2014, Mish, 2007, Oli et al., 2015b).

Other studies into household behaviour corroborate my findings about female involvement in decision-making as they have shown that women are key gatekeepers in influencing household dietary behaviour. Therefore educating (often non-diabetic) women about healthy eating practices has great potential to improve the dietary behaviour of entire households (Smith, 2013, Oli et al., 2015b, Sudo et al., 2006). This is particularly the case because men are often found to have less healthy dietary practices than women in Nepal and elsewhere (Shrestha et al., 2013b, Rausch Herscovici et al., 2013). Additionally, daughters-in-law were often tasked with cooking for the entire household, and take the last position in household serving order (Gittelsohn, 1991, Gittelsohn et al., 1997, Ohno et al., 2005, Sudo et al., 2006, Uprety, 2014) with women often eating only once men have finished (Uprety, 2014). This can be down to a range of factors including power dynamics with their mother-in-law (Bras, 2016). This has implications for both men and women with diabetes, for example women in the household may consume unhealthier food or carry a burden of caring for other members of the household, potentially causing higher levels of strain both physically and mentally. Understanding gender roles within Nepali households is therefore vital to assessing how interventions might effectively influence behaviours within the household.

4.3 An Ecological Model for dietary behaviour

My findings uncover several layers of influence which determine dietary behaviours of people living with diabetes or HBGLs. My ecological model (Figure 8) demonstrates these multiple layers. Though influenced by previous ecological models (Matsudo et al., 2004, Sallis et al., 2006, Story et al., 2008), my model's value is in its ability to categorise the determinants of dietary behaviour amongst a population with a specific NCD and placing the socio-cultural context as the dominant influencing environment on behaviour. These findings align with other research which has shown cultural specificity and sensitivity to be key in implementing health interventions (Helman, 2007, Sharma and Karki, 2014, Dutta, 2008). My findings corroborate the need for more culturally sensitive and adapted approaches to health interventions. Existing ecological models from HIC contexts do not consider socio-cultural context as such an important determinant of behaviour (Story et al., 2008, Heise, 1998, Glanz et al., 2005, Sallis et al., 2006,

Fisher et al., 2005), and would therefore struggle to account for findings from my study which indicate the importance of the socio-cultural context on influencing dietary behaviour.

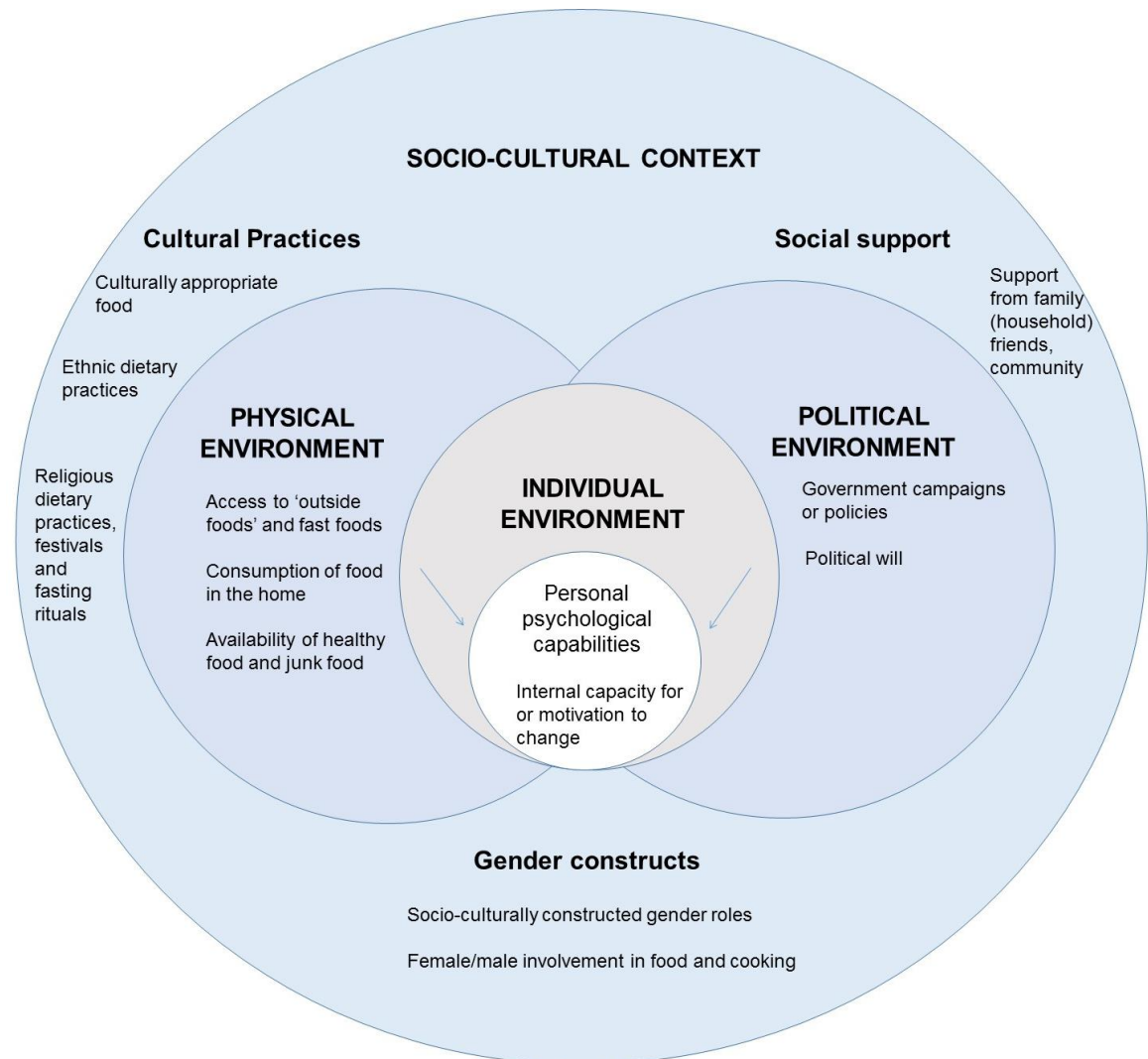


Figure 8: Ecological Model of determinants of dietary behaviour in patients with diabetes and HBGLs in Kathmandu

The model is constructed of four interacting environments, these are; socio-cultural, political, physical and individual environment (individual characteristics and behaviours). Behaviour specific models are useful and often appear in an 'onion' structure to represent multiple measures of influence (Fisher et al., 2005, Owen et al., 2004, Sallis et al., 2006) and mine roughly follows this structure. The overarching environmental influence is socio-cultural context, which was dominant in determining behaviours in various ways, for example cultural practices such as fasting, ethnically defined dietary traditions and the associations around rice were powerful forces in determining behaviours. Intertwined in these cultural practices are religious practices such as eating certain foods during the festivals which dominate the structure of the majority of the Nepalese calendar. Gender constructs also fall within the socio-cultural environment; these describe the way in which the gender norms of society influence behaviour. Socio-cultural environment is not only dominant, but it intersects with all of the other layers of influence, for example the impact of cultural festivals, and gender roles during these, on individual motivations in dietary choices. Socio-cultural context therefore allows for the representation of intersectional identities of patients. Social aspects such as social support from family and friends of the socio-cultural context were influential in determining behaviour. Socio-cultural factors

(social support, gender roles in cooking) can be linked by structures such as households and communities, both of which vary in terms of religious, ethnic and regional differences.

Underneath the overarching socio-cultural environment there are two environments at the same level of influence as each other because my findings suggest they exert similar amounts of influence on behaviours; political and physical. These environments were not as prevalent in affecting behaviours as socio-cultural context. However, they were of overarching influence over the individual. The physical and political environments determined individual behaviour in varying and interacting ways. The physical environment defined aspects such as a patient's distance to health services and opportunity to acquire desired foods. Though my data did not elicit a large amount of information about the cost of food, I classify cost and availability/access to food within physical environment, acknowledging the importance of wider forces of an increasingly globalized food system in urban settings such as Kathmandu. Such factors are important in considering broad multi-faceted approaches to tackling NCDs (Branca et al., 2019). The political environment defined government campaigns and actions to support those with, or at risk of diabetes.

At the central level of influence in my model is the individual environment. This involves behaviours attached to the individual. Within the individual environment are personal psychological capabilities such as the internal capacity for, and motivation to change one's behaviour. These are the C and M of the COM-B framework (Michie et al., 2014). When classifying opportunities for the individuals to change their behaviours (the O of the COM-B framework), these span the entire ecological model, with many forces working on the individual to influence their behaviours. Here limitations lie with the way that the COM-B framework marries up with my ecological model.

Though I started with COM-B when designing my interview guides, the data showed that COM-B was not adequate to fully structure my findings. It was useful to classify individual behaviours within the 'individual environment' using COM-B (capabilities and motivations) as discussed. However, using COM-B involved placing all external forces on the individual into the broad category of 'opportunities'. This over-simplified the multi-faceted nature of these opportunities which the ecological model splits into multiple environments of influence (e.g. physical, socio-cultural). By thinking about these factors within their environmental contexts, we can begin to understand the collective influence of the environment on the individual's capability, opportunity and motivation together. My data therefore suggests interventions may be effective if they are collective, and potentially community based (allowing for contextual variability between communities) and combine socio-cultural, physical, political and individual environments.

My model differs from other ecological models as it places the socio-cultural environment around all other environments as the overarching influencing environment on dietary behaviour. Other models place less emphasis on the socio-cultural environment, for example, some place macro forces (Story et al., 2008, Heise, 1998) or government and industry policies (Glanz et al., 2005, Sallis et al., 2006) as the overarching (outer) influence. Others acknowledge the influence of culture but see it as secondary to community and policy (Fisher et al., 2005). Furthermore, other models of behaviour have not proposed the socio-cultural environment as the overarching environment, as mine does; they instead see social, intrapersonal and physical environments as equally influential on behaviours (Matsudo et al., 2004). Alternatively, modelling by Short and Mollborn (2015) stress the importance of looking at social determinants within the complex systems which operate around an individual. Sallis et al. (2006) come closest to my model by acknowledging the intersecting nature of the social cultural environment on

others in relation to determinants of active living in the USA; however, they place policy as the overarching influence on behaviour and do not treat the social cultural environment as the most powerful environment as my model does. The questioning of individual-focused interventions and exploration of the role of structures outside the individual on influencing behaviour has been well established previously (Cohen et al., 2000). My model stresses the importance of gender within socio-cultural context, another model by Cislighi and Heise (2018) places gender and power as the most influential factors over individual, social, material and institutional environments. Whilst this is a valuable interpretation, and my findings concur that gender is an important influencer, I prefer to place gender as a key part of the wider socio-cultural context as socio-cultural context dictates the manner in which gender manifests as an influence. This consideration of gender demonstrates gender-sensitive research and provides an evidence base on which to build gender-transformative approaches to improve dietary behaviour.

My model advances socio-ecological thinking by proposing that the socio-cultural environment is the most overarching influence on dietary behaviours in an LMIC context and interventions should consider this influence on behaviour rather than developing interventions which only consider the individual without the influence of wider environments on their behaviour. These findings align with recent broader discussions in the literature about the importance of social determinants of health (Marmot, 2015). I believe that as my model differs from other existing models it adds to the existing literature by providing a valuable insight which cannot be gleaned from models based on HICs (for example Story et al. (2008)).

4.4 Incorporating key determinants into interventions

The data suggests that the most acceptable interventions will be developed with full consideration of the various environmental determinants of behaviour in a multi-layered way considering multiple dimensions or environments rather than levels of influence. This does present a challenge for policymaking which follows a one-size-fits-all approach advocated by global guidelines (WHO, 2004b, WHO, 2004a, WHO, 2009, WHO, 2019, WHO, 2016b). Instead, this study advocates the importance of using global advice as a starting point, but then adapting it to the socio-cultural context using a multi-layered approach considering multiple environments (physical, socio-cultural, political, individual). An example of such a multi-layered approach might be to train family members to cook healthy, culturally appropriate foods in the home, engaging both men and women in household food preparation.

Culturally constructed gender roles play a significant role due to the importance of male/female division in food preparation. This indicates the continuation of cultural traditions even in a modernised urban environment (Gittelsohn, 1991, Gittelsohn et al., 1997, Ohno et al., 2005, Sudo et al., 2006, Uprety, 2014). Increasing numbers of women are working outside the home, their changing role in society means that they now often have to work inside (domestically – cooking food etc.) and outside (paid employment) the home. This places increasing strain on women who are traditionally the members of the household who cook (Hossain et al., 2015, Mish, 2007, Uprety, 2014, Oli et al., 2015b), which could lead to less time being spent on food preparation in the home, and more convenience foods being consumed (Hossain et al., 2015). Socio-culturally appropriate and compelling interventions which draw on social bonds and cultural nuances and aim to equally distribute responsibility for healthy food preparation in the home hold the potential to improve dietary behaviour in households.

An alternative multi-layered approach which considers the physical, political, socio-cultural environments may be to harness the power of community spaces such as community health centres, as well as other spaces which act as hubs for the community, such as recreation facilities

or parks. The power of the communities, which are themselves laden with multiple and intersecting cultural, ethnic and religious elements, has great potential for the development of feasible interventions. For this to happen communities must be understood, listened to and then harnessed and utilised effectively to bring about change. Further examples of community-led interventions have been community camps discussed by the participants which disseminate healthy dietary advice to the community by using the structures in communities, such as mothers' groups or Ward committees to implement contextually appropriate change (Asian Disaster Preparedness Center, 2002, Acharya and Zafarullah, 2017, Oli et al., 2015b). Interventions should not only be contextually appropriate but also culturally compelling (Panter-Brick et al., 2006), by fully engaging people in interactive behaviours which link to cultural practices and beliefs which are entrenched within their identities and therefore are deeply meaningful to them. For this to happen, socio-cultural context and its relationship to the individual must be deeply understood. If patients had more and regular contact points with advice-givers in a community setting accessible to them, where they could receive regular reminders about healthy eating habits, they might be more able to consistently change their behaviour long term, rather than relying on short term quick fix measures which do not properly consider the communities or the importance of long-term sustainable health care interventions.

My data illustrated the importance of many ethnic and cultural practices to people in Nepal. Potentially effective interventions should balance protecting cultural traditions with ensuring no harm is done to individuals. An example of this could be demonstrated in the case of Teej when the principle of honouring the husband could be preserved, but the way of conducting these traditions changed so they are not harmful to the woman if she is diabetic (tradition dictates that during Teej women should fast to honour their husbands and fasting is potentially harmful to women who have diabetes). Examples of how these practices could be adapted must be developed by individuals and communities themselves as part of a participatory process. This is particularly important because my data also found that individuals often adapted fasting practices to their own circumstances. Cultural adaptation has been demonstrated in LMIC contexts previously (Meegan et al., 2001) and holds great potential for improving health outcomes whilst ensuring the preservation of core cultural beliefs and rituals. Within these approaches there needs to be consideration of how individual and socio-cultural environments in particular contain multiple intersecting elements (e.g. religion, gender, ethnicity). Therefore, approaches considering intersectionality are important. Interventions should consider the intersectional aspects of individuals, social groups, communities and societies which flow between and inside the intersecting environments conceptualised in the ecological model.

Study 2 did not find evidence that BCTs were explicitly in use in terms of interventions/strategies to encourage healthy dietary behaviour in Kathmandu. Therefore, it was not possible to state if specific BCTs were effective or not in influencing dietary behaviour from Study 2 data. This is an aspect which will be further explored in Chapters 7-9 as I consider how BCTs could be embedded in the intervention development process using evidence about their potential effectiveness collected from Study 1 [Chapter 1].

My model provides the basis to develop, test and evaluate interventions. Whether interventions based on my model are effective or not would provide further validation to the model. To provide a valid intervention test, however, interventions would need to be developed in close alignment with my model. Often interventions are not developed with close alignment to models despite purporting to do so (Prestwich et al., 2017a, Prestwich et al., 2015b, Prestwich et al., 2014b). Awareness of these issues should be considered when taking my model forward for testing interventions.

4.5 Conclusion

My results suggest that socio-cultural context is paramount in underlining, defining and influencing dietary behaviours in Kathmandu. Some participants had demonstrated positive dietary changes since diagnosis to limit culturally normal foods such as rice, which they had since learned were unhealthy if consumed in large amounts. However, the challenge of improving dietary behaviours amongst the majority of people with HBGLs and diabetes, and those at risk of getting the disease, remains an urgent priority in Kathmandu. To tackle this issue, an overarching understanding of the socio-cultural nuances and multiple socio-ecological environments can be used to propose interventions which are culturally compelling by engaging communities, households and individuals in an adaptable way which are flexible to the context and lead to positive health outcomes. The possibility of adapting cultural traditions through participatory consultation with communities about compelling ways to maintain core beliefs and rituals yet improve health outcomes is clear and should be further explored. This study has challenged the one-size-fits-all approach to tackling NCDs, specifically diabetes, and instead highlights the value of investigating contexts in-depth to gather a detailed understanding of the intersecting determinants of specific behaviours. My ecological model is the first of its kind to understand dietary behaviour in people with diabetes or HBGLs in an LMIC with a focus on socio-cultural context. I believe that my model has applicability to other contexts and other conditions (such as other NCDs like cancer and cardiovascular disease). I propose tailored, contextually appropriate intervention design which adapts global guidance to a specific context and considers gender and intersectionality as key. My model's robustness and transferability require testing in other contexts taking into account the fluidity of changing environments. My model provides the basis to develop, test and evaluate interventions.

Chapter 5 Assessing the supply and demand of interventions to support people with diabetes/HBGLs in Nepal

5.1 Introduction

In Chapter 4 I used findings from Study 2 to investigate the determinants of dietary behaviour amongst people with diabetes/HBGLs in Kathmandu to better understand the influences on dietary behaviour. This chapter presents results from Study 2 with a different focus – an assessment of the supply of and demand for interventions to provide support to improve dietary behaviour for people with diabetes/HBGLs in Kathmandu. I draw on the recent rise in the conceptualisations of health systems which acknowledge and embed overarching social and political context as important (Sheikh et al., 2011). Sheikh et al. (2011) categorise the influences in the health system which are impacted by social and political contexts into ‘hardware’ – concrete and tangible expressions of aspects of the health system (e.g. finance, medical products, information systems etc. as outlined in the WHO building blocks (WHO, 2007)) – and ‘software’ – the ideas and interests, values and norms and power aspects which guide actions among system actors and elements. Inspired by such existing frameworks, I use my findings to conceptualise the socio-cultural, political and organisational contexts which influence the supply of and demand for interventions to improve dietary behaviour amongst people with HBGLs/diabetes in Nepal. Here I prefer to use ‘contexts’ instead of ‘environments’ because environment refers only to the surroundings, circumstances or conditions which form a particular setting. However, context refers to the conditions which form a situation/setting within which something exists or happens that *can help explain it*. Therefore, considering ‘contexts’ allows me to better explain intervention supply and demand.

5.1.1 Aims

To

- a) explore factors which influence the support provided for people with diabetes/HBGLs

5.1.2 Objectives

1. Consider the existing supply of and demand for interventions to improve dietary behaviour amongst people with diabetes/HBGLs
2. Understand which factors affect the supply of and demand for interventions to improve dietary behaviour amongst people with diabetes/HBGLs
3. Consider how suggestions can be made to improve the supply of interventions to improve dietary behaviour amongst people with diabetes/HBGLs.

These objectives are necessary to pursue because by establishing the existing supply of interventions and demand for interventions, we can begin to understand what has been done to attempt to improve or address unhealthy dietary behaviour amongst people with diabetes/HBGLs and what is still needed. These gaps in provision will help to establish which interventions are needed and feasible within the specific setting of Kathmandu. These aims therefore contribute to the overall aim of this thesis which is to establish how healthy dietary behaviour can be encouraged by the development of a feasible intervention(s).

5.2 Methods specific to Chapter 5

The following section is a summary of the specific factors relating the methods for Chapter 5, which is in addition to the general methods for Study 2 summarised in Chapter 3, [3.3]. I did not set out to ask participants about the hardware and software elements in the health system which affected the supply and demand of interventions. There was not explicit probing on the elements within the health system which affected the supply and demand for dietary support for people with HBGLs/diabetes. However, there was probing around barriers and opportunities for improving dietary support in general. During data analysis, I found that key themes that emerged related to several (but not all) major WHO building blocks (e.g. service delivery) and also incorporated ‘software’ elements. I use these themes to structure the presentation of my results below. In addition to the results below, I conducted a document review as part of Study 2 which compiled all existing policy documents relating to NCD policy in Nepal (see appendix B.10). I used this to inform my analysis relating to existing supply of diabetes policy from a national level.

5.3 Results and discussion

I organised my results into two groupings; themes which considered the supply of interventions, and those which considered demand (Table 4).

Table 4: Themes from data analysis which related to supply of and demand for interventions to provide support for people with diabetes/HBGL

	Supply of interventions	Demand for interventions
	Pervasiveness of the acute care model	Reluctance to seek health services or preventative activities
	Lack of investment in the workforce	Need for improved follow up
	Low staff motivation levels	Lack of investment in community programmes
<i>Theme from data analysis</i>	Inadequate medical school training	
	Lack of trust of health professionals	
	Inadequate facilities and equipment	

Some of the above themes may relate to both demand and supply (e.g. lack of trust; lack of investment in community programmes; need for improved follow up). I have classified these themes according to the most appropriate category (supply/demand) in which they predominately fitted according to the data collected. I document the evidence for the themes which emerged from the data, starting with themes relating to supply of interventions and moving on to those relating to demand.

5.3.1 Supply of interventions

5.3.1.1 Pervasiveness of the acute care model

One theme relating to the current supply of interventions was the need for a broader pathway in policy which incorporates prevention as well as chronic care. My findings revealed the pervasiveness of the acute care model which did not allow for adequate time to be spent on promoting preventative outreach activities such as disseminating healthy eating advice to those at risk of diabetes (with HBGLs). Health workers stated that the treatment for diabetes they provided was reactive and often took place once a patient’s condition was serious. One

government official working on NCDs, when asked about whether the health system provided more reactive treatment for diabetes stated that there was a need for better coordination and provisioning within government for services that focused on preventing the worsening of diabetes and managing its symptoms. A health worker, unprompted, explained how there was an inadequate understanding of the chronic care model in her health care facilities (both private and public) and there was a disproportionate focus on the acute care model which created problems when trying to develop more preventative and symptom-management care:

'Nobody is in tune and the residents and medical students are not trained in the chronic model and even the national medical council do not consider it important... [our] service can be outpatient based also...our job is to keep the people out of the hospital. So, if you base your criteria on training your doctors in terms of the beds, it doesn't work...it's...very dogmatic...' Health worker 03

This clinician believed that refocusing the services to include more outpatient, primary care services including dietary advice to those at risk of diabetes (with HBGLs) or their diabetes getting worse, would bring needed changes to the existing reactive system. This would also allow patients to manage their condition more effectively and reduce the likelihood that they would need emergency or serious treatment in hospital. Other health workers also called for units dedicated to primary care and a shift to the chronic care model. These findings corroborate research into the Nepalese health system which found that the primary care system in Kathmandu does not currently address ways of preventing diabetes or getting worse, and most health management is performed by a handful of specialists at the central level and in tertiary centres (Vaidya et al., 2010b).

5.3.1.2 Lack of investment in the workforce

Health workers told us of a lack of investment by policymakers in the workforce. There was a belief among the majority of health workers that the government did not staff public health care facilities adequately. This included providing inadequate numbers of dieticians to provide nutritional advice:

'This is an almost six-hundred bedded hospital and according to the protocol we should have at least six to seven dieticians, but we have only two.' Health worker 02

Though I cannot corroborate this statement, there was a clear perception that there was an inadequate number of dieticians for the number of patients. Several health workers also stated that they had to do the work of others – for example nurses having to do the work of administrators – meaning they could not focus on their nursing role. One health worker (clinician) had taken part in a fellowship scheme which involved visiting a hospital in India and learning from good practice there. She states that this fellowship had been highly beneficial to her practice. Other work on the Nepal health system has stressed the importance of investing in the health workforce to ensure health services are delivered effectively and can meet demand. For example Dogar et al. (2016) found that training healthcare professionals, possibly with incentives, was important. They found that for better implementation of interventions it is necessary to build capacity of health workers and provide proper mentoring and guidance.

5.3.1.3 Low staff motivation levels

Several health workers interviewed stated that they felt undervalued, overworked and therefore under-motivated to provide the best services. This was due, in some cases, to challenging working conditions. One healthcare worker in an urban community centre was the

only worker left to run the clinic: she said that her only other colleague had recently left, and she was unable to take holiday or time off because if she did the clinic could not be opened:

*'Interviewer: Will you try to find someone else to take your place?
Respondent: No. They will not send anyone even if I am on leave. There is no staff in the municipality. We cannot even take sick leave. We just get leave for a month per year which we cannot even take it due to lack of staff... We have so many challenges. No medicines, no manpower.'* Health worker 05

Lack of resources contributed to absenteeism and other issues as highlighted by this health worker. These issues contributed to low staff motivation levels. Subsequently, there was a need to improve staff motivation levels, and this was connected with resourcing of community health clinics, and as explored, improved investment in the workforce.

5.3.1.4 Inadequate medical school training

Health workers, researchers and policymakers stated that there was a need to improve the teaching and support given to medical students about dietary education and increase the number of programmes for training nutritionists. Medical students and new residents were not being supervised enough, which led to further problems with the provision of dietary advice to people with diabetes/HBGLs:

'Medical students are not supervised enough and I tell that in every forum...I almost like beg and cry...because patients will be like not getting proper care... and advice on how to improve their lifestyles [including healthy eating advice] to prevent their conditions from getting worse [if students are not supervised sufficiently].' Healthworker 03

Health workers stated that without proper training, medical students would not be able to give adequate lifestyle advice, specifically dietary advice, to those at risk of or with diabetes once they were qualified doctors. A policymaker from the Ministry of Health was aware of the need to improve medical training, but stated the ministry needed more resource and money from central government to invest in programmes to improve medical training. There have been attempts to improve medical training which have not necessarily involved increasing resources, for example posting medical students in district hospitals to learn from placements to encourage learning of a wide range of skills (Magar and Subba, 2012). The need is clearly urgent as recent calls to improve training in Nepal illustrate (Adhikari and Mishra, 2016). This is particularly the case in private medical training colleges (Huntington et al., 2012). In 2014 and 2018 a leading Nepali doctor, Govinda KC, went on hunger strikes calling for the end to 'fake doctors' and medical colleges which do not regulate the training of young professionals (Sapkota, 2015). More specifically, a recent review of global approaches to type 2 diabetes emphasises the need to improve nutrition counselling globally and invest more in medical education to train medical students and physicians in lifestyle interventions, including incorporating nutrition education in medical curricula (Forouhi et al., 2018). There have been recent calls to improve medical training in LMICs to tackle the causes of NCDs (Collins et al., 2019). Evidently, there are significant political issues in Nepal surrounding the training of health professionals in giving adequate dietary advice which affect the supply of dietary support to diabetes/HBGLs patients. Issues such as inadequate medical training could also be transferable to HIC settings (Dietz et al., 2015) and this means that such findings could lead to suggestions for both HIC and LMIC contexts if tested for applicability.

5.3.1.5 Lack of trust of health professionals

Issues emerged from the data relating to trust in health professionals. Some doctors interviewed advocated and championed dieticians, but other doctors did not know what dieticians did and would not draw on the expertise of dieticians to help support patients:

'Most of patients don't know who a dietician is. This is the condition of our country, so the doctors have to make patients aware of us ... they should make patients visit a dietician to find out what to eat and what not to eat.' Health worker 06

Doctors who did not refer their patients to dieticians believed that dieticians were less reliable sources of information than clinicians. A related issue was that patients also told us that they held the reputation of doctors (not dieticians) highly and very much respected the profession. The majority of patients interviewed only wanted to visit a doctor with a renowned reputation who they could trust. When asked about this, doctors stated that this factor meant that more experienced and well-known doctors were overloaded:

'I have my own setback because people are hell-bent on seeing only me and it makes it difficult. So, one part of me is to train, another part of me is to highlight that we have three endocrinologists over here and everybody is the same. We follow the guidelines; we do the same thing. You can see any doctor...I'm stretched and that compromises my quality.' Health worker 04

Renowned doctors were overwhelmed with patients, though they usually offered the same support as less well-known doctors or sometimes, in the case of nutrition support, as dieticians, who were less respected and trusted than doctors. This indicates socio-cultural factors around trust, together with organisational mechanisms dictating referral processes in health facilities, which influence the uptake of support, including dietary support, by people with diabetes/HBGLs.

5.3.1.6 Inadequate facilities and equipment

A further issue relating to the supply of interventions to improve dietary support was concerns about inadequate facilities and equipment. Both groups of patients and health workers raised these concerns. This problem seemed far more acute in public hospitals than in private ones:

'Dieticians in the counselling room are inundated with patients crowded into the room and waiting outside to enter to receive dietary advice. There are only two dieticians - too few to see all of the patients who need help. The room is cramped, basically equipped and uncomfortable with no windows or air conditioning, only a small fan in the corner.' Field observation by lead researcher, diabetes counselling room, public hospital, May 2017

This observation illustrates that in this public hospital dietary counselling was given in limited facilities by overstretched dieticians. Other observations from public hospitals showed corridors full of waiting patients who would often squeeze into a doctor's room to try and overhear medical advice being given to fellow diabetes patients. Furthermore, there was an issue with the inadequate reporting to policymakers about how existing services were functioning. One clinician stated that policymakers only considered figures relating to quotas, i.e. sessions provided for diabetes outpatient care related to targets. However, in reality, these sessions were not sufficient to meet demand in public health facilities and many people in need of diabetes outpatient care could not be seen in the provided sessions due to overcrowding. The health

worker interviewed stated that this reality was not being reported to policymakers, leading to a distorted reality being provided to policymakers about the adequacy of facilities and resources to support patients with diabetes and HBGLs.

5.3.2 Demand for interventions

5.3.2.1 Reluctance to take up dietary support or participate in activities to manage their condition/prevent it getting worse

Several themes emerged from the data relating to the demand for interventions to support people with diabetes or HBGLs. First, there was a reluctance amongst people with diabetes or HBGLs to take up dietary support or take part in activities to manage their condition or prevent it getting worse after their diagnosis. There appeared to be underlying socio-cultural reasons for this reluctance. The determinants of dietary behaviour of people with diabetes/HBGLs revealed the complexity and entrenched nature of cultural beliefs in Kathmandu. I discuss these social and cultural beliefs in detail in Chapter 4. My findings indicate the importance of not just an ethnic but also a regional understanding of the influence of different dietary traditions in different ethnic groups. These traditions often led to patients not wanting to participate in activities to manage their condition or to prevent it getting worse. My findings are consistent with other research which suggests that culturally-defined eating patterns affected behaviours (Sudo et al., 2009) and specifically in Kathmandu (Caperon et al., 2019) finding socio-cultural context to be important [see Chapter 4]. Evidently, my data revealed great diversity in terms of eating patterns. These need to be well understood and interventions adapted to them in a socio-culturally sensitive way.

5.3.2.2 Need for improved follow-up

Health workers, patients and policymakers discussed the need for improvements to the follow-up process, that is, the process which involves patients returning to health facilities to seek follow-up treatment after a consultation or diagnosis. The majority of patients interviewed reported that they did not follow up on their medical treatment. Often this was due to time or financial constraints (many had to travel long distances to health care centres). Additionally, most health facilities, public and private, did not provide follow-up. Record-keeping was sporadic and largely on paper, and therefore there was no communication from the health setting to remind the patient that follow-up was due and important. However, in addition to practical reasons, a more subtle socio-cultural reason emerged for patient's reluctance to follow up; some patients believed that it was not important, or it was inconvenient for them to return to health facilities for further treatment. Furthermore, some medical professionals interviewed placed little emphasis on the importance of follow-up. This could have been influenced by limited resources in health facilities which meant that health workers prioritised new patients rather than following up patients they had already treated:

'I feel bad of blocking new patients because some of them come from far flung areas with some hope and I don't want to do that...so, that means older [previously seen] patients don't get appointments and they fall through the cracks.' Health worker 03

Evidently, a steady number of new patients from areas outside Kathmandu took priority for this clinician over following up patients who had already received some care. The lack of electronic systems also made follow-up difficult. News reports and research have advocated the introduction of electronic medical record management systems in Nepal which could improve

follow-up (Mishra et al., 2009, Raut et al., 2017, Watkinson-Powell and Lee, 2012, Dhungel, 2017, Raut and Chand, 2017).

5.3.2.3 Need for investment in community programmes

The final theme which emerged relating to the demand for interventions was an apparent lack of investment in community programmes despite demand for them from patients and health workers. Some patients and health workers had been involved in community programmes which had been popular in past health promotion activities such as promoting blood glucose testing and nutrition education. This presented a type of intervention which involved active and popular community engagement and was seen as more enjoyable and less formal than attending follow-up in health facilities, making it a valuable mechanism for the potential promotion of dietary support. My research found that government funding for such community programmes was very hard to find:

'The management of health facilities and patients want us to run these activities [in the community], free check-up and these things, but we do not have funding for them. That is a problem. The main problem is funding here...it's very difficult to find funding especially for diabetes.' Health worker 01

Despite the lack of funding for community programmes, potential did exist to use active mechanisms to engage the community in health promotion activities; community events had been run sporadically by health workers from public and private health facilities. Additionally, one health worker discussed the potential of community mobilisers who had been used effectively in the Kathmandu valley to disseminate health messages. Both community mobilisers and FCHVs have been found to be a valuable resource in communities (Cunningham et al., 2016b, Hua, 2015, Schwarz et al., 2014). Such key community connectors could offer a potential mechanism by which to engage the community in dietary education programmes.

5.3.3 Presenting a new framework for understanding the supply of and demand for interventions

I have used my findings to propose a new framework for understanding the supply of and demand for dietary interventions for people with HBGLs or diabetes in Nepal. My new framework is displayed in Figure 9.

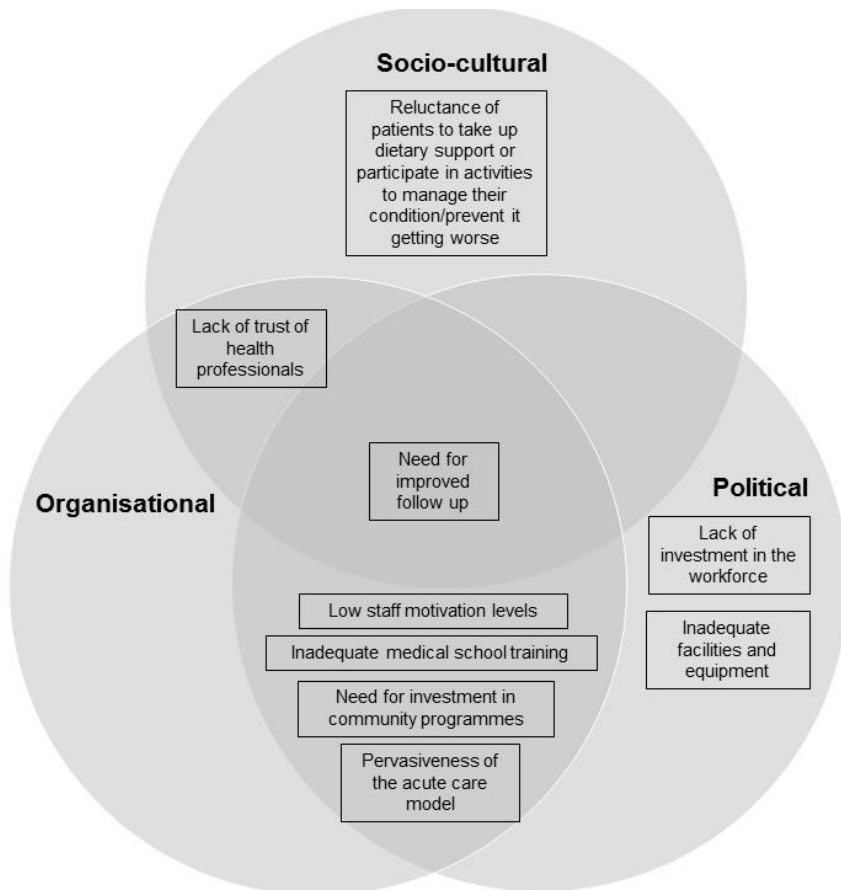


Figure 9: Framework showing factors influencing the supply of and demand for interventions to support people with HBGLs/diabetes in Nepal

The three contexts I have chosen have been derived from my analysis and inspired by conceptual tools highlighted in the literature (e.g. (Sheikh et al., 2011)). In addition to Sheikh et al. (2011) other formations of health systems have also drawn on complex and dynamic relationships between different parts of the health system (deSavigny and Adam, 2009, Frenk, 1994). deSavigny and Adam (2009) focus on health systems as social systems, and their thinking has been built upon further by Olmen et al. (2010)'s conceptualisation of health systems based on values and principles. These alternative formulations further support my conceptualisation of three contexts, and within each context hardware as well as software aspects relating to values and power relationships. I have therefore drawn widely on the literature (see below for further literature relating to each context in the framework) to create a conceptual framework which has been informed by my data. Figure 9 categorizes the three contexts discussed above into often overlapping areas, however I begin by addressing the contexts separately.

5.3.3.1 Political context

Firstly, I define *political context* made up of political spaces which define and dictate behaviours often involving policymaker decision-making. This includes hardware aspects (e.g. investments in health workforce) and software aspects which include the power, norms and values which guide actions and underpin the relationships among policymakers (e.g. value placed on investing in inadequate facilities and equipment). My conceptualisation of the political context in my framework in this chapter provides a direct link to my ecological model from Chapter 4, specifically the 'political environment/context' in my ecological model. An investigation of the

factors influencing the supply of and demand for interventions in this chapter represents an in-depth exploration of the political environment/context from my ecological model.

5.3.3.2 Organisational context

Secondly, I define an *organisational context* which dictates the functioning of an organisation, for example a health facility such as a hospital. This includes software aspects such as 'norms' in an organisation. Such norms can involve a lack of support for employees which can lead to low staff motivation levels. Organisational contexts (Carrada Bravo, 2002a, Carrada Bravo, 2002b, Davies et al., 2000) and political contexts (Atkinson, 2002, Atkinson et al., 2000) have been considered separately in the literature in relation to health systems. There are notable overlaps between organisation and political contexts in Nepal, for example the department of health services which includes factors relating to both political (government/policy run) and organisational (relating directly to health facilities) contexts. Some previous research has considered political and organisational factors influencing service delivery together (Gilson, 2003). This overlap occurs in some of the themes I discuss, for example organisational/political responsibilities for increasing community investment in section 5.3.4.1.

5.3.3.3 Socio-cultural context

Finally, I define a *socio-cultural context*, which shares my definition of socio-cultural context from Chapter 4. That is: socio-cultural context draws on elements of the socio-cultural psychological approach (Vygotsky, 1980). This approach emphasises that cultural factors such as language, art and shared practices/traditions (e.g. fasting/feasting) can play a significant role in the development of cognitive abilities and defining behaviours. I draw on this approach to consider factors such as social norms (informal understandings that govern the behaviour of members of society (Scott and Marshall, 2009)) and social structures (e.g. family, communities) as playing an important role in behaviours. Socio-cultural context incorporates social factors (social relationships, social support) with cultural aspects (traditions, ethnicity, religion, shared practices) to reflect values, norms, customs, influences and traditions. These factors often link to intersectionality as an influence on individual behaviour. Conceptualising socio-cultural context in this chapter provides a direct link to the findings from Chapter 4 and my ecological model which conceptualised the importance of socio-cultural context in influencing dietary behaviour. In this chapter, my findings extend a recognition of the importance of socio-cultural context to find it also important in affecting the supply of and demand for interventions to improve dietary support for people with HBGLs/diabetes. Supporting my categorisation of socio-cultural context in relation to factors influencing the supply of and demand for interventions is literature which has found that socio-cultural factors have been shown to influence people's health-related choices (Cislaghi and Heise, 2018, Ashing-Giwa, 1999, Holroyd et al., 2004, Renzaho, 2004, Caperchione et al., 2011, Gibson et al., 2005, Chibwana et al., 2009). Furthermore, cultural factors have been shown to be an integrated part of the internal functioning of a health system (Pinto and Najar, 2011, Wu et al., 2017) including in Nepal (Harris et al., 2013).

5.3.3.4 Incorporating hardware and software aspects in my framework of influential contexts

As discussed, Sheikh et al. (2011) conceptualise health systems considering the overarching influence of political and social contexts and, within these, hardware and software aspects. I indicate in Figure 10 how each of the contexts in my framework (socio-cultural, political and organisational) draw on the work of Sheikh et al. (2011) to include consideration of hardware and software concepts within them. My conceptualisation of socio-cultural context particularly

allows for the exploration of software aspects such as social norms and socio-cultural values around food consumption. However, software features in all three contexts; political, organisational and socio-cultural. As suggested by Sheikh et al. (2011), software elements together with hardware elements are important in meeting the underlying resource requirements of a health system. My findings serve to further support the emerging recognition that health systems are human creations which are enveloped in social and political realities that are strongly influenced by socio-cultural ways of framing issues and finding solutions (Sheikh et al., 2011, Lambert, 2006). For example, section 5.3.4.2 addresses socio-cultural aspects connected to follow-up such as reluctance to follow up dietary advice/support due to a socio-cultural norm dictating a lack of value that is placed on follow-up. Further examples of the ways health systems are strongly included by socio-cultural ways of framing issues are discussed in sections 5.3.4.3 and 5.3.4.5.

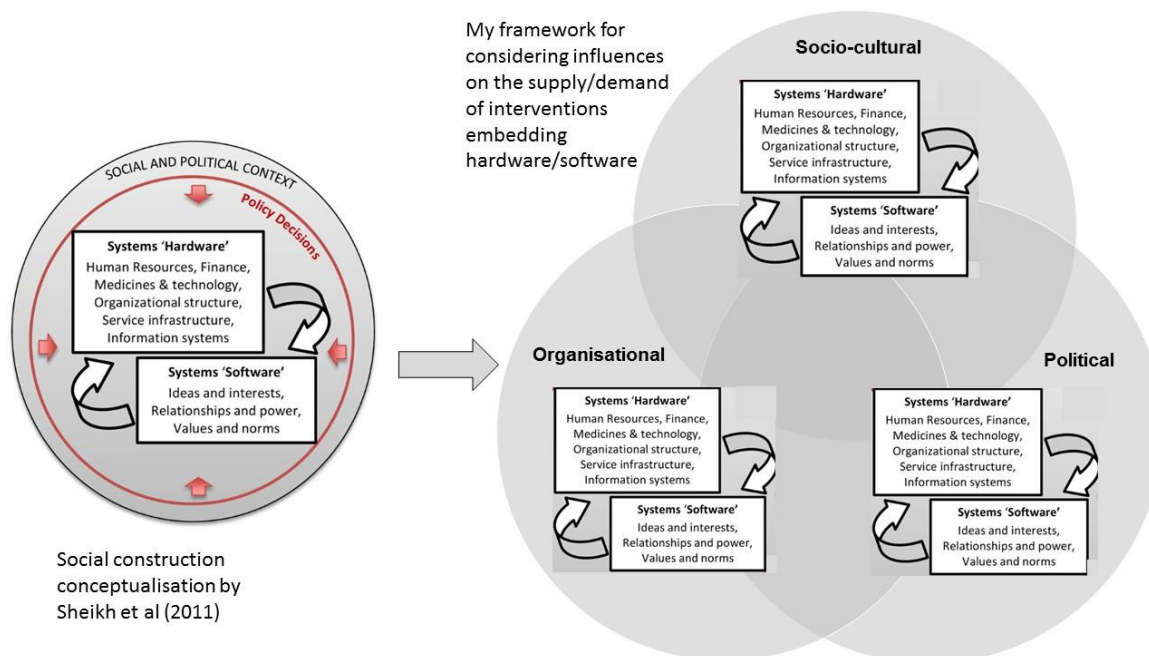


Figure 10: Including hardware and software elements for consideration in my framework conceptualising the influences on the supply/demand of interventions

5.3.4 Presenting potential solutions to issues of supply and demand for support for patients with diabetes/HBGLs

My new framework [Figure 9] can be used to develop and group the issues which emerged from the data. I've categorised the issues in my framework in relation to the three contexts in my model in Figure 9 (organisational, political and socio-cultural). I now organise the issues which emerged from my thematic analysis of the data into the new framework and discuss potential solutions to address them. Many of the potential solutions I present offer a multi-faceted approach and span several of the three contexts in my model.

5.3.4.1 Potential solutions relating to issue in the organisational and political contexts

Several themes overlapped the organisational and political contexts. First, tackling *low staff motivation* fell within the organisational and political context because of a norm that staff are not invested in at organisational level and an accompanying lack of interest to invest in staff by policymakers (see section 5.3.1.2). This issue requires more support for health workers in health facilities which involves strengthening structures within organisations so that health workers

can undertake professional development programmes, fellowships and secondments for skill-sharing between institutions to improve their skills and then be provided with time to implement these under the mentoring or supervision of senior employees. Policymaker support is needed to invest in these improvement measures. One health worker interviewed had taken part in a fellowship and found it highly beneficial for her career and for her team, leading to greater motivation and engagement in her role (see section 5.3.1.2). Furthermore, career development and opportunities for continuing education were found by a review to be important in improving staff motivation in low income settings (Willis-Shattuck et al., 2008). Changes in the structure and delivery of staff development in organisations could allow health workers to develop skills to work more efficiently (e.g. with fellowship programmes or mentoring/supervision schemes), and build confidence and satisfaction in their work, leading to higher motivation and feelings of support. This could also lead to improved service delivery for people with diabetes or HBGLs, better job satisfaction, and fewer well-qualified professionals in Nepal seeking work overseas (Huntington et al., 2012).

Second, there was *inadequate medical school training* which fell into the political context because it involved a lack of interest placed by policymakers on training medical professionals to deliver a high standard of dietary advice to patients (see 5.3.1.4). The issue also fell into the organisational context as it involved a lack of value in organisations placed on ensuring a high standard of medical education is delivered which includes training on giving dietary advice. A potential solution to this is to improve teaching skills in organisations to ensure adequate dietary education is taught, as well as to rearrange the curriculum to educate the educators about the importance of delivering dietary support to patients. This should be accompanied by the demonstration of the value and importance of investing in dietary support in medical education by providing evidence from organisations (including from outside Nepal if none yet exist inside the country) which offer high standards of dietary support as part of medical training. Research has shown the importance of high educational standards for medical training in low income countries (Celletti et al., 2011). Furthermore, recent reviews of global approaches to type 2 diabetes emphasise the need to improve nutrition counselling globally and invest more in medical education to train medical students and physicians in lifestyle interventions, including incorporating nutrition education in medical curricula (Forouhi et al., 2018). Improved medical education could lead to new professionals in Nepal being taught how to effectively disseminate excellent dietary advice for those people with or at risk of diabetes/HBGLs. Such improvements would join the global calls for improvements to medical education to tackle NCDs (Collins et al., 2019).

Third, the *pervasiveness of the acute care model* and a *need for investment in community programmes* were issues within the political context because there was a lack of funding available from policymakers for community programmes which could embed dietary support within communities (see section 5.3.2.3). Pervasiveness of the acute care model and a lack of investment in community programmes were also issues within the organisational context due to a norm of only using health facilities for health care and not using community health clinics to their full potential to deliver health advice (see section 5.3.2.3). These issues could be tackled by developing political support for, and investment in, community healthcare which focuses on preventing, managing and controlling symptoms with improved lifestyle, especially healthy dietary advice. This could be promoted by re-motivating the health system to focus resource and attention on community and preventative healthcare and re-emphasising the work of, and better funding, community health clinics. Simultaneously, health workers from tertiary health facilities could be encouraged to take part in regular awareness-raising activities in community health clinics. These clinics could then act as a base from which to deliver educational activities

to the community on dietary behaviour and ways to prevent and manage diabetes. This investment and attention placed on community health clinics should encourage community members (especially those at risk of or with diabetes/HBGLs), health workers and policymakers to place more effort and emphasis on community-centred activities. Piloting of community based projects should take place. If successful, this evidence could be used to persuade policymakers to invest in larger-scale community based projects. Re-emphasising the value of services to increase value in that particular service has been successfully demonstrated in the UK where funding was increased in primary care to encourage doctors to work as GPs (Campbell, 2015). Skills in running community programmes should be developed. Such skills have been demonstrated on a small-scale in Kathmandu (Oli et al., 2015b). Furthermore, a habit should be developed amongst policymakers and health facilities/organisations of using community mobilisers and FCHVs in community engagement projects to promote healthy dietary behaviour. Research corroborates my suggestion, showing that FCHVs are a valuable resource for engaging communities in healthcare (Cunningham et al., 2016b, Hua, 2015, Schwarz et al., 2014).

5.3.4.2 Potential solutions relating to issues in the organisational, political and socio-cultural contexts

The *need for improved follow-up* spanned all three contexts in my framework. In the political context there was an acknowledgement from policymakers of the need for improvements in follow-up systems which would improve sustained support for diabetes/HBGLs (see 5.3.2.2). One solution to tackle this issue within the political context would be to pilot new systems for improving follow-up and if these are successful and can be shown to be cost-effective, subsequently encourage policymakers to take more interest in evidence-based approaches to improving the follow-up system in Nepal (e.g. with electronic records management). Inadequate follow-up is also an issue in the organisational context as there is a lack of capacity in organisations to ensure follow-up which has created a norm that follow-up is not prioritised in many organisations (see 5.3.2.2). A potential solution to this is that organisations get involved with pilots of follow-up systems to trial how they would work. Technological solutions to improve follow-up (e.g. electronic management systems) have shown great promise in low income countries (Blaya et al., 2010). If pilots of such technologies are successful in Nepal, organisations can then present evidence to policymakers that such systems are effective, can operate effectively within healthcare facilities and should receive government investment to be scaled-up. These pilots would require financing which could be challenging in a low income context (see limitations 6.5). However, the importance of these pilots to long term service delivery and improvements should be stressed to policymakers and potential funders. Organisations should also undertake socio-culturally appropriate health promotion activities within and outside facilities to promote the importance of follow-up for diabetes. This is because follow-up was a socio-cultural issue as well because of the social norm which placed little value on following up medical treatment (see 5.3.2.2). One way to address this would be to embed knowledge of social norms in health promotion campaigns run by organisations/health facilities which promote the importance of regular follow-up care for diseases such as diabetes and HBGLs to maintain treatment and prevent the condition from getting worse. The work of health workers in the community to promote follow-up care has been shown to be effective in other settings to monitor NCDs (Brownstein et al., 2007).

5.3.4.3 Potential solutions relating to issues in the organisational and socio-cultural contexts

A factor within the organisational and socio-cultural contexts which affected supply of interventions was *lack of trust of health professionals*. Within the organisational context doctors were choosing not to refer their patients to dieticians due to, according to dieticians and health

workers, a lack of awareness of their work and a lack of value placed on their work (see 5.3.1.5). To tackle this, mechanisms need to be built within organisations to ensure doctors refer patients to dieticians, fostering trust between both professions. This could be done by encouraging the use of multi-disciplinary teams. Such mechanisms were advocated by one clinician who stated that she was over-worked and referring patients to dieticians would be an effective demonstration of multi-disciplinary teamwork in action, which, through delegation of work, could help to reduce workload on overloaded clinicians. Multi-disciplinary teams have been shown to be effective in NCD care in Nepal in recent years (World Health Organisation, 2018). Lack of trust of lesser known health professionals was also a problem in the socio-cultural context, as the social norm of only visiting well-respected or renowned doctors for treatment meant few people wanted to seek advice from lesser known doctors or dieticians (see 5.3.1.5). To address this issue, knowledge and awareness of the value of dieticians should be developed within health facilities and at a community level through, for example, awareness events involving dieticians offering free dietary advice in communities. One dietician we interviewed stated that she had started to get involved with community awareness events and as word spread of her value, more people had come to ask her for advice. This indicates the potential for this type of solution to work in communities. Such community initiatives to engage dieticians have been successful in other LMICs in the context of diabetes (Liu et al., 2013).

5.3.4.4 Potential solutions relating to issues in the political context

In the political context, *inadequate facilities and equipment* for the delivery of dietary support were not being reported to policymakers (see 5.3.1.6). My findings are corroborated by other research which found many challenges within the political system in Nepal which negatively affected health (Harris et al., 2013). A possible solution to this issue would be for health workers to present evidence to policymakers about the inadequate facilities (e.g. cramped counselling rooms for delivering dietary support) and the impact not having adequate facilities has on service provision. This has potential to be effective because health workers have been shown by other research to be effective affecters of policy-change (Balcazar et al., 2011). This evidence should urge policymakers to provide improved facilities and infrastructure.

Additionally, within the political context there was a *lack of investment in the workforce* due to a lack of value placed on investing in and developing the workforce by policymakers (see 5.3.1.2). This had contributed to there being an inadequate number of dieticians to provide sufficient dietary advice for people with HBGLs/diabetes. This issue could be tackled by piloting programmes to train new dieticians from scratch. If shown to be effective, policymakers should be encouraged to invest in larger scale, national training programmes. This approach should be accompanied by improving working conditions for health workers. This would include ensuring the implementation of formal time-off entitlements. This is particularly important because one community health worker interviewed was not receiving sufficient leave entitlement and this negatively affected her morale and led to her feeling overworked.

5.3.4.5 Potential solutions relating to issues in the socio-cultural context

Finally, I have categorised the issue of a *reluctance of patients to take up dietary support or participate in activities to manage their condition/prevent it getting worse* into the socio-cultural context. Socio-cultural norms and values, including intersecting factors such as ethnicity and gender (see Chapter 4) influenced patients' uptake of dietary support (see 5.3.2.1). Potential solutions to address this involve harnessing accepted and respected leaders and figures in communities in Kathmandu to deliver health promotion messages. Interventions should be ethnically, religiously and culturally acceptable to the local population (using ethnically

appropriate food in a healthier way, e.g. by cooking with less oil) and consider intersectionality and gender-transformative approaches. Using culturally acceptable leaders in health promotion has been demonstrated successfully in other contexts with religious leaders (Campbell et al., 2007, Jane et al., 2002, Mehta and Pramanik, 2010, Ruijs et al., 2013, Sewankambo and Mafigiri, 2017, Webb et al., 2013) and specifically to prevent diabetes (Rivera-Hernandez, 2015). However, cultural leaders can also include 'celebrities' or socially respected figures including, for example, TV personalities. Strategies to improve social behaviours through community activities have been demonstrated in other research and shown to be effective in Nepal (Acharya and Zafarullah, 2017, Asian Disaster Preparedness Center, 2002, UNFPA, 2015). Cultural adaptation of social norms and socio-cultural factors has previously been demonstrated in LMIC contexts (Meegan et al., 2001). This was further explored in Chapter 4 in the context of my ecological model and potential interventions the model indicates may be feasible to improve dietary behaviour. Other research from low income country contexts found that behaviours influenced by the socio-cultural context have been associated with a lack of health uptake and suggestions have been made for culturally appropriate methods to reduce socio-culturally constructed barriers to service uptake (Mutya et al., 2007, Birhanu et al., 2012, Holroyd et al., 2004, Mumtaz and Salway, 2007, Dako-Gyeke et al., 2013). In Uganda, cultural solutions were proposed to tackle the socio-culturally influenced reluctance to take up cervical cancer screening. It was suggested that using culturally accepted and respected Sengas, or paternal aunts, in screening promotion better engaged men in the community and therefore improved uptake of cervical cancer screening. My proposed solutions follow similar lines by using culturally accepted methods to encourage improved health service uptake.

5.3.5 Conclusion

I have considered the existing supply of and demand for interventions to improve support, specifically to improve dietary behaviour, amongst people with diabetes/HBGLs in Nepal. I used data from a range of stakeholders to propose a new framework for understanding the supply of and demand for support for diabetes/HBGLs. This framework has allowed for the better understanding of how key contexts (political, organisational and socio-cultural) intersect and incorporate both hardware and software aspects. I have advanced current research in this area by using my new framework to make suggestions for potential solutions within and sometimes intersecting three contexts. This research therefore begins a process of better understanding of the social and political influences in health systems, as highlighted as important by Sheikh et al. (2011). Whilst valuing the continuing importance of 'hardware' in resourcing health systems, I add to the body of evidence with findings that indicate the importance of considering 'software' elements which were apparent in political, organisational and socio-cultural contexts. Many of the socio-culturally influenced factors were reflective of values and norms (e.g. socio-cultural lack of value placed on take up of activities to limit the impact of diabetes/HBGLs). My findings further confirm that health systems are inseparable from social and political realities and are strongly influenced by socio-cultural ways of framing issues and finding solutions. My framework has potential applicability to other health contexts such as HICs and should be tested to see if all elements are transferable.

Chapter 6 Consolidation of Study 2 findings: proposing an adapted behaviour change wheel and reflections

6.1 Interpretation of results and implications

In Part 2, I have explored determinants of dietary behaviour (Chapter 4) and I have investigated factors influencing the supply of and demand for dietary support (Chapter 5). In doing so I identified and developed theory by providing a) a socio-ecological model for understanding the determinants of dietary behaviour and b) a new framework for considering the contexts which influence the provision of diabetes support. My findings also suggest that some of the aspects of the theoretical frameworks of behaviour change which I have used throughout the thesis, such as the behaviour change wheel, require modification. I consider these aspects in the following chapter.

6.2 Consolidating my findings and contributions from Chapters 4 and 5

In this chapter I use my findings from Chapter 4 and Chapter 5 to propose an adaptation to the behaviour change wheel (Michie et al., 2014). This adaptation is to be used when developing behavioural interventions to ensure that socio-cultural context [SCC] is embedded in intervention design and development. This is necessary because my research has so far found that socio-cultural context is important in determining behaviours and is also influential in affecting the supply of and demand for interventions. Incorporating socio-cultural context in intervention design makes intervention and policy design more appropriate to context and therefore more likely to be feasible.

My findings so far are complementary; the political environment from my ecological model corresponds directly with my discussion in Chapter 5 about factors which influence the supply of and demand for interventions to improve dietary support. Various visual representations can be used to attempt to link my ecological model from Chapter 4 and framework of influential contexts from Chapter 5. My representation in Figure 11 shows the connections between key environments to illustrate my joined-up approach. Discussions in Chapter 5 around factors influencing the supply of and demand for interventions necessarily required a 'zoomed in' and in-depth analysis of the political environment in my ecological model. However, as advocated by my multi-faceted and multi-layer approach in ecological modelling, within the in-depth analysis of the political environment it was important to conceptualise socio-cultural influences. This represents a clear link between the socio-cultural context sphere influencing all other environments in my ecological model, and the presence of socio-cultural context in my framework of the factors affecting the supply and demand of interventions.

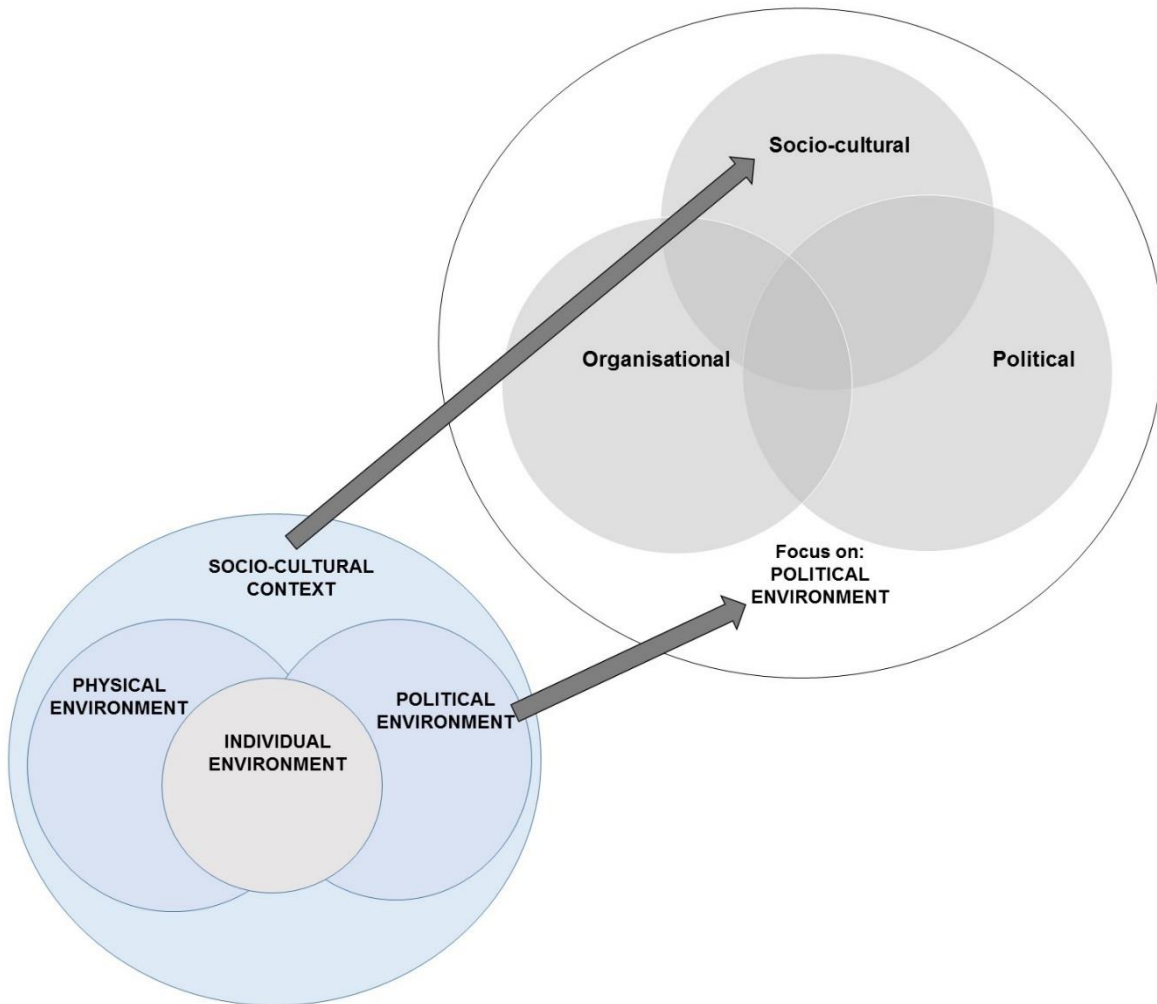


Figure 11: Fitting supply and demand framework [Chapter 5] with the socio-ecological model [Chapter 4]

Building on these conceptualisations of intersecting environments in which SCC plays a vital and reoccurring part, I develop in this chapter a new model of the behaviour change wheel which incorporates SCC. This model will aid intervention development; the focus of Part 3 of my thesis.

6.3 Presenting an adapted behaviour change wheel [BCW-SCC]

The behaviour change wheel [BCW] represents a method for characterising and designing behaviour change interventions (Michie et al., 2014, Michie et al., 2011). It characterises a behaviour system at the centre which considers individual opportunities, capabilities and motivations for behaviour [COM-B]. This is encircled by intervention functions and then by policy categories. I used the BCW to structure my interview guides for Study 2 and inform my research because the wheel was designed to lead to more efficient design of feasible interventions and this research aims to develop a feasible intervention for improving dietary behaviour.

When trying to apply my findings to the BCW, I found that there were findings from my investigation of dietary determinants which the factors in the wheel could not account for. There were aspects of COM-B, for example, which were determined by SCC, such as pressures to eat unhealthy culturally acceptable food during festival times and obligations on women to cook

food for the whole household which was culturally acceptable and often unhealthy (meals prepared with large amounts of oil or salt).

Similarly, when investigating the supply of and demand for interventions, I found the BCW inadequate in covering all aspects of my findings. I found that SCC, in addition to political and organisational context affected the supply and demand of interventions in the political environment. Examples of this include how SCC directly affected the uptake of dietary support. The BCW as defined by Michie et al. (2011) does not look at how SCC influences service provision. This led me to develop a BCW model (shown in Figure 12) which would better account for my findings.

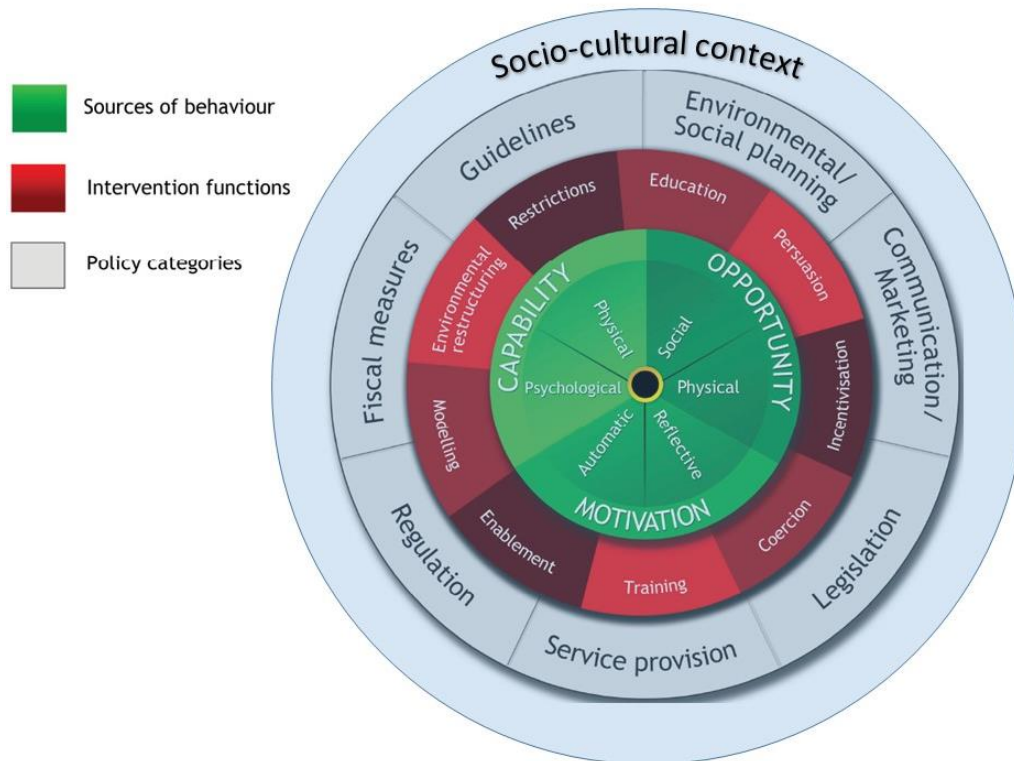


Figure 12: Socio-cultural context added to the behaviour change wheel

To develop a new BCW which better fits my findings I took my definition of SCC (defined in Chapter 4) which incorporates social factors (social relationships, norms) with cultural aspects (ethnicity, religion) to reflect society's values, customs, influences and traditions, and placed it on the outer ring of the BCW. Socio-cultural aspects such as ethnicity and gender intersect (see findings Chapter 4) which means considering such aspects holistically. Including SCC and intersectionality can more accurately inform intervention design. My addition of SCC on an outer ring forms a new behaviour change model BCW-SCC [Figure 12]. This addition to the BCW means that all interventions should incorporate understanding of SCC into their design and policy development. SCC should also then be considered in what motivates behaviour and provides capabilities and opportunities to perform it. Other research supports my new model's incorporation of socio-cultural factors which have been found to influence people's health related choices (Cislaghi and Heise, 2018, Ashing-Giwa, 1999, Holroyd et al., 2004, Renzaho, 2004, Caperchione et al., 2011, Gibson et al., 2005, Chibwana et al., 2009).

As explored in Chapter 4, adding SCC to intervention design is not without challenges. My findings have shown a tension between an approach incorporating SCC, which I advocate in BCW-SCC and traditional cultural practices and beliefs (e.g. a woman honouring her husband in Teej by fasting). There is complexity around ensuring SCC sensitivity whilst at the same time making changes to enhance equity (e.g. gender equity). However, SCC approaches should be taken in combination with gender-transformative approaches which enable and strengthen the position of women. To support this, participatory methods should be used to elicit conversations between both genders about approaches which would enable and strengthen women whilst also respecting SCC traditions and recognising that SCC can also adapt and change. Such participatory methods could include participatory action research which takes a gendered and intersectional approach, for example, training facilitators on dialogue between genders, age-groups and ethnicities, comparing social, ethnic and gender norms/practices around dietary behaviour, sharing knowledge on diabetes and discussing what needs to be changed for dietary behaviour to improve. Groups could use drawings, statements and proverbs to explore the relationship different people have with food (similar to participatory methods used in Study 2 which elicited valuable intersectional data). Such approaches have been used in LMICs previously in relation to key health issues such as maternal health (Research in Gender and Ethics, 2016). Ideally, socio-cultural adaptation involving sensitivity and gender-transformative approaches, will be reconciled. However, where tension arises between the two, careful consideration must be given to respecting cultural traditions whilst also ensuring all genders are empowered and respected.

6.3.1 BCW-SCC as important for low income countries

The original BCW was developed by Michie et al. (2011) in the context of high income, developed and often individualistic societies. To date, it has been applied to low income populations in HICs (Caperchione et al., 2011), to populations with diabetes in HICs (Tomlin and Asimakopoulou, 2014) but it has not, to the best of my knowledge, been applied in LMICs. In one LMIC - Nepal, I have found behaviours to be driven by socio-cultural factors such as cultural expectations, for example dietary behaviours expected during festival times (as demonstrated in my socio-ecological model). This is supported by other research which has found health behaviours in LMICs to be influenced by factors specific to contexts (Peters et al., 2008) and socio-cultural factors (Birhanu et al., 2012, Chibwana et al., 2009, Dako-Gyeke et al., 2013, Holroyd et al., 2004, Mumtaz and Salway, 2007, Mutyaba et al., 2007). This justifies my assertion that BCW-SCC is appropriate for application in LMIC contexts in which community, social and cultural factors are key. BCW-SCC is also applicable to HICs as SCC is important in any country setting. Further investigation of SCC in HICs needs to be conducted to establish to what extent SCC is influential.

6.3.2 The importance of SCC in COM-B

Though Study 2 revealed that BCTs were not explicitly being used to improve dietary behaviour in Kathmandu, Study 1 discovered which BCTs were potentially effective in bringing about dietary change in LMIC contexts like Nepal. Therefore, these BCTs could be incorporated into an intervention design using COM-B as a guide; COM-B was designed to provide a theoretical basis by which effective BCTs could be incorporated into intervention design. However, my results from Study 2 showed that SCC is vital when designing interventions and BCTs cannot be delivered without considering SCC. This appears a shortcoming with COM-B which sits at the centre of the BCW. It focuses on individualised lifestyle, individual responsibility and 'risk' and places the responsibility of lifestyle change in the hands of the individual. COM-B can promote a victim-blaming 'personal failure' mentality and ignore the influence of SCC – elements which my findings have highlighted the importance of. As indicated in the socio-ecological model,

individuals in Kathmandu were influenced by SCC as well as having agency in shaping it themselves. This justifies my decision to place SCC as the overarching influence in my adapted BCW. I now argue for the importance of considering SCC in each of the COM-B components - capability, opportunity and motivation - to allow individuals to be appropriately captivated and engaged with active behaviour change.

6.3.2.1 Capability

Physical capability must be achieved through the development of a physical skill in socio-culturally appropriate interventions, for example, developing healthy cooking skills with culturally appropriate food for the ethnicity and religion of the participants (e.g. Buddhists who are vegetarian). This would be possible in interventions which involve demonstrations of behaviour (a BCT categorised by Michie et al. (2013) and found to be effective in my systematic review in Chapter 1). Similarly, psychological capabilities can be achieved through imparting behavioural skills, such as regular culturally appropriate healthy food consumption, by understanding the importance of social support in communities in Kathmandu in developing behavioural habits and capabilities. A socio-culturally appropriate intervention targeting psychological capabilities would therefore be to engage the whole household in nutrition education about culturally appropriate healthy eating.

6.3.2.2 Opportunity

Physical and social opportunity can be encouraged through environmental change. Physical opportunity can be improved by developing policies and strategies which incentivise or regulate which socio-culturally appropriate products are offered and ensuring these are offered in socio-culturally acceptable places. An example would be to incentivise restaurants, cafes and fast food outlets to offer healthier food including more vegetables and pulses and less fried food. My findings showed that men frequent outside eating spaces, and this is supported by existing research (Liechty, 2005, Liechty, 2010). Socio-culturally acceptable approaches to regulate what is offered in these locations would be an appropriate use of BCW-SCC, for example the regulation of fried food and the encouragement of the sale of healthy food. Social opportunity is defined as the cultural milieu which makes up how we think about things (words and concepts which make up our language). Social opportunity differs from my conceptualisation of SCC because I see SCC as central to all aspects of the BCW which puts a lens on every other aspect of the framework and permeates through all layers. COM-B sees social opportunity as one isolated factor which may or may not be present in any given intervention. I argue that SCC should always be present in interventions. Social opportunity could be provided by encouraging healthy eating with printed materials and verbal nutrition education from health workers which uses appropriate language to gender, ethnicity, religion (e.g. words for healthy food, unhealthy food particularly in relation to festivities and ethnic dietary habits, incentivising dialogue with positive reinforcement and encouragement) to encourage people to make positive dietary change.

6.3.2.3 Motivation

SCC is important for encouraging the reflective motivation of individuals. This type of motivation can be achieved through increasing knowledge and understanding and eliciting positive feelings about dietary behaviour. An example of this would be to teach patients and their families about types of healthy food (e.g. in the form of printed posters or leaflets alongside nutrition education from health workers), which is appropriate to their SCC. This includes considering locally

appropriate healthy foods and an awareness of which healthy foods and cooking methods are deemed culturally appropriate for people of different ethnicities. To elicit reflective motivation, these patients can then be encouraged to keep a record of their positive and healthy dietary changes in food diaries. Automatic motivation is associative learning which can elicit positive feelings or impulses relating to dietary behaviour and can include habit formation or imitative learning. This could be actioned by health workers working with patients to design culturally appropriate action plans which consider locally and culturally appropriate food which suits their ethnic, gender, religious and socio-economic requirements, for example, planning with low income patients how they can afford to cook healthy meals over a week within their weekly budget.

6.3.3 The importance of SCC in intervention function and policy rings of the behaviour change wheel

In their BCW, Michie et al. (2011) acknowledge the importance of other influences on behaviour outside COM-B. The intervention function and policy category layers of Michie et al. (2011)'s BCW are useful in categorising how to select interventions and policies. These layers were designed to help intervention designers to move from a behavioural analysis of a problem to intervention design using the evidence base. I argue that SCC aspects should be considered as essential 'software' components in intervention development and policy decision-making, linking with Sheikh et al. (2011)'s assertion that social and political context is vital in the successful delivery of policy. Table 5 illustrates how consideration of SCC is important in the delivery and dissemination of the intervention function and policy decision rings of the BCW. The suggestions in Table 5 represent illustrations of potential intervention functions and policies that can be socio-culturally adapted or otherwise take SCC into account. These serve to justify my revised BCW and do not necessarily represent solutions which should be implemented in Kathmandu. For potential interventions specific to Kathmandu based on a range of feasibility criteria see Chapter 7 and Chapter 8.

Table 5: Mapping intervention function and policy type to Socio-cultural context

Interventions	Example of how SCC could be incorporated
Intervention functions	
Education: Increasing knowledge or understanding	<p>Providing information to promote healthy eating which is culturally nuanced and relevant to gender, ethnicity, socio-economic group, religion. Regarding gender, men could be provided with tailored nutrition education so that they are more aware of how to support diabetic females in their home. Men could be taught about the healthiest food to buy, according to their ethnicity and affordability of items fitting with their socio-economic status. They can also be taught cooking skills so that they might assist their female partners when they are unable to cook. This is particularly important because men have been found to have less healthy dietary practices than women in Nepal (Shrestha et al., 2013b). My research found that women often carry a burden of caring for others [Chapter 4.2.6]. Daughters-in-law were often tasked with cooking for the entire household, and take the last position in household serving order (Gittelsohn, 1991, Gittelsohn et al., 1997, Ohno et al., 2005, Sudo et al., 2006, Uprety, 2014) with women often eating only once men have finished (Uprety, 2014). In general, women have been found to have worse nutrition than men due to entrenched culturally defined gender roles dictating food allocation (Madjdian). Therefore such interventions incorporating socio-cultural awareness follow examples from wider research which found that culturally-appropriate health education is more effective than 'usual' health education without a cultural element amongst people with type 2 diabetes (Hawthorne et al., 2008, Attridge et al., 2014). I take these suggestions forward in Chapter 7.</p>
Persuasion: Using communication to induce positive or negative feelings or stimulate action	<p>Using printed materials (pamphlets, posters, advice books) [intervention tool] appropriate to socio-cultural context and promoted by religious leaders [intervention delivery strategy] to motivate, increases in healthy eating behaviour. Using religious leaders of influence to persuade using positive motivational materials appropriate to SCC holds great potential to improve behaviour. Religious leaders have successfully promoted health messages in diabetes prevention (Rivera-Hernandez, 2015, World diabetes federation, 2018), amongst Hindu religious figures (Mehta and Pramanik, 2010) and engaging other religious leaders (Campbell et al., 2007, Jane et al., 2002, Ruijs et al., 2013, Sewankambo and Mafigiri, 2017, Webb et al., 2013). Cultural leaders could also include celebrities or respected figures in politics or society. Celebrities have been used successfully in YouTube videos to persuade people to take up a more healthy lifestyle and prevent diabetes (Sanchar, 2015). These videos can be shown repeatedly to persuade participants to improve their dietary behaviour. I take these intervention proposals forward in Chapter 7.</p>

Interventions	Example of how SCC could be incorporated
Intervention functions	
<u>Incentivisation</u> : Creating expectation of reward	Social rewards could be encouraged appropriate to SCC, for example, the incentive of visiting a desired location such as a shopping mall or temple (depending on the SCC of the participant) with a friend or family member as a reward for eating a healthy meal. Some research has shown how the use of culturally adapted incentives can be effective (Ma et al., 2004).
Coercion: Creating expectation of punishment or cost	Introducing a tax to raise the financial cost of unhealthy food to reduce its consumption. This financial cost must be socio-culturally appropriate to those people who it targets, for example, a tax should affect those from high socio-economic backgrounds as well as from low socio-economic backgrounds.
Training: Imparting skills	Teaching people to cook healthier meals through the demonstration of healthy cooking skills. In Kathmandu, these cooking classes would need to teach people how to prepare culturally appropriate food depending on their socio-economic status and ethnicity (Sherpa, Newari, <u>Chhetry</u> and others). An example would be to teach Sherpas, who eat a lot of potatoes, to learn to cook meals with different, healthier carbohydrates such as wholemeal grains, as well as how to cook potatoes in smaller amounts and in a healthier way (less oil and salt). Culturally appropriate cooking classes using ingredients which are affordable for participants have been found to be effective (Abbott et al., 2012). Connected to developing such classes would be the exploration and improvement of local recipes for healthy meals, an activity which is advocated in the multi-sectoral nutrition plan 2018-22 (Ministry of Health, 2017). I take proposal for demonstration of cooking skills forward in Chapter 7.
Restriction: Using rules to reduce the opportunity to engage in the target behaviour	Restricting the sale of junk foods in fast food outlets to reduce the consumption of junk food. This should be appropriate to the SCC context of Kathmandu where many men in particular eat outside the home in restaurants (Liechty, 2005, Liechty, 2010).
Environmental restructuring: Changing the physical or social context	Providing health workers with diet screening tools for consultations. These screening tools need to be made appropriate to SCC. An example of this would be to ensure that health professionals consider how cultural factors and gender roles affect patient's behaviour (E.g. how much help or support a female patient would get with cooking, and to what extent she must cook separate healthy meals for herself). My findings have shown that often diabetic women must cook healthy meals for themselves separately with little help from their family, and this places a greater burden on her [Chapter 4.2.6]. Similarly, nutrition advice must be adapted according to the socio-economic group of the participant. Screening tools must consider such socio-cultural factors as other research has found (Gladstone et al., 2008, Soto et al., 2015). Once

Interventions	Example of how SCC could be incorporated
Intervention functions	
	screened with this new tool (which represents an addition to the physical context) health workers will be able to adapt the nutrition education they provide to their patient based on the results of the screening (findings about gender, socio-economic group, ethnicity).
Modelling: Providing an example for people to aspire to or imitate	Using TV dramas which model healthy eating practices to provide an example of how to imitate healthy food consumption. This can be done by using cultural figures in drama videos, for example the already successful YouTube videos to persuade people to take up a more healthy lifestyle and prevent diabetes (Sanchar, 2015) which were discussed by patients I interviewed. For these video dramas to be effective, actors need to be culturally accepted (e.g. celebrities or religious role models) and behave in a culturally appropriate way (e.g. wear culturally appropriate clothing, use culturally appropriate language) and scriptwriters need to be given professional advice on appropriate dietary and cultural behaviour. Another example of modelling is peer education within communities which would provide patients with a localised peer educator who has successfully improved their dietary behaviour. These peer educators would share ethnic, religious, socio-economic, age or gender characteristics with those people they are providing an example to. Such educators have been used successfully (Harris J et al., 2015, Singh et al., 2018b, van Olmen et al., 2016). Some patients I interviewed in Study 2 showed a willingness to share advice with others who were recently diagnosed. I take peer educator role models and TV dramas forward as modelling interventions in Chapter 7.
Enablement: Increasing means/reducing barriers to increase capability or opportunity	Behavioural support for healthy dietary behaviour. This behavioural support, for example that given by dieticians, must account for socio-cultural determinants of behaviour. One dietician I interviewed in Study 2 was aware of the cultural tendency in Nepal to give unhealthy food – craved food – to family members as a sign of love for them. The dietician therefore uses this cultural awareness to encourage family members of her patients to see giving healthy foods to their diabetic family members as showing more love than giving them unhealthy foods because it will help them live longer. Socio-culturally appropriate behavioural support has been proven to be effective in other settings (Cheremshynski et al., 2013) as well as being used by health workers in my Study in Nepal.
Policies	
Communication/marketing: Using print, electronic, telephonic or broadcast media	Conducting mass media campaigns. E.g. Using socio-cultural awareness to target campaigns around key festival times (e.g. Dashain in October every year) and use of culturally-tailored language within campaigns. Culturally sensitive mass media messages have been used to encourage healthy sexual behaviour in other contexts, illustrating the potential of this method in relation to healthy dietary behaviour (Romer et

Interventions	Example of how SCC could be incorporated
Intervention functions	
	al., 2009). Also, mass media campaigns may only be feasible if they involve culturally respected figures heading them, (see examples of this in relation to persuasion above). Connected to communication and marketing is the development of culturally specific behaviour change materials, tailored to socio-cultural context to ensure they are appropriate for use, (see examples relating to printed materials above).
Guidelines: Creating documents that recommend or mandate practice. This includes all changes to service provision	Producing and disseminating guidelines for dietary advice to be given by health workers. SCC is important in tailoring this advice, for example to ethnicity or religion (e.g. Buddhists who are vegetarian). Culturally adapting guidelines for diabetes care has been successful (Philis-Tsimikas et al., 2004) and steps have begun to be taken to allow for cultural adaptation within Nepalese diabetes dietary advice, with the DEAN Nepal including a caveat that dietary advice should be culturally adapted to common diets in Nepal (DEAN Nepal, 2018). This is a positive step towards more sensitive cultural adaptation of guidelines. Furthermore, the nutrition plan 2018-22 (Ministry of Health, 2017) advocates for the dissemination of food based dietary guidelines to local governments. These guidelines should be tailored to the locality to consider socio-cultural context in dietary behaviours.
Fiscal: Using the tax system to reduce or increase the financial cost	Sugar tax. Introduction of sugar tax should consider whether it would impact culturally important foods which contain sugar, for example Sherpa food Khapse (eaten by some of the patients I interviewed) which is often prepared in the home with large amounts of sugar and is not often sold as a product which could be easily taxed.
Regulation: Establishing rules or principles of behaviour or practice	Establishing voluntary agreements on advertising. There needs to be a socio-cultural consideration of the incentives powerful multi-national companies provide to business in Nepal to advertise unhealthy products. Businesses should be offered other incentives by government to advertise culturally appropriate healthy food instead.
Legislation: Making or changing laws	Legislation to ensure that food carries information on nutritional content of food. Socio-cultural awareness is needed to ensure culturally important food contains this nutritional information.
Environmental/social planning: Designing and/or controlling the physical or social environment	Using environmental planning to allow for the introduction of shared/community vegetable patches Kathmandu. However, socio-cultural awareness is needed to consider the cultural aspects around the security of vegetable gardens. I take vegetable gardens forward as a potential intervention in Chapter 7.

Interventions	Example of how SCC could be incorporated
Intervention functions	
Service provision: Delivering a service	Establishing support services involving nutrition education provided by health workers who receive improved training on how to provide dietary advice depending on the SCC they work in. This training could be provided by allowing health workers to take part in a participatory discussion about what would be appropriate for their patients (depending on region, socio-economic group, ethnicity, age) and training health workers how to adapt generic dietary advice to provide a more tailored dietary advice service. I take this intervention proposal forward in Chapter 7.

Table 5 has linked relevant evidence from Study 2 and other research to support the importance of incorporating SCC in the policy and intervention function rings of the BCW. I have demonstrated why and how policy and intervention functions should take account of SCC giving examples of interventions and policy which is tailored to SCC. I also advocate this consideration for the future development interventions in Nepal including policies such as the PEN package in Nepal which holds potential to improve screening for and prevention of diabetes. I take some of the intervention proposals I make in Table 5 forward in Part 3. Though Table 5 focuses on a specific behaviour (diet) and type of country (LMIC, Nepal), my revised BCW can be applied more broadly to different health behaviours and country contexts. An example could be applying my BCW to physical activity in the UK, ensuring intervention functions are adapted to SCC (e.g. providing appropriate education about the benefits of physical activity to different genders, ethnicities and age groups) and policies (e.g. SCC adaptation of physical activity promotion policies by training health workers appropriately depending on the ethnic group they advise). The examples that I provide in Table 5 illustrate the importance of the new outer ring I propose for the BCW and demonstrates how SCC moderates policy and intervention functions in any context.

6.4 Reflection on methods from Study 2

6.4.1 Reflexivity

One of the challenges of Study 2 was gaining a reflexive awareness of my impact on data collection. I reflected on the data collected at every stage in a reflective field diary. Key questions I asked myself when reflecting were in line with the pragmatist paradigm (Feilzer, 2010) and included ‘what is the research for?’, ‘who is the research for?’ and ‘how do my values influence the research?’ I also took steps to build rapport with those I interviewed to try to reduce the impact of my presence during interviews or observation activities. It was decided that I would not conduct interviews with diabetes/HBGL patients or their families. It was agreed with Nepali researchers at HERD that the presence of a British researcher in a one-to-one or one-to-two interview set up would potentially affect the interviewee’s responses. There was a concern that, if I was present, interviewees may try to provide answers they thought I would want to hear. I trained the two researchers who conducted the interviews intensively in three training sessions over the course of one week. These sessions involved training on conducting interviews and interpreting the research aims and objectives. These researchers then conducted test interviews after which we came together as a team to comment on them and improve our questioning and methods. The interviewers provided interpretation of key points once the interviews had been translated into English and this added richness to the data and rigour to the data collection process.

6.4.2 Reflections on the data collection process

The interview process was iterative and multi-faceted. Sometimes interviews did not follow the interview guide in the order intended. However, instead, after several interviews both I and the Nepali researchers were able to adapt to the interviewee and to the flow of the conversation and ensure the objectives of the interview were met in a way which made the interviewee more relaxed. I found it was important to reflect after each interview and I completed a reflection diary and detailed reflection log for each interview, as did each of my researchers. I encouraged an open dialogue and tried to put aside any personal judgements or assumptions; ‘in suspending our own truth, we open ourselves to the possibility of empathy as a way of making sense of collective experiences in order to act collectively for change’ (Ledwith and Springett, 2010)

p.115). I was empathetic with the participants I interviewed and only interrupted them to ensure they remained focused on the objectives of the interview.

One aspect of the data collection process which may limit the reliability of the results was that the participants were all recruited to a project which they knew was focused on dietary behaviour and changes to it. This preface to the research will have set expectations that participants would discuss changes in their dietary behaviours and may have been reluctant to discuss eating practices which remained the same after they were diagnosed. This represents one potential limitation of the research. Some people who were recruited did refuse to join the project, but the reason they provided was that they did not have time to take part either due to busy schedules or caring commitments.

6.4.3 Reflections on interview methods

Interviewing partners together has been successfully done before (Bruce et al., 2014, Haahr et al., 2014, Kendall et al., 2009, Matheson et al., 2010, Mellor et al., 2013, Miller and Caughlin, 2013, Morgan et al., 2013, Sakellariou et al., 2013) and though I was unsure how this method would go, it proved effective in my research, allowing partners to encourage each other to provide further information. When reflecting on the interview with both partners together, and interviewing the same couple separately, the interviewer said the partner interviews elicited a lot more information and stated the interview flowed better than interviews conducted with individuals:

'Interviewing them together meant they were more communicative than when they were separate. The participant's partner was less likely to talk when he was interviewed alone but when the interview came to the end, when both of them were together, then he spoke more and gave me more information about his partner. When they were interviewed together then they corrected each other, supported each other's points adding more new things and it was more like a conversation rather than an interview.' Researcher 2 reflections

Further reflections from our researchers explain the success of this method in more detail in Appendix B.8.

The participatory methods used were successful at eliciting large amounts of useful data and also ensuring participants engaged fully during the interviews. Both researchers thought the first method, writing food diaries, was effective:

'The benefits of writing down their dietary habits were it was easier to remember the foods that they told me. It helped in comparing the two schedules [before and after]. Further it helped to probe the questions if the participant went off track with their answers.' Researcher 1 reflections

All but one participant preferred it if the researchers themselves actually wrote down the food items consumed. One reason for this included that some participants were not comfortable writing and preferred to be led by the researchers. Another drawback of the method was that it could be a bit monotonous to list all the foods eaten during the day.

The second participatory method, using the calendar as a prompt was very effective in reminding participants of the events which affected their dietary behaviour. It was particularly effective amongst the Brahmin and Chhetry ethnic groups who took part in many religious events. However, the method was less effective amongst other ethnic groups who followed different events throughout the year which sometimes were not included on the calendar. The

final method was mapping the participants' regular places of support. Again, few participants wanted to draw themselves, and some initially got confused. However, once the researchers explained the method, it worked as a prompt for specific discussion about the participant's support mechanisms. Overall, the participatory methods were effective, as one researcher reflects:

'All of the participatory methods were innovative, creative and most importantly interesting. They made the interviewer attentive and able to probe during questioning. The same thing was applied among the participants. They got involved in it even if they did not write the answers. The methods helped both the interviewer and interviewee to build good rapport.' Researcher 1 reflections

These methods were important in allowing for participant-led responses to the interview questions and elicited rich data.

6.5 Limitations

Study 2 was not without limitations. I only recruited patients who attended one public hospital in Kathmandu and who were diagnosed and receiving treatment for their condition. Patients who attended other health facilities, and those who were not actively seeking treatment, would also have been valuable to interview to gather a broader understanding of treatment at different health facilities, and the challenges facing those patients who have had limited treatment. However, as discussed in Chapter 1, there were practical limitations around recruiting and identifying patients and the public hospital used was a pragmatic solution to this problem. I was only able to interview a limited number of policymakers, researchers and health workers due to budget and time constraints. Furthermore, I acknowledge that more health workers in the formal private sector would have been useful to interview. To mitigate this problem, I was able to gather knowledge about the private health system from health workers interviewed who worked in both public and private health systems. Additionally, I acknowledge that health workers in the informal private sector including unqualified practitioners play an important role in care provision in Nepal and could influence dietary behaviour. These people were not interviewed in my study, though some patients referred to the influence of traditional healers, and I acknowledge this as a limitation.

With partner interviews, where both partners were present, gender dynamics between the partners, and with the female interviewer may have influenced the data collected. There was one example of a female patient who appeared shy and reluctant to talk when interviewed with her husband. In another example, the female partner had to keep getting up to tend to her children in an adjacent room to where the interview was taking place, meaning she missed answering some questions. Such gaps in data represent a need to be more gender-sensitive in future data collection by potentially interviewing participants with family commitments away from their domestic setting where distractions would be minimal or interviewing individuals alone to allow their voice to be better heard.

Additionally, though my ecological model shows multiple levels of interaction and multiple variables of interaction across and within these levels, I am aware that sometimes ecological models do not provide enough information about how the broader levels of influence interact or the interaction of variables across levels. An example is Matsudo et al. (2004) who do not consider an overarching environmental influence and the interactions between variables. One way this could be addressed is with further research using my model to conduct a multi-level

analysis to evaluate and examine the impact of interventions on outcomes at multiple levels (Sallis et al., 2008).

My ecological model is also not exhaustive, it would be difficult to capture all determinants of behaviour within the environments, and I am aware of others which were not discussed by participants, for example body image or the impact of advertising (Gissing et al., 2017) which can also influence dietary behaviours. Also, I am aware of limitations with the way I categorised my sample according to socio-economic position. I am aware that social positions in south Asian settings can be complex and income levels are only one of many several markers of socio-economic position (other non-income markers include caste groupings and influence positions). However, given the difficulties of measuring socio-economic position, I limited my focus to income groupings. Similarly, I am aware that the use of the terms 'healthy' and 'unhealthy' diet are terms which can be open to cultural interpretation. Though as this study indicates, culturally appropriate foods are contextually specific and vary with SCC, I have defined healthy/unhealthy diet in alignment with WHO advice on healthy diet while accounting for socio-cultural variation within this generic advice (e.g. the importance of rice - ideally brown rice for people with or at risk of diabetes - as a carbohydrate staple food in Nepal) (WHO, 2019). Furthermore, I am aware that I have discussed the political environment's impact on behaviours only from the perspective of policymakers and researchers as there was little mention of the impact of policy by the patients themselves. I acknowledge this as a limitation because policy was not discussed from a patient perspective. I believe, however, that given the constraints of this study, reflections from policymakers and health workers on political issues (e.g. about government campaigns) were valuable in identifying policies which held the potential to improve dietary behaviour.

In Chapter 5 I drew out in my results, key software/hardware elements and aspects of the WHO building blocks which corresponded with each of my key themes within my conceptual framework (of political, organisational and socio-cultural contexts). However, I acknowledge that there was not explicit probing on the elements within the health system which affected the supply and demand for dietary support for people with HBGLs/diabetes. Therefore, my findings do not cover *all* software/hardware elements or WHO building blocks and further work would be needed to investigate these in more detail. I also acknowledge that there are potential financial limitations relating to some of my proposed solutions in Chapter 5 (e.g. piloting improved electronic records systems). Despite this, I believe it is important to highlight the improvements to existing policy and structures needed to push for change in diabetes support, which policymakers should strive for despite potential challenges around implementation.

Finally, very few of my participants in Study 2 had heard of the PEN package which was due to be rolled out in Nepal sometime after the period of data collection. Therefore, the policy-related solutions discussed did not fully consider PEN on the political landscape at the time. Following data collection in Part 3 for Study 3, PEN has been somewhat adopted by the government in rural areas (with little adoption in Kathmandu).

6.5.1 Conclusion

So far this thesis has addressed two elements of the MRC guidelines for intervention development (Medical Research Council, 2006). I have *identified the evidence base* and *identified and developed theory* in both Study 1 (exploring evidence for effective dietary interventions in LMICs) and Study 2 (exploring and understanding of determinants of health and factors influencing the supply and demand of dietary support for people with HBGLs/diabetes). In Chapter 7 I take these contributions forward to consider and assess the feasibility of specific intervention proposals derived from Study 2 data. Overall, in Study 2 I have demonstrated the

potential of investigating research contexts ecologically and with socio-cultural sensitivity to develop interventions and make policy suggestions to tackle diabetes.

PART III

Chapter 7 Selecting potential interventions

7.1 Introduction to Part 3

In Parts 1 and 2 I have addressed the first stages of the MRC guidelines for intervention development, which are 1. Identifying the evidence base and 2. Identifying/developing theory (Medical Research Council, 2006). I have also considered steps 1 - 2 of the 6SQuID framework for intervention development; 1. Define and understand the problem and its causes, and 2. Clarify which contextual factors can bring about change. I have begun to address step 3 - how to bring about change with an intervention (Wight et al., 2015). See Figure 13 for a breakdown of how the MRC and 6SQuID guidelines have been used throughout my thesis.

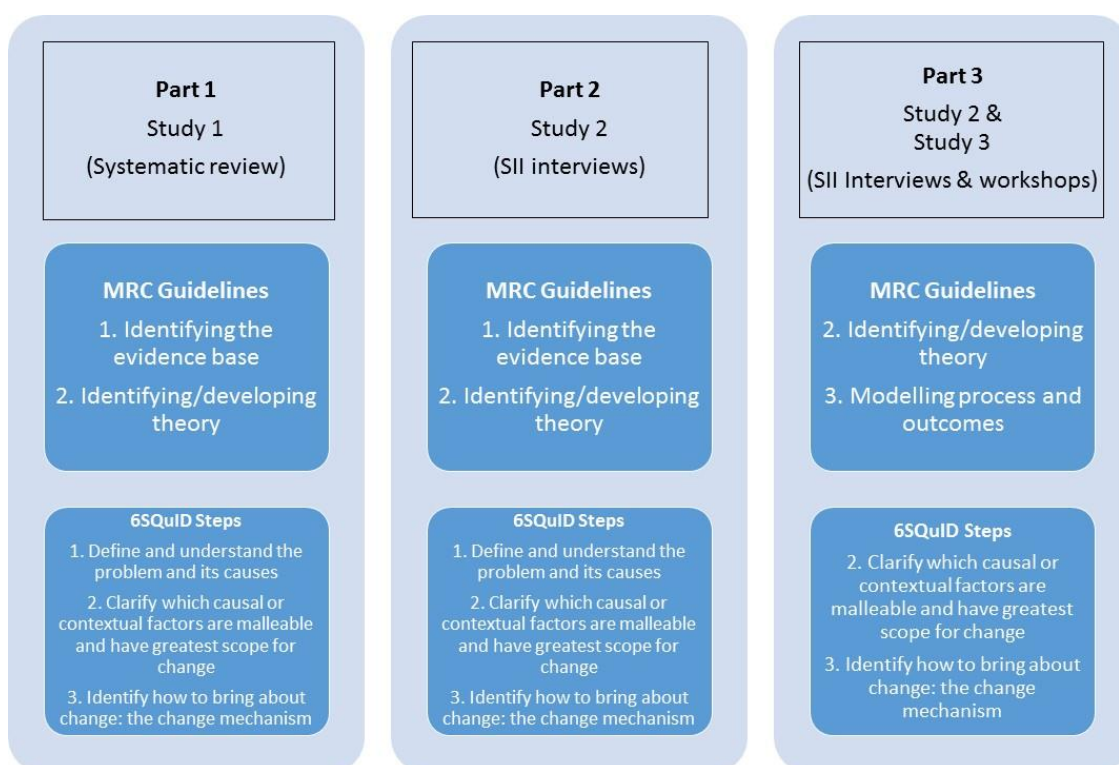


Figure 13: How MRC guidelines (Medical Research Council, 2006) and 6SQuID steps for intervention development (Wight et al., 2015) intersect with my thesis sections

Part 1 found that, on the whole, dietary interventions are effective in improving dietary behaviour and identified potentially effective elements of dietary interventions in LMICs. Part 2 then identified and developed theory with a contextual understanding of which factors a) determined dietary behaviours and b) affected the supply of and demand for interventions to improve dietary support. Part 2 has provided a wider understanding of what determines dietary behaviours amongst people with diabetes and HBGLs. The development of a contextually specific ecological model has indicated that many environments, particularly the socio-cultural context, have a substantial influence. The subsequent adaptation of the behaviour change wheel to include SSC when considering the development of intervention proposals, provided a further theoretical contribution to the literature and a basis from which to begin modelling a contextually appropriate intervention.

Part 3 uses the findings of Parts 1 and 2 to inform and consider the development of an intervention to improve dietary behaviour amongst people with diabetes and HBGLs. This will involve addressing the next stage of the MRC guidelines for intervention development; modelling the processes and outcomes surrounding the intervention (Medical Research Council,

2006). Modelling the processes and outcomes involves exploring and discovering important information about the design of the intervention which may affect its likelihood to bring about change. It involves developing the intervention and incorporating insights from the theory into an explicit model of how the intervention might alter behaviour. Part 3's modelling focus will be complemented by a consideration of Steps 3 and 4 of 6SQuID which are to identify how to bring about change (change mechanism) [step 3] and how to deliver it [step 4] (Wight et al., 2015).

Part 3 comprises three sections:

1. Selection of potential interventions – initial feasibility assessment – Chapter 7 [**using results from Study 2**]
2. Methods for and Results from **Study 3** – workshops and interviews to further investigate the feasibility of intervention proposals - Chapter 8
3. Final intervention proposals and suggestions for broader, macro-level improvements to policy – Chapter 9

Therefore to begin modelling the intervention, Part 3 presents results from both Study 2 (in Chapter 7) and Study 3 (in Chapter 8). This chapter explores how I consolidated potential intervention proposals from the findings of Study 2, how these fit into my ecological model and conducted an initial assessment of their feasibility. The process I have developed for selecting feasible interventions is shown in Figure 14. This process is an innovative one which stems from the reality that few methods exist in the literature for assessing intervention proposals and narrowing these down to the most feasible interventions.

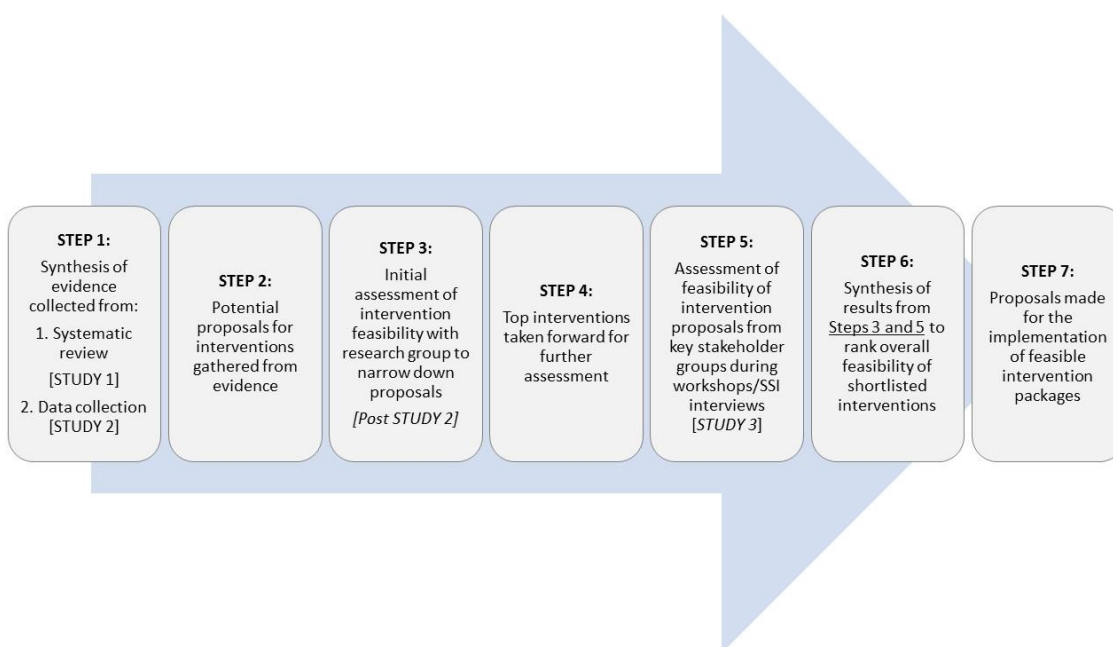


Figure 14: Process for selecting feasible interventions

Option appraisals are often used in health economic assessments and with statistical modelling (Raftery and Powell, 2013, Tappenden et al., 2007). They draw on a range of methods for assessing value (value for money in achieving objectives, best use of available resources according to criteria) and are suited to policy evaluation across government (Treasury, 2003). Option appraisals involve an over reliance on quantitative data and an inadequate recognition of qualitative data (though qualitative data can be included). Option appraisals can miss some

options and have potential for bias caused by the workings of the group conducting the appraisal (Marks et al., 2015). For these reasons I decided to develop a process which includes and values the findings from qualitative research. This process involved two points of assessment with different groups (one assessment point with research group – Step 3 [post Study 2 data collection] and one assessment point with key stakeholder groups – step 5 [Study 3]). Part 3 will document how I worked through the process outlined in Figure 14 to reach final proposals for the implementation of potentially feasible interventions.

7.2 Aims and Objectives

In this chapter I begin the modelling process outlined in Figure 14 with Steps 2 and 3; gathering potential interventions from the evidence (systematic review, wider research and Study 2 results) and undertaking an initial assessment of intervention feasibility with a research group to narrow down proposals. My objectives are to:

1. Consolidate and justify the proposal of potential interventions to improve dietary behaviour
2. Conduct an initial feasibility assessment of these interventions

7.3 Narrowing down possible interventions with initial feasibility testing

7.3.1 Considering theoretical elements in intervention proposals

I decided that the feasibility of the potential interventions could be best measured by the four criteria stated by Walley and Wright (2010) to assess the feasibility of public health interventions. These criteria are: 1. technical effectiveness, 2. organisational feasibility, 3. gender, cultural and ‘political’ feasibility and 4. financial feasibility. These criteria, represent connections to my findings in Chapters 2-6 as shown in 7.3.2 to 7.3.5. For all of the criteria, judgements on feasibility were based on the evidence collected from Study 1 and the data collection from Study 2, as well as an awareness from the literature about what has worked in similar contexts to improve dietary behaviours.

7.3.2 Technical effectiveness – effectiveness to change behaviour

According to Walley and Wright (2010), the technical effectiveness of an intervention is how well it controls the disease. The technical effectiveness of interventions proposed was evaluated based on the potential for the intervention to technically improve dietary behaviour. This criterion was informed by evidence from Study 1 which reviewed current literature about dietary behaviour interventions in LMICs (drawing on Michie et al’s (2013) taxonomy of 93 BCTs) as well as evidence collected during Study 2 (including literature to support statements by participants) about interventions which participants indicated could be potentially effective in improving behaviour.

7.3.3 Organisational feasibility

Organisational feasibility was an assessment of how the intervention would work within the organisational structures in Nepal. In particular, this category considers who would deliver the intervention and whether the existing skills of health workers would enable the intervention to be successfully implemented, or whether there would need to be changes to existing staff provision or health structures to make the intervention work. My findings in Chapter 5 on factors affecting the supply and demand of dietary support directly informed my assessment of this level of feasibility.

7.3.4 Gender, cultural and 'political' feasibility

Gender, cultural and political feasibility considers how acceptable the intervention is culturally, i.e. to the community and community leaders, whether it would need buy-in from the community and whether this would be difficult to achieve. It also ensures that consideration of gender is an important component of the feasibility assessment and also allows for the consideration of intersectionality within the 'cultural' aspect of this criterion. Within this category is a consideration of personal characteristics, for example, an intervention's acceptability to an individual (considering their gender, ethnicity etc.). Specifically, this category considers cultural issues such as the importance of socio-culturally appropriate dietary behaviours, as found to be very important in Chapter 4. The political feasibility aspect of this criterion involves consideration of political constraints on institutions, but also opportunities offered by formal and informal political mechanisms, such as Ward Committees at local government level. For the gender and cultural aspects of this criterion I drew on findings from Chapter 4 and Chapter 6 (BCW-SCC). For the political aspect of this criterion I drew on evidence about the political environment in Chapter 5 (discussion of supply and demand of existing support for people with diabetes/HBGLs).

7.3.5 Financial feasibility

Finally, Walley and Wright (2010) advocate the consideration of financial elements involved in the intervention such as materials, manpower and money. This involved considering the number of health workers available to deliver the proposed interventions, and the resources available such as monetary resources and equipment such as glucometers. An assessment was provided of how potentially financially viable each intervention would be. This category also considered an intervention's affordability to an individual with diabetes/HBGLs. I have not conducted an assessment of cost-effectiveness of potential interventions because the detailed data needed for such an assessment was not possible to collect from qualitative discussions with my sample in either Studies 2 or 3. This is a limitation of the ranking method, as discussed in Chapter 3. However, it is implicit in the data collected in Studies 2 and 3 which interventions might be cost-effective and these are considered as part of the financial feasibility and other assessments later in Study 3.

7.3.6 Generating candidate interventions

It was possible to establish the overarching principles of how interventions should be developed, using the 6SQuID framework (Wight et al., 2015) and the MRC guidance on complex intervention development (Medical Research Council, 2006). However, it was difficult to establish from the literature methods of compiling possible interventions from a combination of quantitative and qualitative data outputs as have been produced in this project. Despite the limitations of guidance in the literature, I used evidence from Study 1 and data collected in Study 2, to compile an initial list of fourteen intervention proposals. The evidence I used included literature reviews of other research conducted relating to these proposals *within* Studies 1 and 2 (e.g. in the literature review section of Study 1 and the results and discussion of Study 2 which discussed the use of similar interventions from other research).

In the next part of this chapter I document a full feasibility assessment of my list of interventions by using the feasibility criteria outlined by Walley and Wright (2010). Interventions in other studies have been ranked using different classifications, for example numerical scales of effectiveness from 1-7 (Kathirgamanathan et al., 2010) or from 1-5 (Wilson et al., 2013) and simpler classifications with three categories, for example, most to least important (Morton et al., 2017). However, these methods have been used to rank predominantly quantitative data. A

large number of my intervention proposals (12/14) were derived from qualitative data from Study 2, whereas 2/14 proposals were derived from quantitative data from Study 1– see Table 6. Therefore, I developed a simple and broad ranking method for both quantitative and qualitative data which did not overly represent my qualitative data in numerical form. However, I also needed to use my qualitative data in a practical way to produce useful outputs, in line with my pragmatic research paradigm (Feilzer, 2010). Therefore, my ranking method comprised: high, meaning very feasible, medium, meaning feasible but with some shortcomings and low, meaning not at all feasible. These terms were loosely applied to the proposed interventions by the research group (Lizzie Caperon, Andrew Prestwich, Rebecca King and colleagues at HERD international) to provide a guide as to which ones should be shortlisted and taken into the next stage of the process (further feasibility assessment with workshops in Study 3 – see Chapter 8). Though the ranking of qualitative data was subjective (see limitations in Chapter 9), it was a method designed to be appropriate for both qualitative and quantitative data and allow for a synthesis of both data sets.

7.3.7 Categorising interventions

I have drawn on the work of Hubley and Copeman (2018) on health promotion to categorise my proposed interventions. Hubley and Copeman (2018) explore health promotion strategies, within which they categorise different health promotion methods which they split into three main groups; person-to-person methods which involve direct contact with the target group; media methods which include those where communication takes place through electronic or print media without face-to-face contact and finally advocacy which involves health promotion through policy change and lobbying. This classification is useful for considering the scale of delivery of an intervention, for example if it should be national/target large populations (e.g. mass media, social marketing) whether it should target ‘small’ groups (e.g. community camps, training of health workers in small groups) or whether it should target one-to-one interactions (e.g. peer to peer, health worker to patient interactions). Hubley and Copeman (2018) also present different types of media which they interpret broadly, for example print media i.e. leaflets, posters [printed materials] and digital media which includes use of mobile phones to send text messages.

7.3.8 Printed material-based interventions

[Print media - Media methods]

7.3.8.1 Intervention description

Printed material-based interventions can be health education focused and include posters, leaflets and flip-books with health education messages. Printed materials constitute an intervention strategy/tool as they are a means by which nutrition education can be disseminated. These messages should be in both text and pictorial format to ensure accessibility for those who are illiterate. In line with BCW-SCC (Chapter 6), the messages in the printed materials should be made appropriate to socio-cultural context, specific to ethnicity, socio-economic group, religion and other key characteristics of the target population.

7.3.8.2 Evidence for intervention

From the data analysis of Study 2 it was clear that patients, health workers and policymakers needed and wanted better printed health education materials to help support diabetes and HBGL patients and their families to eat more healthily:

'We can help them by distributing pamphlets which will tell them about the amount of food they should eat. We tell them to eat certain amount of calories but they often do not understand, but if we tell them to eat food by measuring the amount and show it visually on a pamphlet then it might be easier for them...they can read the pamphlets and if some of them could not read then we can describe it for them. They can also understand through the pictures.'
Health worker 06

As this health worker explains, visual depiction of dietary advice on materials which a patient can keep for reference could be effective. Though the government has produced posters and pamphlets as part of PEN, indicating structures are in place for dissemination of such materials nationally, these have not been circulated in Kathmandu, and they provide general dietary advice, which is not tailored to be socio-culturally specific to the myriad of religions and ethnicities in Kathmandu. There are improvements to be made to the existing health materials, and better materials with an effective delivery strategy could constitute a valuable intervention to inform people how to change their dietary behaviour.

7.3.8.3 Technical feasibility - high

Printed materials were highly technically feasible as health workers in Study 2 reported that they had been used previously and patients had shown (through simple recall to the health worker) that they had learnt key facts about diabetes from the leaflets they had received. Printed materials could also be designed to incorporate key BCTs such as those found to be effective in Study 1 (1.4 action planning) to improve dietary behaviour.

7.3.8.4 Gender, cultural and political feasibility - high

This intervention is adaptable to socio-cultural variation, for example, leaflets can be designed for specific genders or those designed for specific ethnic groups detailing alternative to ethnically acceptable food (shown to be an important determinant of behaviour in Chapter 4). This adaptation is important, as illustrated in the revised BCW-SCC (Chapter 6), making it highly gender, cultural and politically feasible.

7.3.8.5 Organisational feasibility - high

This intervention is also highly organisationally feasible as health workers in Study 2 highlighted the need for more printed materials in health facilities. Policymakers interviewed stated that incorporating printed materials within existing organisations and structures would be straightforward if health workers were trained on dissemination of them.

7.3.8.6 Financial feasibility - high

Finally, this intervention is highly financially feasible as the cost of producing materials would be low compared with rolling out other interventions (such as media interventions).

7.3.9 Community camps

[Health promotion in groups - Person to person methods]

7.3.9.1 Intervention description

Community events (often called community camps) have been used by several health facilities in Kathmandu to reach out to communities. These camps involve local people coming together

in one location to learn about diabetes/HBGLs with others from health workers/professionals. They can involve interactive elements or blood glucose testing and nutrition education.

7.3.9.2 Evidence for intervention

Community camps have been shown to be successful in encouraging people to improve their lifestyle and awareness of healthy eating in the context of diabetes prevention and reduction. Community interventions such as community camps have been found to be effective by other research (Touchstone, 2018, Pambos et al., 2012, UNFPA, 2015). This is corroborated by my findings from Study 2 where health workers reported that some camps with free blood glucose testing and dietary education with health professionals had had many attendees who were engaged and interested in learning about the ways to tackle HBGLs. Patients corroborated this view, with many preferring health education and engagement activities to be conducted in their communities rather than at hospitals which are often further away:

'We [participant – a health worker – together with other health workers] conducted a community camp with teaching hospital [a public hospital in Kathmandu] in the community [away from the hospital]. Over five-hundred people came of which around two-hundred people found out they had high fasting blood sugar for the first time'. Health worker 05

7.3.9.3 Technical effectiveness - medium

Community camps rate medium on technical effectiveness because though they have not yet been shown to improve dietary behaviour by extensive formal research (small projects have shown the value of community interventions (Fottrell et al., 2019)), those community events which had been run by health workers so far have had high attendance of engaged participants. Such community events carry the potential to successfully improve dietary behaviour as stated by health workers and patients in Study 2. Additionally, camps could include BCTs highlighted as effective in Study 1, namely 6.1 demonstration of behaviour (e.g. cooking demonstrations at the camps), 1.4 action planning (e.g. making healthy meal plans with health workers at the camps) and 2.4 self-monitoring of the outcomes of behaviour (e.g. enablement of self-monitoring of progress by healthy meal planning and food diaries with health workers at the camps).

7.3.9.4 Organisational feasibility - medium

Camps could be closely linked with existing community structures such as community health centres. However, their large-scale adaptability to the health system in Nepal is limited, particularly as staffing the camps with health professionals could be challenging when there are significant demands on their time. For these reasons the organisational feasibility of community camps was medium.

7.3.9.5 Gender, cultural and political feasibility - high

Camps are feasible ways of accessing the community in different regions and contexts and they can incorporate targeted gender, ethnic, socio-economic and religious components. This means that camps rank high on gender/cultural/political feasibility.

7.3.9.6 Financial feasibility - medium

The materials needed for running a camp can be minimal (glucometer, posters, food diaries and action plans, pens, healthy ingredients). However, health worker time could be costly, giving the camps medium financial feasibility.

7.3.10 Text messages

[Electronic media and internet - Media methods]

7.3.10.1 Intervention description

Text message (SMS) reminders to eat healthy food regularly could be an intervention to encourage healthy dietary behaviour. These messages would be sent to the phones of those with or at risk of diabetes/HBGLs to remind them to eat healthily and why it is important.

7.3.10.2 Evidence for intervention

Existing research supports my findings as SMS reminders have been found to bring about behaviour change (Dobson et al., 2016, Grady et al., 2017, Horner et al., 2017, Kazi et al., 2017, Maar et al., 2017, Peters et al., 2017, Rathbone and Prescott, 2017, Rehalia and Prasad, 2016, Sharma et al., 2017). Recently, these have been shown to be feasible in Nepal (Style et al., 2017). Several patients and their family members stated in Study 2 that they thought that text messages reminding them to eat healthily in certain specific ways would be a feasible method of improving and prompting healthier eating. Other patients were more sceptical about whether this method would be feasible:

'I cannot [read] such information [in a text message]. I would find it easier if there are programs where I can discuss healthy eating in person with other people.' Female diabetic patient 03

A few patients who were illiterate, all of whom were women, stated they would need the help of a family member to read the messages, making it less feasible for illiterate populations. An essential component of this intervention, as advocated by the BCW-SCC wheel in Chapter 6, is the importance of making text messages culturally specific and tailored to those who receive them.

7.3.10.3 Technical feasibility - medium

Text messages have medium technical feasibility. They have been shown to have a positive effect on behaviours if messages are well-targeted (Horner et al., 2017, Peters et al., 2017, Sharma et al., 2017). However, they have not been tested in the context of Kathmandu, and some shortcomings and reservations were stated about the method from patients in Study 2. Text messages could include 7.1 prompts and cues, 4.1 instruction on how to perform behaviour and 5.1 information about health consequences.

7.3.10.4 Organisational feasibility - medium

Text messages rate medium for organisational feasibility due to the need for infrastructure to be in place to; a) create a database of target participants, b) maintain this database, c) ensure text messages are sent appropriately.

7.3.10.5 Gender, cultural and political feasibility - medium

Text messages rank medium for gender/cultural/political feasibility as my data from Study 2 showed that some people, particularly women and those over 40, may not have access to phones. Illiteracy and access to technology can also impede success of this method.

7.3.10.6 Financial feasibility - medium

Once set up, the infrastructure to send text messages can be cost-effective. However, the infrastructure is likely to cost a significant amount initially, giving this proposal medium financial feasibility.

7.3.11 Social media messages

[Electronic media and internet - Media methods]

7.3.11.1 Intervention description

Social media (e.g. Facebook, Twitter, WhatsApp) can be used to promote healthy dietary behaviour through the dissemination of health education messages on online and interactive platforms. A benefit of social media over other methods such as printed materials is the potential for a two-way interaction between the patient and others (health professionals or peers). Social media interactions can also be made optionally public so that discussions between a patient and health professional (for example about how much oil to use in cooking, or which healthy foods to buy) can be seen, and learnt from, by others.

7.3.11.2 Evidence for intervention

From the findings in Study 2 it is clear that many people in Kathmandu use social media to communicate and receive news. Facebook was mentioned as a medium by which a majority of patients got their news and connected with others. Many of these patients believed that finding information about prevention behaviours online would help them to change their behaviour. One patient stated he checked Facebook at least once a day and would respond well to information found on this or similar platforms, this was a view echoed by others:

'If I cannot get time than there is also a Facebook, I can read and watch it [health messages] on Facebook. It is not necessary to go hospital...I cannot go everywhere because I have to look after 3 people and I have to work. But I can get information by watching Facebook and YouTube'. Male diabetes patient 8

In addition to the evidence from my own research, there is evidence that social media platforms have been used for health promotion to produce positive results (Gold et al., 2012, Kumar and Preetha, 2012, Neiger et al., 2012, Welch et al., 2016, Puljak, 2016, Latif et al., 2016, Dhawan et al., 2008, Hubley, 2006). Such an intervention could be appropriate for those with mobile phones. However, it is important to ensure that those without internet access would also be able to access the same information and resources. Furthermore, one patient stated that she was concerned about some of the reliability of the information she saw on Facebook:

'Facebook says I should eat these things, but I think they are often promoted by businesses because my doctor tells me the opposite.' Female diabetes patient 9

Therefore, there are some concerns around the reliability of information on digital platforms.

7.3.11.3 Technical effectiveness - medium

Social media messages have been used successfully and could employ BCTs such as 1.4 Action Planning (found to be effective in Study 1), 4.1 Instruction on how to perform, 5.1 Information about health consequences, 7.1 Prompts and cues and 3.1 Social Support meaning this intervention has potential for high technical effectiveness. However, as the method has not been tested in the context of Kathmandu, it ranks medium overall for technical effectiveness.

7.3.11.4 Organisational feasibility - medium

Social media messages are simple to set up, but the administration and monitoring of social media platforms to ensure the information disseminated is reliable could be a challenge. The health workers interviewed were already overstretched with tasks meaning they are likely to have little time to monitor social media. Therefore, this intervention has medium organisational feasibility.

7.3.11.5 Gender, cultural and political feasibility - medium

Use of social media platforms such as Facebook, WhatsApp, Viber and others spans ethnicity, gender and religion, making them gender/culturally feasible as they are widely used across Nepal. However, as with text messages, social media may only be accessible by certain age groups, literate populations (often excluding women who are less likely to be literate than men) and those with access to the internet. There may also be issues around the security of using some online platforms and the reliability of information disseminated as one patient discussed in Study 2. Therefore, this intervention has medium gender/cultural/political feasibility.

7.3.11.6 Financial feasibility - medium

Social media platforms are free to access but are not likely to cost significantly to manage (see organisational feasibility). However, health worker time would be needed to administer social media platforms, meaning this intervention has medium financial feasibility.

7.3.12 Videos with health promotion messages

[Electronic media and internet OR mass media - Media methods]

7.3.12.1 Intervention description

This intervention involves disseminating health messages through the medium of video. This can be as videos shown in health facilities, or videos to be shown to a wider audience online on internet platforms such as YouTube.

7.3.12.2 Evidence for intervention

Two health workers in Study 2 told me that educational videos had been used in some private hospitals in Kathmandu to show patients and their family members' key health messages about eating healthily before they had a consultation with a doctor about their diabetes diagnosis. These health workers reported favourable results from the videos, therefore such videos carry potential to bring about behaviour change:

'Many patients who come to us without seeing the video [created by the doctors and shown to patients' pre-consultation], are kind of a blank, they are not able to capture what we are saying because they are overwhelmed with information...those who have seen it can understand and absorb the information we give much more easily. We have seen the clear difference between patients who watch the video and those that don't. The video is about twenty minutes long and talks about diabetes and how to control it.' Health worker 1

Additionally, videos featuring celebrities can also be viewed on the internet, on social media, sent via message apps such as WhatsApp and Viber, and can be seen on television. One interviewee suggested it could be helpful to record interviews with diabetes doctors/specialists

about the risk factors and ways to prevent the disease. Health promotion videos have also been used in other settings (Dhawan et al., 2008, Latif et al., 2016).

7.3.12.3 Technical effectiveness - high

Videos on social media reach large numbers of people, as shown by existing videos about diabetes prevention which have had tens of thousands of views (Sanchar, 2015). They can include BCTs such as 1.4 Action Planning (found to be effective in Study 1), 4.1 Instruction on how to perform, 5.1 Information about health consequences, 6.1 Demonstration of behaviour (found to be effective in Study 1), 7.1 Prompts and cues and 11.2 Reduce negative emotions. Videos therefore have high technical feasibility.

7.3.12.4 Organisational feasibility - medium

Health promotion videos require institutional buy-in. They are likely to be feasible in private facilities due to more access to equipment and better facilities to show the videos to patients. Evidence of successful videos used in private health facilities were shown by health workers and patients interviewed in Study 2. However, videos are not as feasible without technical equipment and space, two key aspects lacking in crowded public facilities. Videos can be more easily accessible if played outside health facilities on devices which have internet access. This depends on individuals having internet access. Therefore, videos have medium organisational feasibility.

7.3.12.5 Gender, cultural and political feasibility - high

Health promotion videos are common in Nepali society and some videos (on YouTube) were discussed by patients interviewed in Study 2 favourably. Videos can be adapted to include cultural elements, for example including cultural icons to influence change or role models of specific genders. This makes them highly gender/political/culturally feasible.

7.3.12.6 Financial feasibility - high

Videos can cost a limited amount to create (depending on the content, number of actors used etc.) and they are then reusable. Therefore, videos are financially feasible and can represent a saving on health worker time. This means videos have high financial feasibility.

7.3.13 Training health workers, FCHVs or community mobilisers

[1-2-1 communication - Person to person methods]

7.3.13.1 Intervention description

Training of health workers, FCHVs or community mobilisers involves providing resources including training materials, supervision and guidance to them for delivering improved or different services to those they serve. Training should include how to effectively deliver dietary advice and nutrition education.

7.3.13.2 Evidence for intervention

Findings from Study 2 indicated that there was a need to improve the training of health professionals, FCHVs and community mobilisers who deliver health messages. My findings from Study 2 indicated that FCHV's and community mobilisers were valuable mechanisms for influencing behaviour in communities. However, some caution was raised about the use of FCHVs:

*'If you want to roll out a campaign through FCHV you need the government to do it; they have a very big role and control many of the activities of FCHVs'.
Health worker*

Evidently, access to FCHVs is through the government and negotiation would need to take place with government gatekeepers to embed new interventions in the work of FCHVs. One researcher stated that FCHVs would benefit from better education and training as many do not have basic school leaver certificates, with some reportedly illiterate. More investment in their education can help to widen their potential for reading and disseminating health information, as has been shown by other research (Cunningham et al., 2016b, Schwarz et al., 2014). Community mobilisers were very active in one district in Kathmandu valley where one health worker told me that they were an influential group who could encourage behaviour change in the community. However, more research needs to be done on the feasibility of community mobilisers in communities in urban Kathmandu. Other research has found that FCHVs have been important in health promotion (Panday et al., 2017, Perry et al., 2014). Community mobilisers have been shown to encourage health promotion (Karkee and Khanal, 2016) though there is less evidence for their involvement in health promotion (particularly in Nepal) than that for FCHVs.

Study 2 also found the need for better training to be provided for medical professionals during their initial training and after they have qualified. There was a need for medical students to receive better training on nutrition education and dietary care for those patients with diabetes (see Chapter 5).

7.3.13.3 Technical effectiveness - high

Evidence from other research (see 7.3.13.2) suggests that improving training of health workers is highly technically feasible. Furthermore, several health workers and policymakers interviewed in Study 2 stated that they thought that improved training of health workers would be effective in improving the dietary behaviour of patients with diabetes/HBGLs. BCTs included in training health workers to disseminate health education to patients could include: 9.1 credible source, 4.1 instruction on how to perform behaviour and 1.4 action planning (found to be effective in Study 1) which could include for example, planning culturally appropriate healthy diets.

7.3.13.4 Organisational feasibility - high

Such an intervention would also be highly organisationally feasible as it involves working with existing structures within the health system to bring about change to the training of health workers. Additionally, health workers and researchers from Study 2 stated that they thought such an intervention would work in the health system in Nepal.

7.3.13.5 Gender, cultural and political feasibility - medium

Training health workers has medium gender/cultural/political feasibility. This is because it requires political will to ensure training for health workers is improved, which could be difficult to achieve if policymakers' priorities lie elsewhere. However, the government has shown a commitment to tackling NCDs with introduction of the PEN package, indicating a favourable policy environment. Furthermore, a policymaker interviewed in Study 2 confirmed that there was political will to bring about improved training of health professionals. Also, training of health workers/FCHVs/community mobilisers carries substantial cultural/gender feasibility because culturally and gender appropriate health education messages could be embedded within training packages which are tailored to gender, ethnicity and other factors.

7.3.13.6 Financial feasibility - medium

The intervention has medium financial feasibility due to the health worker time it would take to undertake training and the time it would take for senior health workers or ‘trainers of trainers’ to design, monitor and evaluate training packages effectively.

7.3.14 Role modelling and peer support

[Health promotion in groups OR 1-2-1 communication - Person to person methods]

7.3.14.1 Intervention description

There has been evidence that using patients who have successfully improved their behaviour as role models for other patients can be a feasible way of changing behaviour (Oli et al., 2015b). This is closely linked to the concept of peer support, where those who have already experienced behaviour change due to diabetes/HBGLs have an ability to support and guide those who have just been diagnosed.

7.3.14.2 Evidence for intervention

Several patients in Study 2 stated that they would like to talk to other patients who had successfully made lifestyle changes to improve their diet. This could be in the form of 1-2-1 interactions or in small groups (e.g. household groups). A few patients interviewed in Study 2 were happy to provide advice (unprompted) to hypothetical recently diagnosed patients during their interviews:

‘If someone has sugar then do not worry about it...it is just about controlling ourselves in diet and medicine...You can eat everything but in a less quantity. If you used to eat 300 gram of rice then you should eat one fourth of it...’ Male diabetic patient 4

Therefore, the evidence from Study 2 suggests that asking patients and their family members who have made positive lifestyle changes to talk to newly diagnosed patients about how they can improve their eating behaviours could be feasible. Several dieticians interviewed already employed this method successfully. Additionally, Study 1 revealed 6.1 Demonstration of behaviour as a potentially effective BCT which is closely connected to role modelling and peer support. Additionally, BCTs which could be included in this intervention are 3.1 Social Support (unspecified), 3.2 Social Support (practical) and 3.3 Social Support (emotional).

7.3.14.3 Technical effectiveness - high

Research has shown that that peer education programmes can be useful for spreading nutrition education in low income country settings, including in Nepal. An example of this was a project in Kathmandu which gathered mothers to learn nutrition education including cooking skills, and then to act as peer educators to other women in their communities, to whom they taught their nutrition knowledge (Oli et al., 2015b). There is evidence that peer mentoring can help to control diabetes (Annon., 2005, van Olmen et al., 2016, van Pelt et al., 2015) suggesting that this is a valuable intervention to explore. Role modelling and peer support could involve BCT 6.1 demonstration of behaviour, found to be potentially effective in Study 1, to illustrate healthy dietary behaviour. Evidently, role modelling and peer support has high technical feasibility.

7.3.14.4 Organisational feasibility - medium

Peer support/role modelling has medium organisational feasibility as no current infrastructure to implement peer support exists, as confirmed by health workers in Study 2. Therefore, this

infrastructure would need to be developed within the health system. However, health workers were positive about the prospect of training and using peer support programmes to support their work.

7.3.14.5 Gender, cultural and political feasibility - high

Peer support/role modelling has high gender/cultural/political feasibility because peer supporters/role models are able to adapt dietary advice to others within their own community according to gender, ethnicity and other social factors. Furthermore, patients in Study 2 already showed a willingness to support their peers with advice.

7.3.14.6 Financial feasibility - medium

This intervention has medium financial feasibility because health worker time would be needed to facilitate the peer support and role modelling activities. Health workers interviewed in Study 2 stated they had little spare time to support such activities with their current workloads.

7.3.15 Community gardens

[Health promotion in groups - Person to person methods]

7.3.15.1 Intervention description

Community gardens use a shared space in the community to grow fruit and vegetables for the benefit of the community who tend the garden to share amongst themselves.

7.3.15.2 Evidence for intervention

Though vegetable markets have been mapped in Kathmandu and they are plentiful (Resource Centre for Primary Health Care, 2015), the opportunities for people to grow their own fruit and vegetables in the city, and potentially save financially, are limited. During Study 2, one couple interviewed stated that they used to have a vegetable patch in their rural home and grow healthy food to eat from it. However, since moving to Kathmandu, they found it impossible to grow their own fruit and vegetables due to time and space restrictions:

'In comparison to Kathmandu... When we were back in Chitwan [a rural district of Nepal] we cultivated our own vegetables and we used to eat them but now we have to buy them.' Male diabetic

Using this evidence, it is possible to suggest an intervention in the form of community-run gardens to improve dietary behaviour. These gardens would address the physical environment and enable the growing of healthy fruit and vegetables which members of the community could then eat for free, not needing to pay for these healthy foods.

7.3.15.3 Technical effectiveness - medium

Community based initiatives allowing for communities to grow their own healthy foods are limited, some do exist but they are not widespread in Kathmandu (Hariyo Chowk, 2018). Other research has advocated that if seeds, space and tools are provided, gardens have potential to have high yields of healthy foods and therefore be highly technically effective to reduce diabetes (Carney et al., 2012, Schreinemachers et al., 2017). BCTs which could be used in this intervention are 7.1 Prompts and cues and 12.1 restructuring the physical environment. However, gardens have not been tested for technical effectiveness in the busy urban setting of Kathmandu, therefore they score medium for technical effectiveness.

7.3.15.4 Organisational feasibility - medium

This intervention has medium organisational feasibility as incorporating it within existing health structures would be complicated, though there is a possibility gardens could be supported by agricultural or social affairs ministries.

7.3.15.5 Gender, cultural and political feasibility - medium

Gardens have medium gender/cultural/political feasibility as they require a high degree of involvement and commitment from the community to maintain and this could involve a cultural shift in already busy urban lives, as discussed by several patients in Study 2. Patients in Study 2 stated that community gardens, though a positive and potentially useful intervention, would largely fall to women to maintain as cooking and gardening were largely seen as female responsibilities. Several female patients stated that they were unsure if such a burden would work alongside their other commitments and busy schedules. Patients and health workers stated that maintenance of the gardens would depend on the time members of the community have to spend on them which could be limited due to pressures of urban living. Political backing for gardens may be difficult as they may not easily be integrated into the health system.

7.3.15.6 Financial feasibility - medium

Community gardens have medium financial feasibility as they are potentially costly as they require land and materials and maintain. However, when gardens are successfully producing healthy food, members of the community could stand to benefit financially as they would have to buy less produce from markets.

7.3.16 Interventions using influential leaders

[Health promotion in groups - Person to person methods]

7.3.16.1 Intervention description

Interventions using influential leaders, sometimes called popular opinion leaders, involve engaging influential and trusted cultural leaders in health promotion. These leaders are people who influence the opinions, attitudes, beliefs, motivations or behaviours of others. An example might be enlisting a religious leader or famous actor in promoting healthy dietary behaviour to those people who follow/respect her/him.

7.3.16.2 Evidence for intervention

Results from Study 2 showed the influence of religion in Kathmandu, for example, in dictating feasts and festivals throughout the year. As illustrated in Chapter 4, patients stated that there were religious reasons for their dietary behaviours. Therefore, harnessing the influence of religious leaders as part of an intervention holds potential to instigate behaviour change. There is evidence from other research of religious leaders successfully promoting health messages in diabetes prevention (Rivera-Hernandez, 2015), amongst Hindu religious figures (Mehta and Pramanik, 2010) and engaging other religious leaders (Campbell et al., 2007, Jane et al., 2002, Ruijs et al., 2013, Sewankambo and Mafigiri, 2017, Webb et al., 2013). Cultural leaders could also be expanded to include celebrities or respected figures in politics or society. Celebrities have been used successfully in YouTube videos to promote healthy lifestyle and prevent diabetes (Sanchar, 2015). This video had been seen by several patients and was favourably reviewed. Furthermore, trusted opinion leaders have been found in research to be effective in promoting behaviour change (Valente and Pumpuang, 2007), trust being an important element in the relationship between influencer and influenced.

7.3.16.3 Technical effectiveness - medium

Health promotion by influential leaders has a medium level of technical effectiveness because it could incorporate the following BCTs; 7.1 Prompts and cues, 3.1 Social support, 9.1 Credible source and 6.1 Demonstration of behaviour (found to be effective in Study 1). To achieve high technical effectiveness, this intervention would require an accompanying intervention whereby influential leaders are given extensive training (similar to that health workers would receive) on how to disseminate dietary information. However, evidence from Study 2 showed the influence and trust of leaders in the spheres of religion (influencing religious dietary practices) and popular culture (e.g. YouTube videos of celebrities on diabetes prevention videos) was high. Therefore, this intervention ranks medium on technical effectiveness.

7.3.16.4 Organisational feasibility - medium

This intervention would have medium organisational feasibility because, if it involved religious leaders, embedding religious components in a secular organisational structure (as exists in Nepal) could be challenging. However, other use of leaders could be embedded in outreach activities of health facilities.

7.3.16.5 Gender, cultural and political feasibility – high

The intervention has high gender/cultural/political feasibility because Study 2 has shown that cultural leaders (e.g. religious leaders, celebrities) had influence over patients interviewed and this influence could potentially be used to deliver nutrition education and other positive dietary messages. Influential leaders could also have influence over specific genders, ethnicities and religions.

7.3.16.6 Financial feasibility - high

The intervention has high financial feasibility because costs will be potentially minimal as a relatively small number of influential leaders would need to be enlisted in/trained for the intervention and existing mechanisms, e.g. religious gatherings, could be used to disseminate messages with minimal cost.

7.3.17 Excluded interventions

Using the feasibility criteria outlined above, and in consultation with members of the research team (Rebecca King and Andrew Prestwich), I shortlisted the nine interventions detailed above to undertake further feasibility testing in Study 3. These shortlisted interventions all scored 9 or above overall and did not have a low feasibility score in any feasibility category. Additionally, some interventions gathered from Study 2 scored lower than 9 and were therefore excluded at this stage. Excluded interventions included:

- Self-monitoring of behaviour – scored low on gender/political/cultural feasibility because it was seen by some patients in Study 2 as intrusive or time-consuming. Although shown to be effective in other research (Vorley, 2018), some patients interviewed in Study 2 expressed reluctance to record data, or suggested they might not record accurate data to portray a more positive image of their behaviour.
- Diabetes café and shop selling healthy food options– scored low on organisational feasibility. It would be difficult to incorporate café provisioning into health policy. Additionally, such an intervention would require effective integration into the community and it is difficult to prove its technical and financial feasibility with other research evidence.

- Fellowship scheme for health professionals – scored low on financial feasibility as could be costly because health professional time needs to be covered as does costs of travel and education of the health professional completing the fellowship.
- Mass media campaigns – scored low on financial feasibility. To appropriately tailor this intervention to different populations it would be expensive. The intervention required for this thesis needed to be focused on ensuring the *socio-cultural appropriateness* of the intervention to context and it was decided by the research team assessing the interventions that this would be difficult to achieve in a financially feasible way with mass media campaigns.

Furthermore, there was one proposed intervention which was informally already part of everyday practice. This intervention was encouragement to take family members to appointments and counsel them on healthy eating behaviours. I therefore decided not to include it in the next stage. However, presence of such an intervention did suggest that social support could be an important mechanism to engage in an intervention to bring about change.

7.3.18 Considering interventions in order of feasibility

Table 6 displays potential interventions and their feasibility scores after synthesis of the data collected from Study 2. I assigned a numerical value to each ranking to allow me to calculate an overall score of feasibility for each intervention. An intervention which ranked 'High' gained 3 points, 'medium' gained 2 points and 'low' gained 1 point. The final column of Table 6 shows the total points for intervention following the feasibility assessment. The most feasible option was printed materials, followed by videos. These top-ranking options require a consideration of the contexts in which they would be distributed, which will be addressed further in Chapter 9. Three interventions take joint third place (training health workers, peer support/role modelling and engaging influential leaders), community camps take sixth place and three interventions take joint seventh place (text messages, social media messages and community gardens). The next stage of this project will continue to model intervention proposals based on their feasibility after further feasibility assessments. My method of ranking is not without its limitations (full discussion of limitations is provided in Chapter 9). However, overall the ranking process provided a useful and practical way of interpreting my data. My ranking process demonstrates how predominately qualitative data can be interpreted in a pragmatic way to present useful outputs about intervention feasibility when this has not been done widely in research before.

Table 6: Results of feasibility assessment of intervention proposals

Intervention proposal [Study intervention was generated from is provided in brackets]	Feasibility (3 = high feasibility, 2 = medium feasibility, 1 = low feasibility)				Overall score of feasibility	Overall ranking
	TE	OF	GCPF	FF		
Printed materials [2]	3	3	3	3	12	1
Community camps [2]	2	2	3	2	9	6
Text messages [2]	2	2	2	2	8	=7
Social media messages [2]	2	2	2	2	8	=7
Videos [2]	3	2	3	3	11	2
Training health workers [2]	3	3	2	2	10	=3
Peer education/role modelling [1&2]	3	2	3	2	10	=3
Community gardens [2]	2	2	2	2	8	=7
Engaging influential leaders [2]	2	2	3	3	10	=3
Self-monitoring of behaviour [1]	2	2	1	2	7	=12
Taking family member to appointment [2]	3	1	1	2	8	=10
Diabetes café and shop selling healthy food [2]	1	1	2	1	5	14
Fellowship scheme for health professionals [2]	3	2	2	1	8	=10
Mass media campaigns [2]	2	2	2	1	7	=12

KEY: TE = Technical effectiveness; OF = Organisational feasibility; GCPF = Gender, cultural and political feasibility; FF = Financial feasibility; SC = Scalability; SB = Sustainability

My list of fourteen interventions spanned the environments in my ecological model and were generated from Study 2, Study 1 or both [see Table 6 for detail]. I value the two evidence sources of Studies 1 and 2 as similar, because though Study 2 results are not RCT tested, they came directly from the context in which the intervention would need to be implemented, giving these proposals potentially a large amount of contextual suitability. Each intervention proposed would target a range of the determinants, crossing the ecological model presented in Chapter 4, for example peer education/role modelling would address a variety of determinants by providing socio-culturally specific social support for developing food/cooking skills. The detail of the environments each intervention would intersect requires further investigation and will be explored in later chapters, particularly in Chapter 9 – 9.2.7 where Figure 16 indicates how final intervention packages map on to the ecological model.

7.3.19 Type of Interventions

Table 7 shows in which categories my initial 14 interventions fall (some are loosely categorised, such as community gardens) according to their scale of delivery Hubley and Copeman (2018). No interventions fell within the advocacy category. This classification helps to differentiate between the different interventions that I have identified and organises them according to health promotion method. Though this classification does not directly affect the ranking of the interventions, it is useful for assessing preferences for person-to-person/media/advocacy interventions and the type of intervention within these which may be the most feasible.

Table 7: Mapping my intervention proposals on to categories of health promotion methods as categorised by Hubley and Copeman (2018)

[Italicised interventions were excluded after Study 2]

Person-to-Person methods		Media methods		
1-2-1 Communication	Health promotion in groups	Mass media	Print media	Electronic media and internet
<i>Self-monitoring of behaviour (taught by 1-2-1 communication)</i>	Community camps	<i>Mass media campaigns</i>	Printed materials	Text messages
Peer education/modelling (if 1-2-1)	Peer education/ modelling (if group)	Videos (if large scale dissemination)		Social media messages
Health worker training (leading to interactions between patients and health workers) Including fellowship scheme	<i>Encouraging family member to attend appointments</i>			Videos (if disseminated on electronic media)
	Engaging influential leaders			
	Health worker training (process of delivering healthy diet messages to small groups)			
	Community gardens			
	<i>Diabetes café/shop</i>			

7.4 Conclusion

This chapter has analysed findings from Studies 1 and 2 to address the two main objectives; a) to consolidate and justify the proposal of potential interventions to improve dietary behaviour;

and b) to conduct an initial feasibility assessment of these interventions. The first stage of feasibility assessment narrowed down fourteen intervention proposals to nine. Of the fourteen intervention proposals, those which scored low in any category and 8 points or below were excluded from the list due to overall low feasibility. I therefore put forward nine shortlisted intervention proposals which could lead to positive dietary behaviour change with a consideration of the organisational and SSC environment. The next stage in the process was to further assess the feasibility of the shortlisted nine proposals. This further testing was with key stakeholder groups. Workshops and interviews with key stakeholders in the context of Kathmandu enabled me to further assess the proposals for culturally appropriate and compelling interventions to bring about dietary behaviour change.

Chapter 8 Methods and results from Study 3 - workshops and interviews to investigate intervention feasibility

8.1 Introduction

This chapter reports the methods and results from Study 3 and represents a continuation of the modelling process of an intervention (Medical Research Council, 2006). This also corresponds with step four of the 6SQuID Steps to Intervention Development which is: 'identifying how to deliver the change mechanism' (Wight et al., 2015). In Chapter 7, I compiled a list of feasible intervention proposals based on findings from studies 1 (systematic review) and 2 (data collection from a range of stakeholders in Kathmandu). I then conducted an initial assessment of their feasibility (technical, organisational, gender/cultural/political and financial). I chose to further explore the feasibility of potential interventions by conducting a series of workshops and further semi-structured [SSI] interviews with the groups consulted in Study 2.

Workshops would add validity and credibility to the next part of the modelling process. They have been shown to stimulate discussion between participants who have commonality and encourage common discussion (Skovdal and Cornish, 2015). Workshops allow for the continuation of a dialogue with the four different groups (1. patients, 2. health workers and 3. policymakers and 4. researchers) who helped to form knowledge and insights on the determinants of dietary behaviour amongst the target population. Dialogues which can emerge from workshops, stem from listening to narratives and can be seen as the basis of praxis - the unity of theory and action (Freire, 1970). These dialogues can offer an important insight as a tool of democratic communication and can form the basis of transformational change (Ledwith and Springett, 2010). Workshops are a well-tested participatory technique for eliciting authentic research contributions (Green and Thorogood, 2009, Breuer et al., 2014, Carr et al., 2003, Cote-Arsenault and Morrison-Beedy, 2005, Kitzinger, 1995, Tausch and Menold, 2016, Chambers, 2002). The workshops in Study 3 build on previously established relationships with participants in each of the groups interviewed and aimed to elicit a clearer understanding of the type of interventions which would be feasible. These workshops were supplemented with further semi-structured interviews [SSI's]. As discussed in Chapter 7, little guidance exists in the research about how to use both quantitative and qualitative data sets to rank a series of interventions. This chapter therefore builds on the work in Chapter 7 to use qualitative and quantitative data in a constructive and practical manner to generate useful outputs. This chapter begins by explaining the methods I used and goes on to discuss subsequent results gathered from Study 3.

8.2 Aims and objectives

Study 3 aimed to further investigate the feasibility, including scalability and sustainability, of nine intervention proposals to improve dietary behaviour.

The objectives of Study 3 were to:

1. Conduct a secondary feasibility assessment of key interventions
2. Rank and identify the overall most feasible intervention proposals to take forward

8.3 Study design

8.3.1 Separating participants in workshops

I decided to separate the four groups – 1. Patients, 2. Health workers and 3. Policymakers and 4. Researchers so as to minimise the impact of power dynamics between the groups. As has been found previously, successful dialogue requires participation of all stakeholders, setting aside organisational or professional positions, and other external sources of power (Ledwith and Springett, 2010). I also decided to conduct separate workshops for male and female patients. This was because, in Study 2, I observed that women and men often had different attitudes, and men's views sometimes dominated women's when they are interviewed together. Other research supports my findings; interventions have often been developed for men and women separately. Nine studies from Study 1 were targeted at a specific gender (8 female, 1 male), and multiple studies have shown gender differences in dietary behaviours in Nepal (Shakya et al., 2015, Smith, 2013, Sudo et al., 2005, Sudo et al., 2009). This further demonstrated a gender-sensitive approach to my research.

8.3.2 Order of the data collection

1. Workshop with researchers from HERD
2. Workshop with male patients
3. Workshop with female patients
4. Workshop with health workers
5. SSI interviews with individual health workers, policymakers and researchers

I conducted the researcher workshop first, to provide a good overview of what might or might not work in the broader, macro context and raise awareness amongst the team at HERD of my project objectives prior to conducting the other workshops (which some members of HERD would help me with). I then conducted the two patient workshops, followed by the health worker workshop. I chose to conduct the patient interviews before the health worker interviews to enable findings from the patients, and issues they raised to inform discussions with health workers about feasibility within the health system. I was unable to gather enough policymakers together at the same time to conduct a workshop with them so I conducted SSI interviews with two key policymakers, one researcher and one health worker after I had conducted the patient workshops. I chose to order the data collection in this way to allow my ideas to evolve and for iterative adaptations after initially testing the workshop design with the HERD team who were experienced in engaging in research workshops.

8.3.3 Refining feasibility criterion for Study 3

8.3.3.1 Sustainability

In addition to the feasibility criteria stated by Walley and Wright (2010) I have added into this stage of feasibility assessment the important consideration of sustainability. Sustainability is important as practitioners and funders are increasingly focused on the need to allocate scarce resources effectively and efficiently (Swerissen and Crisp, 2004). A sustainable intervention will be able to be delivered over a long period and embedded into existing structures to ensure its long-term impact and success (Shediac-Rizkallah and Bone, 1998, Swerissen and Crisp, 2004). Sustainability is related to organisational and financial feasibility, as to be sustainable, an intervention is likely to fit well into existing organisational structures, involve political will for its implementation and not be too expensive to sustain. Despite being linked to existing criteria, I wanted to explore sustainability in more detail in this next stage of the feasibility assessment

because the sustainability of an intervention is more specific than considering whether it will fit into existing organisational structures [i.e. organisational feasibility]. There has been some ambiguity around the use of the term sustainability in public health interventions (Walugembe et al., 2019). However, agreement has emerged around the conditions needed for sustainability. These include ensuring supportive context (e.g. political and organisational), capacity building (e.g. with stakeholders or communities), effective partnerships and careful planning (Smith et al., 2014). Whilst considering the criterion of sustainability, I took into account that not all interventions need to be sustained to be useful or effective (e.g. if dietary behaviour change is achieved after a short intervention, this intervention would not necessarily need to be continued). Similarly, a sustained intervention does not necessarily result in sustained outcomes (e.g. a long-term intervention to improve dietary behaviour through text message reminders may not necessarily result in sustained behaviour change – these messages may only be effective for a short time).

8.3.3.2 Scalability

I also added another criterion, that of scalability. Scalability is the ability of a health intervention to be expanded from small-scale to reach a greater proportion of the eligible population while retaining its effectiveness (Redman et al., 2012). There is a growing acknowledgement amongst policymakers, research funders and researchers that there is a need for interventions which can be adopted more widely and at scale (Rubenstein and Pugh, 2006, National Institutes of Health, 2011). Scalability is generally assumed to be based on its effectiveness and cost-effectiveness as well as other criteria such as political feasibility and acceptability, as to be scalable an intervention must be politically endorsed by government so that it can be scaled up nationally (Vos T. et al., 2010). Therefore, considerations of scalability are connected to, but distinct from political feasibility.

8.4 Re-prioritising the feasibility criteria which were used in Study 2

For Study 3, I decided to undertake new discussions of two of the four criteria discussed in Study 2; *gender cultural and political feasibility [GCP]* and *organisational feasibility* and not repeat discussions of *technical and financial*. This was partly due to time constraints in the workshops to cover multiple criteria, particularly after adding scalability and sustainability as new feasibility considerations. Furthermore, GCP and organisational feasibility were chosen because Study 2 data suggested that they would elicit more discussion from participants about interventions than technical or financial feasibility. Additionally, GCP feasibility aligns with what this research has so far found to be important; socio-cultural context including gender and intersectional issues (see specifically Chapter 4 and Chapter 6), and political aspects connected with the health system (see Chapter 5). Organisational feasibility also correlates closely with my findings and discussion of factors influencing diabetes care in the health system (see Chapter 5). However, there were also other reasons for including/excluding criteria in Study 3, which are documented in Table 8. Despite not considering technical and financial feasibility criteria for a second time with the data from workshop and interview guides, the feasibility results relating from these criteria from Study 2 were embedded in my overall ranking of the interventions, as can be seen later in Table 13.

Table 8: Criterion used to assess feasibility of interventions

Criterion	Included in Study 2?	Included or excluded in Study 3?	Reason for inclusion/exclusion
Gender cultural and political feasibility [GCP]	Yes	Yes	<ul style="list-style-type: none"> The richness of the findings about GCP in Study 2 meant that there was high likelihood that further insights could be provided by participants, particularly by patients, in Study 3.
Organisational feasibility	Yes	Yes	<ul style="list-style-type: none"> Findings from Study 2 suggested that further insights could be provided about this criterion, particularly by health workers and policymakers, into the organisational functioning of the health system in relation to the intervention proposals following my in-depth and complex findings uncovered about the supply and demand of interventions in Study 2.
Technical feasibility	Yes	No	<ul style="list-style-type: none"> The lack of richness of findings in Study 2 on this criterion and The likelihood that the evidence for technical effectiveness of interventions (e.g. print media compared to text message reminders) would not have changed significantly between studies 2 and 3
Financial feasibility	Yes	No	<ul style="list-style-type: none"> The difficulty of finding rich evidence from qualitative research about cost-effectiveness of interventions The likelihood that the evidence would not have changed significantly between studies 2 and 3
Scalability	No	Yes	<ul style="list-style-type: none"> There is a growing acknowledgement amongst policymakers, research funders and researchers that there is a need for interventions which can be adopted more widely and at scale
Sustainability	No	Yes	<ul style="list-style-type: none"> The sustainability of an intervention is more specific than considering whether it will fit into existing organisational structures [i.e. organisational feasibility].

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- Sustainability is increasingly important as practitioners and funders become increasingly focused on the need to allocate scarce resources effectively and efficiently.
-

8.4.1 Content of workshops – development of the workshop plans

I wanted to allow discussion to flow rather than overly structuring the workshops. Therefore, I focused on five main discussion areas:

1. The feasibility of the interventions (according to the four feasibility criteria in 8.4)
2. The appropriateness of the *content* of dietary messages in the intervention. Dietary messages were taken from a combination of dietician recommendations for Nepali culture from the data collected in Study 2, and international guidelines (American Diabetes Association, 2018, Diabetes UK, 2018, NHS England, 2018, WHO, 2019, American Diabetes Association, 2015). International guidelines were adapted in consultation with three dieticians involved in studies 2 and 3, and members of the HERD team to ensure they were appropriate for a Nepalese context (as best as is possible when considering the wide range of different ethnic and religious practices, genders and dietary norms in Kathmandu). These messages centred around cooking healthy foods, foods which can be eaten, healthy eating during festivals, including your family members, frequency of eating and maintaining a healthy lifestyle (more detail can be found in appendix C.2). I wanted to understand how appropriate participants thought these messages were.
3. How these dietary messages should be transmitted through various *forms of media* (e.g. print media, mass media, electronic media) as categorised by (Hubley and Copeman, 2018)
4. The feasibility of interventions based on the *type of groups* involved in delivering them according to categories by Hubley and Copeman (2018), such as one-to-one communication (e.g. peer support) and health promotion with groups (e.g. community camps).
5. [Connected to 3. and 4.] What type of dietary support interventions are in supply and/or demand?

The interventions proposals incorporated a combination of different forms of media and types of groups to deliver interventions. Throughout these discussions I wanted to consider the feasibility based on Walley and Wright (2010) as well as the scalability and sustainability of the intervention proposals. I also wanted to ensure my intervention proposals were considered in the context of which dietary interventions were in supply and/or demand by people with HBGLs/diabetes.

To ensure that the facilitator was able to give a concise description of each intervention, prior to the workshops I prepared a short description of each intervention which was no longer than 250 words so that they could be read out in approximately 2 minutes (see appendix C.3). I ensured that these verbal descriptions were accompanied by pictorial representations of the interventions, with each intervention having one 'icon' assigned to it which the participants could then associate with it when discussing their preferred interventions. This was to ensure that illiterate participants understood the interventions and could fully participate.

Following the description of each intervention proposal, participants were asked key questions probing their views about which interventions they thought would be most feasible and why. I ordered the questions with the most important first, in case time ran out and there was no time for the later questions. Example workshop plans and interview guides used in Study 3 can be found in appendix C.4.

8.4.2 Use of logic models

Logic models are a systematic and visual way to present and share an understanding of relationships amongst the resources needed to implement a planned intervention, the activities planned and the changes or results which are hoped to be achieved (Funnell and Rogers, 2011). I decided to use logic models because they are helpful at various stages of programmes and interventions; development, implementation/delivery and evaluation. Using logic models allowed me to engage participants with the intervention proposals and stimulate an in-depth discussion of specific functional aspects of intervention implementation.

There is criticism of some logic models for not incorporating context. Current debates around the use of logic models criticise researchers for overlooking the important role of context in logic model design, construction and usage (Renger et al., 2015). However, context is key to my research, so I paid particular attention to incorporating it. To do so, I drew on existing research which advocates the use of logic models to model interventions that adapt to context (Ebenso et al., 2019, Mills et al., 2019, Renger et al., 2015).

Logic models can be targeted at facilitators (such as health workers or policymakers) to enable them to assess settings and develop context-sensitive suggestions for implementation (Mills et al., 2019). This can be done by context mapping within the logic modelling process which visualises many of the underlying causes of a problem (Renger et al., 2015). The value of logic models as a tool to provide an in-depth consideration of context was a particularly important aspect for my research following the emergence from Study 2 of data indicating the importance of considering socio-cultural context in intervention development in Kathmandu. Developing logic models has been shown by recent research to be an essential step for identifying initial hypotheses for specific contexts, mechanisms and outcomes (Ebenso et al., 2019), showing their value for my investigation of appropriate interventions in Kathmandu. Therefore, I decided to use logic models to identify initial hypotheses in an in-depth context. Additionally, logic models had been used successfully by my research partners HERD as a form of engagement with participant groups and to stimulate in-depth discussion of specific functional aspects of intervention implementation. They also form part of the intervention development process outlined by the MRC guidelines for the development of complex interventions (Medical Research Council, 2006).

I focused on using the models for implementation development, a stage at which they have been used successfully (Bartholomew and Mullen, 2011, The Health Compass, 2018, Funnell and Rogers, 2011). This allowed for consideration of how each input and activity would link to the outcomes and the resource requirements for key activities. Consideration of these factors helped to inform judgements about the feasibility of the interventions. The process also allowed for scrutiny of the plausibility of the model and identification of potential weak links in the intervention which may be improved prior to implementation. The logic models were adapted from those used by Funnell and Rogers (2011) and focused on three aspects: resources – what is needed for the intervention to be successful; activities – what are the processes, techniques, tools, events, technology, actions needed for the intervention including products, materials, services or infrastructure; and outputs – what are the direct results of the intervention

(materials produced, hours of each service provided etc.) [see Figure 15]. The outcomes (short and long term) and impact were similar for all of the interventions, so I decided to focus on the first three elements of the logic models.

In the researcher workshop, I asked participants to complete logic models for the intervention proposals. I did not use them in the other workshops due to time constraints and their complex nature which would have been time-consuming to explain to health workers and patients. Also these two groups had limited knowledge of wider implementation issues for the interventions I proposed. Participants in the researcher workshop were asked to think generally about the resources needed for the intervention to be successful (e.g. for printed media, printing materials). Participants were also asked to consider the processes, techniques, tools, events, technology and actions involved in the intervention (e.g. designing, printing and then distributing printed media). Finally, participants were asked to fill in the direct results they expected from the interventions, (e.g. 5 community based meetings between dieticians and patients to disseminate dietary advice or 4000 printed posters and leaflets). I split the researchers in the workshop into groups and assigned each group one intervention proposal to assess within the logic model structure. This allowed for in-depth discussion of each intervention grouping in the time available. A whole group discussion following this activity involved each task group feeding back to the whole group about their models. Completed logic models can be seen in Appendix C.7.

Resources	Activities	Outputs	Outcomes (short and long term)	Impact
What resources are needed for the intervention to be successful?	What are the processes, techniques, tools, events, technology and actions of the intervention? products/materials, services or infrastructure	Direct results: could be number of meetings, materials produced, participation rates and demography, hours of each service provided etc.	Changes in attitudes, behaviours, knowledge, skills, status or level of functioning	Organisational, community or system level changes
			<p><u>Short term</u> Improved capability, opportunity and motivation to eat more healthily</p> <p><u>Long term</u> Skills to maintain sustainable dietary change</p> <p>Scalable for implementation in other parts of Nepal (rural and urban)</p> <p>Integration into health system</p>	<p>Healthier and improved dietary behaviour amongst patients with diabetes, high blood glucose levels and their families</p> <p>Improved health system with better prevention and treatment of diabetes</p>

Figure 15: Logic model template

8.4.3 Incentives for participation

I offered patients who attended the workshops reimbursement for their travel costs to and from the HERD offices where the workshops were held, lunch and refreshments (appropriate for diabetes patients) and dietary advice from a professional dietician before/after the workshop. The dietician was provided with a small remuneration for coming to both patient workshops to offer dietary advice. For health workers I provided reimbursement of their travel costs to and from the HERD offices where the workshops were held, lunch and refreshments. The HERD team and policymakers I interviewed offered their time for free.

8.4.4 Consent, withdrawal from Study and data management/protection

All participants provided written consent. Ethical approval was the same as that provided for Study 2 (see Chapter 1). Similarly, data management and protection procedures were the same as those described in the ethics statements relevant to Study 2 in Chapter 1. Participants were allowed to ask questions before and after the workshops. Once the workshop had started, participants were free to leave if they wanted to. Participants had these conditions explained to them prior to the start of the workshops and it was written in the participant information sheet and consent form.

8.4.5 Facilitation of workshops

As three workshops had to be held in Nepali, I delegated the running of these to a Nepalese researcher who had been involved in Study 2 of the project so had appropriate background and awareness of the project aims and objectives. I facilitated the researcher workshop and conducted interviews with policymakers in English. I was present at all of the workshops, and when the workshops were held in Nepali, a researcher helped to translate key discussions so that I was able to input with questions and probes when I felt it necessary. Recordings of the workshops were then translated and transcribed.

8.5 Translation and transcription

I followed the same method of translation and transcription as described in Chapter 1 and checked a sample of three transcripts for translation consistency.

8.6 Data analysis

The interview transcripts were analysed using the Framework Approach (Gale et al., 2013). This approach was selected to allow themes to emerge inductively from the data, and also to allow pre-determined objectives to lead to deductive analysis. This was a similar process to the one I used in Study 2. I developed my coding framework for Study 3 around the central aims and objectives of the Study. As can be seen in my coding framework (appendix C.6), I developed codes around the three key areas; (1) intervention characteristics including the four specified feasibility criteria, the content of the intervention, consideration of combining interventions together, location/target population and promotion of intervention; (2) government policy and what is being done [supply] to support diabetes patients; (3) gaps in government policy – what is in demand but not in supply. These categories aided the presentation of my results for each intervention proposal. I also conducted a second document review to include any newly updated policies or materials relating to the supply of diabetes support in Nepal [as well as current dietary advice materials] (see Appendix C.1). I used this review to inform my analysis of the findings of Study 3, particularly around macro policy-level factors.

8.7 Sample of participants

8.7.1 Sample

I undertook purposive sampling to select my sample for Study 3. This involved considering; a) participant characteristics (e.g. ethnicity, gender), b) what each person could contribute according to their area of expertise or experience and c) taking advice from our partners at HERD as to which individuals would interact well with others in a workshop setting. Participants for the workshops were selected from those interviewed previously in Study 2 (n=12), with the addition of some who had not been interviewed in Study 2 previously [patients (n=2), health workers (n=1), researchers (n=12) and policymakers (n=2)]. Those policymakers and health workers who had not been interviewed before were chosen because they could offer valuable insights into the specific intervention areas I wanted to explore, for example research experts on interventions implemented for people with diabetes. Those participants who had taken part in Study 2 were recruited by telephone. Of those participants not involved in Study 2, policymakers and health workers were initially telephoned and asked if they would like to participate in the project. Patients not recruited in Study 2 were recruited by a research assistant who attended a public hospital during diabetes clinic times in the same way and location as recruitment was done for Study 2.

8.7.1.1 Patients

I selected a range of patients for these groups according to age, ethnic caste identifier, religion, condition (diabetes/HBGLs) and gender (see

Table 9). Regarding the classification of 'ethnic caste identifier' I settled on this classification after reflecting on the ethnicities I collected from Study 2. In Study 2 Newari was commonly given by participants as their ethnic identifier, this is the ethnicity of the original inhabitants in Kathmandu. I had also recorded hill groups such as Sherpa, Magar and Rai. Participants had defined themselves as sitting in the Caste system (e.g. Brahmin) or by ethnic group (e.g. Newari), and sometimes by both (though I only recorded the first ethnic identifier participants supplied in Study 2). Therefore, I decided to select a sample of patients according to ethnic caste identifiers collected from Study 2– this meant a mixture of Brahmin, Chhetry, Newar and other groups (Sherpa, Magar and Rai). Due to the limited availability of many participants I found it difficult to select a completely equal range of ethnicities, religions and ages.

Table 9 shows my purposively selected patient sample for the workshops. There were 5 Newar (1 male, 4 female), 2 Brahmin (both male) and 1 Chhetry (male). Four patients had diabetes and 4 had HBGLs (3 male diabetes patients, 1 with HBGLs; 3 female patients with diabetes, 1 with HBGLs). All of the patients were between 45-59 years old because the younger age group were difficult to recruit due to work commitments during the daytime when the workshops were held. All participants in our workshops were Hindu and 2 had been interviewed in Study 2 with their partners, 4 had been interviewed in Study 2 without their partners and 2 had not been interviewed for the project previously. I decided not to involve partners of patients in the workshops for several reasons. First, practically, patients were difficult to recruit due to day-time commitments, their partners were equally difficult to recruit. Second, in Study 3 I was interested in the patient's perspective on interventions which would help them to change their behaviour. Whilst partner input to these discussions would be helpful, the interventions were

to be focused primarily on people with diabetes/HBGLs and therefore their opinions were the most relevant at this stage of the research.

Table 9: Patient sample for Study 3

ID from Study 2	Condition	Age	Gender	Interview type (Study 2)	Ethnicity	Religion
1	Diabetes	46	Male	Single	Newar	Hindu
12	Diabetes	55	Male	Partner	Brahmin	Hindu
26	Diabetes	45	Male	Partner	Chhetry	Hindu
68	HBGLs	51	Male	Single	Brahmin	Hindu
23	HBGLs	52	Female	Single	Newar	Hindu
33	Diabetes	59	Female	Single	Newar	Hindu
N/A	HBGLs	45	Female	Not interviewed in Study 2	Newar	Hindu
N/A	HBGLs	55	Female	Not interviewed in Study 2	Newar	Hindu

8.7.1.2 Health workers

I selected four health workers from those I interviewed in Study 2, with the addition of one extra health worker (04) who I expected would offer valuable insights into patient care and who had experience in treating patients from different backgrounds [Table 10]. Two health workers were from private health facilities and 3 were from public facilities. I recruited 3 dieticians, one health worker in a community clinic and one doctor. All had experience of treating a variety of diabetes patients and many had experience providing dietary advice to diabetes patients.

Table 10: Health worker sample for Study 3

ID [Study 3]	Position	Sector	Institution	Reason for inclusion
HW_01	Dietician	Private	Diabetes clinic	Knowledge of community engagement, experience of community camps. Lots of knowledge of dietary advice. Daily contact with diabetes patients.
HW_02	Dietician	Public	Public hospital	Knowledge of community engagement, experience of community camps. Lots of knowledge of dietary advice. Daily contact with diabetes patients.
HW_03	Dietician	Public	Public hospital	Knowledge of community engagement, experience of community camps. Lots of knowledge of dietary advice. Daily contact with diabetes patients.
HW_04	Health worker	Public	Urban Health clinic	Knowledge of community engagement. Daily contact with patients.
HW_05	Health worker (Doctor)	Private	Specialist clinic	Knowledge of treating patients from different backgrounds

8.7.1.3 Policymakers/researchers (interviews)

I conducted four SSI's with policymakers (2), researchers (1) and health workers (1) [Table 11]. These interviews followed similar structure and themes as the workshops. However, they differed from the workshops in that participants were asked more policy-level questions about government policy and other broader factors affecting diabetes support. Examples of the interview questions can be found in appendix C.5. I selected my interviewees from a range of government, NGO and private institutions. Two government officials from the Ministry of Health were selected to provide information about the government's current diabetes support. A researcher working on diabetes support was recruited to give perspective on NGO-led interventions for diabetes care and a doctor specialising in treatment of diabetes patients I had previously interviewed was recruited to provide information on patient needs and interventions which may work for her patients. This was a purposive sample, with interviewees chosen strategically so as to provide in-depth specialist knowledge on the issues around diabetes support which provided necessary insights for the development of the project.

Table 11: Policymaker and Researcher sample for Study 3

ID Number [Study 3]	Position	Sector	Institution	Reason for inclusion
PM_01	National Health Training Centre	Public	Ministry of health	Training of trainers, government training of health workers. Clinical experience.
PM_02	HERD	NGO	PEN and Diabetes Coordinator	Knowledge of PEN and how it is being implemented. Including social media and wider media campaigns and community engagement.
PM_03	National Health Training Centre	Public	Ministry of Health	Knowledge of government policy on NCDs – feasibility of larger scale interventions and infrastructures needed.
PM_04	Metro Hospital	Private	Doctor of Endocrinology	Knowledge of diabetes support, community camps, health care provided to patients in hospitals and community initiatives.

Overall, I conducted 4 workshops and 4 interviews with participants from a range of health facilities to gather as broad a perspective on health care services and patient needs as possible [Table 12]. In total 29 participants were involved in this phase of the project. There were more researchers available for the researcher workshop (n = 12) as it took place in the HERD offices where the researchers worked. The patient workshops (n = 8) and health workers (n = 5) were more difficult to recruit for as many patients and health workers were busy during the day and could not spare the time to travel to the HERD offices where the workshops were held.

Table 12: Full data collected for Study 3

Type of Data	Participant (s)
Workshop – researchers	12
Workshop – male patients	4
Workshop – female patients	4
Workshop – health workers	5
Interview – policymaker (PM1)	1
Interview – researcher (PM2)	1
Interview – policymaker (PM3)	1
Interview – health worker (PM4)	1
Total number of participants	29

8.8 Results from Study 3

8.8.1 Feasibility of all intervention proposals

Below I present discussion of my results from the workshop discussions and interviews in Study 3. This discussion provides justification for the rankings provided in the subsequent Table 13. In the workshops I attempted an activity whereby participants ranked the interventions according to the four feasibility criteria; organisational, GCP, scalability and sustainability. However, these concepts seemed abstract and complex for many participants and the ranking activity was not successful. Therefore, after the workshops I drew evidence out of the discussions relating to each of the feasibility criteria and I present this below.

I have structured the interventions primarily categorising the interventions using the same classifications as in Chapter 7 as identified by Hubley and Copeman (2018). I have then addressed each of the four criteria included in the study. In the interests of space, I have not included illustrative quotes under each criterion for each intervention but have included illustrative quotes under selected criteria where they are appropriate and include at least one quote under the discussion of each intervention proposal. I focus on validating my findings from Study 2 about GCP feasibility and organisational feasibility whilst providing discussion of any new insights in the areas of financial or technical feasibility if they arose. I also discuss the new criteria sustainability and scalability for each intervention proposal.

8.8.2 Printed material-based interventions

[Print media - Media methods]

8.8.2.1 Gender, cultural, political feasibility - high

Printed materials were generally seen by patients, health workers, policymakers and researchers as feasible for integration into existing lifestyle/culture. To be feasible, patients, health workers and researchers stated that materials must be located strategically in appropriate places. These places included frequented spaces such as temples, parks, shopping malls, bus parks, in hospitals and in community health centres. However, placing multiple leaflets in such locations may not be very cost-effective or environmentally friendly. Posters could be a more viable alternative. Patients and health workers stated that printed materials must contain attractive content, including pictures and cartoons to draw attention, which would also make them accessible to illiterate people. These should be appropriate to ethnicity and gender dependent on the target audience. Health workers stated that materials should contain messages which include strategies for encouraging families to eat healthy food (appropriate to ethnicity/caste) for the good of the health of everyone in the household. This could involve targeting materials at men to encourage them to participate in cooking healthy food and make healthy purchases as many patients stated that men did not currently participate in cooking healthy food. Such messages should be carefully constructed to ensure they do not reinforce gender inequalities. Also, materials should be ethnically targeted and adapted to festival times for different groups and provide healthy and culturally acceptable alternatives to unhealthy (e.g. fried or sugary) festival food. The government already produces health education materials, so doing so in a more contextualised way would be practical and politically feasible. Therefore, the printed materials were potentially highly feasible in the category of political/gender/cultural feasibility.

8.8.2.2 Organisational feasibility - high

To be organisationally feasible, policymakers reinforced that printed materials must be endorsed by the National Health Information Communication Centre which is tasked with

producing government funded health promotion materials. Collaboration with this department would be essential to ensure that this intervention could be embedded into existing government approaches towards promotion materials. With this collaboration, printed materials are highly feasible.

8.8.2.3 Sustainability - medium

Despite patient and health worker enthusiasm about the introduction of printed materials, some researchers urged caution about providing health facilities with printed materials and not providing any accompanying training to health workers on how to disseminate the materials:

'If you go to the health facility, then there are a lot of posters that have been sent. But they have been dumped in the corner and not used. Availability and use are two different things. So, unless you have an intervention to ensure they are used regularly, you are not going to get any results.' Participant, HERD workshop

This stresses the need to accompany printed materials with a suitable intervention strategy for dissemination to make this intervention highly sustainable. Therefore, currently the intervention ranks medium for sustainability.

8.8.2.4 Scalability - high

To ensure that this intervention tool was scalable, health workers and patients suggested that Ward offices could be useful for transmitting messages. Wards commonly consist of 30-50 households in Kathmandu:

'We could also give such information at the ward offices which will relay it onto the entire ward.' Participant, male patient's workshop

Using ward offices would ensure that messages could be regionally/contextually tailored as stressed as important by the BCW-SCC model, making the printed materials potentially highly scalable.

8.8.3 Community camps

[Health promotion in groups - Person to person methods]

8.8.3.1 Gender, cultural, political feasibility - high

The majority of patients believed that camps would actively engage all genders and members of communities of all ages because collective gatherings are common and work well in Nepalese culture (e.g. when large groups gather to attend temples or celebrate festivals). Some patients suggested community camps could be held outside religious venues such as the popular Pasupatinath temple in Kathmandu:

'We know that there are quite a lot of people visiting the temple on Saturdays. We could set up a tent outside the temple gates and provide the visiting people with information about diabetes.' Participant, male patients' workshop

Patients and health workers also highlighted the importance of the camps actively engaging attendees, e.g. through blood glucose testing, interaction with facilitators and other participants and other interactive activities such as cooking and using food models to understand portion sizing. No political support had been provided for existing camps, but policymakers interviewed

in Study 3 showed willingness to consider funding such activities. Camps therefore score high on GCP feasibility.

8.8.3.2 Organisational feasibility - medium

Health workers reported that community camps had been run sporadically by various hospitals indicating that they can function within the public health system. However, without regular funding and support these camps remained up to the health facilities themselves to organise. Public health facilities were overstretched and under resourced meaning health worker time was hard to find for organising extra activities such as camps. However, as advocated in Chapter 5, developing skills within organisations in running community programmes and developing a habit of using community mobilisers and FCHVs in community engagement projects such as community camps holds potential to promote healthy dietary behaviour. Community camps carry organisational feasibility if well supported through organisational structures, they therefore score medium on organisational feasibility.

8.8.3.3 Scalability - medium

Camps would require federal and municipal support to be successful. Both of which could be difficult if the camps are not part of another broader national strategy such as PEN. PEN was discussed by researchers as a potential vehicle which could involve community camps. More policymakers were aware of PEN in Study 3 than Study 2 (when it had been in its early stages). However, PEN is focussed on NCDs in general, not diabetes specifically, and on all NCD risk factors, not specifically dietary behaviour. This makes PEN's aims broader than those of this research and negotiation would be needed with policymakers to embed diabetes specific diet-related interventions into the national strategy. Therefore, whilst replicable, community camps (made contextually specific) could be scalable if they are incorporated into broader national strategies (which they are not currently) with a specific focus on diet and diabetes. Therefore, camps score medium on scalability.

8.8.3.4 Sustainability - medium

Health workers and researchers stated that community camps are feasible at the ward level, with people likely to attend them if they were held close to where they live. Patients suggested that to be sustainable, camps should incorporate culturally acceptable groups such as mothers' groups who are able to mobilise the community. Despite positive mechanisms within communities, health workers also warned about powerful organisations which have been used in some cases to exploit their own interests under the guise of delivering community camps. One health worker stated that camps are sometimes sponsored by pharmaceutical companies to promote medical products or can be used by private hospitals as marketing tools to try and recruit patients. This raises questions about the ethical reasoning behind some existing community events. Pharmaceutical companies and private hospitals can be motivated by profit and therefore not necessarily prioritise dietary advice over the promotion of (sometimes expensive) medicines to control diabetes. A sustainable community camp would therefore need to be driven by patients' interests and aim to provide them with cost-effective methods to manage their health and reduce the impact of diabetes. There is little written evidence which reports camps by pharmaceutical companies or private hospitals in Kathmandu. However, there is evidence of the influence of the company one health worker mentioned called Eli Lilly, an American pharmaceutical company in Kathmandu (Business Line, 2011). Furthermore, trust in pharmaceutical companies has been low in South Asia (Brhlikova et al., 2011) with unhealthy practices of drug promotion being reported by pharmaceutical companies in Nepal (Giri and Shankar, 2005). There have been calls for improvements to the materials supplied by drug

companies when they are promoting their products (Alam et al., 2009). This indicates that there are many potential flaws with health promotion activities run by pharmaceutical companies in Nepal. Additionally, some camps were criticised by health workers for being short-term and led by INGOs or private organisations for short periods, often parachuting into a community and leaving as quickly as they came, leading to a lack of sustainability, and some believe, causing more harm than good (Seabrook, 2012). A successful camp intervention would need to be funded for a series (several camps in a row) to ensure consistency of the delivery of the nutrition messages and embedded within existing mechanisms to be sustained. If this could be achieved, some of the challenges highlighted in Study 3 could be addressed. Therefore, camps score medium on sustainability.

8.8.4 Text messages

[Electronic media and internet - Media methods]

8.8.4.1 Gender, cultural, political feasibility - low

Text messages received mixed responses from patients depending on their gender. Male patients preferred text messages to social media because they had better access to them as they did not require an internet connection. However, female patients reported confusion after receiving unreliable text messages from unknown sources claiming to be reputable. This created scepticism from females about the reliability of text messages as an intervention tool:

'I have received text messages telling me to buy this rice because it will do me good. When I talked to my friend she had the same message and we decided not to trust them because they only wanted our money for their product.'
Participant, female patients' workshop

Furthermore, political will would be needed to finance infrastructure to send text messages and recipients details recorded in a database. The policymakers I interviewed showed reluctance to fund such an intervention due to lack of belief in text messages alone as an effective intervention without face to face support. They preferred more community based activities or health worker training which involved elements of social support involving face to face support. Lack of trust and political support, combined with some female patients stating that they could not read the messages themselves, meant that overall text messages had low GCP feasibility.

8.8.4.2 Organisational feasibility - low

Researchers discussed how the text message alert system could be set up and believed that the government would need to organise it at federal level. This would mean that it would not be easy to tailor messages to participants, an important aspect required in the intervention as outlined by BCW-SCC. Though the government may be able to put infrastructure in place to deliver the text messages, more research would be needed on when the messages should be delivered to participants as well as the characteristics of the participants. Furthermore, health facilities would have little input into the content of the text messages if they were delivered from a central point. These factors mean that text messages scored low on organisational feasibility.

8.8.4.3 Scalability - medium

Researchers discussed how text messages would be scalable nationally. Central dissemination of the messages would be straightforward once the infrastructure was in place. Text message trials had already been conducted as part of PEN, suggesting that such infrastructure was being

built. However, health workers warned of complications around access to patients' mobile numbers and who could sign up to receive the text messages. Those people in remote areas with poor mobile signal, or with no mobile phones at all, would not be able to receive the messages. These factors combined made the intervention score medium overall on scalability.

8.8.4.4 Sustainability - medium

Evidence suggests that text messages could be sustainable for a short or mid-term intervention. However, they can lose their impact if sent to the participant frequently over a long period of time due to text message fatigue (Bull and Ho, 2019). Furthermore, research has found that often text messages do not need to be repeatedly sent over a long period of time to be effective (Rassi et al., 2018). Further research would be needed to establish how long to send text messages to participants for and how frequently. Therefore, text messages score medium on sustainability.

8.8.5 Social media messages

[Electronic media and internet - Media methods]

8.8.5.1 Gender, cultural, political feasibility - low

Similar to text messages, social media tools such as Facebook were discussed by patients and health workers with concerns being raised about the reliability of information they carried and overload of information, alluding to what has been coined in research 'social media fatigue' (Bright et al., 2015, Goasduff and Pettey, 2011). In the female patients' workshop participants discussed unreliable scientific information which they had read on Facebook:

'Participant 3: I have seen posts where they have said that consuming some leaves every morning helps cure diabetes...I think that now I should try it.

Participant 4: The thing is that Facebook is not reliable... the use of the leaf is something that science has not proved which is why we should not blindly follow it...' Discussion, Female patients' workshop

One participant was encouraging the other to be cautious about the content of the post, this was then confirmed by a dietician who stated the information was false. Men were equally concerned about the content of posts on social media platforms. This concern also relates to the criteria *technical effectiveness*, as reliability of information is key to how technically effective such an intervention could be, maintaining technical effectiveness as medium, not high. In addition to concerns about the reliability of content on platforms such as Facebook, participants were concerned that not everyone had access to them. Many patients did not have access to the internet and social media, and many female patients were concerned that they or their relatives were unable to read messages if they did have access to them. Political will was low from policymakers to monitor social media as a way of health promotion. One policymaker stated that the organisation and monitoring required on social media made the intervention an unattractive prospect, especially compared with other more community based solutions. Furthermore, the unreliability of health information on social media has been widely reported (Dalmer, 2017, Forester, 2017, Marcus, 2016). For these reasons social media messages scored low on GCP feasibility.

8.8.5.2 Organisational feasibility - medium

Social media messages could be disseminated by health professionals from health facilities to large numbers of people, indicating broad reach. However, health professionals interviewed in

both Studies 2 and 3 were concerned about the time it would take them to monitor such an intervention. Therefore, social media messages scored medium on organisational feasibility.

8.8.5.3 Scalability - medium

Social media messages have the potential to reach large numbers of people who have access to the internet, making this intervention scalable to national level. Patients discussed regional groupings on social media platforms which could allow messages to be regionally/contextually tailored. However, access to the messages would be dependent on recipients having access to the internet. For these reasons social media messages scored medium on scalability.

8.8.5.4 Sustainability - medium

Social media interventions could involve generating online groups of patients who could support each other over time, and/or build positive relationships with health professionals providing online advice. This could make it a sustainable intervention. However, this would rely on participants having regular, continual access to the online platform, which can be problematic when participant's internet connections are not stable, as several patients in both Studies 2 and 3 stated was a problem for them. Therefore, social media interventions scored medium on sustainability.

8.8.6 Videos with health promotion messages

[Electronic media and internet OR mass media - Media methods]

8.8.6.1 Gender, cultural, political feasibility - high

Videos were seen as generally the most culturally and politically feasible mode of electronic media intervention (ahead of texts and social media). Corroborating evidence from Study 2, patients in Study 3 expressed interest in video dramas and were aware of other health promotion dramas created by the Nepali government. However, videos were discussed by patients with less enthusiasm than interventions which would directly engage them with face-to-face advice-givers (e.g. camps, peer education). Female patients particularly favoured videos as they enjoyed watching television dramas. Health advice delivered on visual media [videos and TV] was seen as more universal in appeal than text messages or social media due to it being easier for older people to understand. This was seen as particularly important due to the large number of diabetic people who are older in age. Health education videos could be made contextually specific if there was resource to fund their production. Videos have already been produced by the government to promote health dramas, so they are a tool which has been used previously. Videos therefore ranked high on cultural, gender and political feasibility.

8.8.6.2 Organisational feasibility - medium

Videos have been used in private health facilities to show to patients prior to consultation and these have been well received by patients. Equipment, space and time is more limited in public health facilities and showing a video may be difficult due to a lack of resources. However, with ownership of mobile phones increasing, access to videos on mobiles and tablets in public health facilities could allow videos to be seen either in the facility or in the homes of the target population who have access to mobile devices or other devices with internet. This makes the intervention of medium organisational feasibility.

8.8.6.3 Scalability - high

Videos can be shown nationally once they are made. However, this creates a tension between national scale dissemination and regional variation/contextual adaptation. One way around this would be to make a series of videos for different genders, ethnic groups and ages delivering key adapted health messages. The intervention ranks high on scalability as an intervention tool, though making the videos contextually specific requires building into the intervention delivery strategy.

8.8.6.4 Sustainability - high

Videos can be sustainable as they can be watched multiple times over long time periods. They can also deliver messages which health workers do not have time to deliver due to their busy schedules:

'We can show the videos to patients over and over again, to reinforce the important things. It helps because actors can demonstrate how to eat healthily when we do not have time to.' Participant health worker workshop

Positive and repetitive reinforcement with videos could also help to bring about positive dietary behaviour change. Videos would need to be accompanied by a dissemination strategy to ensure they reach the target audience. Overall, this intervention ranks high on sustainability.

8.8.7 Training health workers FCHVs or community mobilisers

[1-2-1 communication - Person to person methods]

8.8.7.1 Gender, cultural, political feasibility - high

From the health worker workshop it was clear that it was important to train health workers on important aspects of dietary advice which were tailored to their patients. The importance of adapting an intervention to a patient's socio-economic status, for example, was seen as vital because some low income patients could not afford to change their diets easily:

'We cannot simply write down milk and biscuits for breakfast for the people who visit of from the village [because they will not have access to them]. So, we ask them what they usually have; it could be roti and so on...' Health worker workshop

Health workers also highlighted that often patients in low income groups do not have access to refrigerators to store food, limiting the range of foods that they can consume, and they often have unhealthy eating habits, such as consuming large amounts of oil:

'Patients belonging to the low income group, consume about seven to eight litres of cooking oil in a month.... Even if we were to advise that only half a litre of oil is to be consumed per head in a family then we could manage the costs for the rest of the meals.' Health worker workshop

Health worker training would enable tailored contextual adaptation to different types of patients, including specific advice for men and women, depending on their dietary behaviour. Training could be incorporated by government action into the health care system, making it politically feasible. This intervention therefore ranks as high on GCP feasibility.

8.8.7.2 Organisational feasibility - medium

Training of health workers was recognised by health workers and researchers as an important delivery strategy to be employed. Researchers highlighted problems with existing government mechanisms to train health workers. Skills and mechanisms need to be developed by government to improve training and supervision to ensure that it is adhered to. This is a policy-level issue, which is further discussed in Chapter 9.

'Training is not just a theoretical knowledge given to the health workers. It is linked with resources, logistics, medications... But what exactly happens is government simply provides training to the health workers without preparation. They design a training package and just deliver it. A supervision mechanism [is needed] to make sure that the health workers have been following what they have learned. Then time and again there should be supervision from the higher authority.' Researcher interview

Generally, researchers and health workers saw the training of health workers intervention as being possible to integrate into existing structures, stating there was a need for improvement in training. These factors mean that this intervention ranks as medium for organisational feasibility.

8.8.7.3 Scalability - high

Several researchers discussed how the PEN package involved training of trainers of health workers and how government structures can enable a pyramid-style system for training health workers on a national scale. This intervention is therefore highly scalable.

8.8.7.4 Sustainability - high

Policymakers and researchers believed that if done effectively, and knowledge is provided to the health workers together with supervision to ensure training, health workers could to educate large numbers of patients over a long period of time. This intervention therefore ranks high on sustainability.

8.8.8 Peer education/role modelling

[Health promotion in groups OR 1-2-1 communication - Person to person methods]

8.8.8.1 Gender, cultural, political feasibility - high

Participants in all workshops agreed that peer education could be feasible. Support was desired by patients from other patients and families who had already experienced positive behavioural changes to their diet after diagnosis:

'Learning how they [existing patients] have managed and stopped eating the unhealthy foods will be useful for us because it is hard for us.' Participant, female workshop

However, some concerns were raised about the trustworthiness/education levels of peer educators or role models compared with health professionals who were seen by some patients as a more credible source of information. Despite this, peer education was seen as culturally and gender adaptable, with peer educators able to demonstrate healthy dietary behaviour to similar socio-economic groups and ethnicities and to all genders. The majority of policymakers interviewed were also positive about the potential of peer education programmes to improve dietary behaviour. For these reasons this intervention ranked high on GCP feasibility.

8.8.8.2 Organisational feasibility - medium

Policymakers stated that peer support programmes could be incorporated into health facilities and the wider health system. However, health workers warned that in public health facilities such programmes would need government resourcing they would also need a strategy for maintaining interest and participants. Peer support ranks as medium for organisational feasibility.

8.8.8.3 Scalability - medium

Researchers raised concerns about how scalable peer support programmes would be due to large amounts of time and resource needed to maintain the intervention. Peer support was seen as more complicated for those patients who visit Kathmandu for medical treatment but live some distance away in rural areas. Maintaining relationships with peer educators would be problematic due to this transiency. Despite this, such programmes could be practical for implementation within communities where the population is less transient. Peer education ranked medium on scalability.

8.8.8.4 Sustainability - high

Patients stated that they would be more inclined to make positive behavioural changes if they could see examples of people who had actively sustained these changes over time. Other research has found that building social relationships with peers leads to a sustained connection which helps to improve behaviours over time (Annon., 2005, Harris J et al., 2015, Singh et al., 2018a, van Olmen et al., 2016, van Pelt et al., 2015). Peer education ranked high for sustainability.

8.8.9 Community gardens

[Health promotion in groups - Person to person methods]

8.8.9.1 Gender, cultural, political feasibility - low

Community gardens were seen by researchers as a new concept and participants were uncertain about how they would work in an urban context like Kathmandu:

'Participant 1: We would need to look at the cultural aspects and security of what they grow. Trust. It requires a lot of things to make a community garden function. Their relationship to their community matters and the land, irrigation and other things.

Participant 2: Yes. Although I like this idea, it may not be feasible in our context. Instead of promoting the kitchen garden, I would suggest... we have a culture where we meet... If I grow a leafy vegetable in my garden, then I share it with my neighbour... That is not just sharing the product but also talking about the product and linked with the best cooking practice.' Researcher workshop

Other participants in the researcher, health worker and patient workshops agreed that community gardens would be difficult to maintain and sharing from individual household gardens might be more practical in an urban area. Female patients were particularly resistant to this intervention due to the cultural expectation that they would maintain crops in the garden. Many stated that they had little time to tend to gardens in their busy urban lives. Other research has found gardens to be feasible when they are maintained by a central organisation in the community, for example a school (Schreinemachers et al., 2017). Whilst community gardens

have worked in other country contexts (e.g. in the UK (Larsson, 2018)), evidence from Study 3 strongly suggested that community gardens in Kathmandu may not be practical. This was confirmed by policymakers interviewed. Therefore, this intervention ranked low on GCP feasibility.

8.8.9.2 Organisational feasibility - low

It was evident from the health worker and researcher workshops that community gardens would be difficult to integrate into the health system and complicated to maintain. Much of the work would need to be done by the community themselves and the intervention proposal as it stands does not include a strategy for educating patients about how to cook and prepare the healthy produce from the gardens, this would require health worker input which requires expertise and resource. For these reasons, community gardens score low on organisational feasibility.

8.8.9.3 Scalability - low

Participants in all workshops agreed that community gardens might work better in rural areas where there would be more space and trust than in the crowded urban areas. This would make the intervention scalable to rural areas. However, it does not address the issue of incompatibility with crowded urban spaces, therefore it ranks low on scalability.

8.8.9.4 Sustainability - medium

Community gardens were seen by patients as sustainable over time if crops could be grown and gardens cared for so that they produced healthy food regularly. The issue of time, resource and space to care for the gardens, however, overshadowed the potential for the gardens to be sustainable. Also, as discussed, training on how to prepare the vegetables would also have to accompany the intervention to make it truly sustainable. Therefore, gardens ranked medium on sustainability.

8.8.10 Interventions using influential leaders

[Health promotion in groups - Person to person methods]

8.8.10.1 Gender, cultural, political feasibility – medium

Participants in all workshops agreed that the diversity and abundance of cultural leaders meant that influential and trusted leaders could be powerful influences in conveying positive health messages. Despite this, some patients discussed how some religious leaders who hold influence in Nepal have been criticised for promoting their own commercial products (such as white rice). This has led them to not be trusted by many. Older patients, in particular, seemed susceptible to believing business promoting messages from religious leaders to consume their (often unhealthy) products such as white rice, cooking oil and flour. These concerns were widespread and are corroborated by news reports questioning the ethics of the self-promotion of goods by religious leaders (Doshi, 2016, Nawaz and Trivedi, 2017). There was consensus in the workshops, and amongst both male and female patients, that influential leaders could be used as a dissemination tool for healthy dietary messages specified by health professionals if the leaders are not pursuing business interests. However, caution was raised in the researcher workshop about secular government endorsement of messages by religious leaders. Therefore, overall this intervention had medium GCP feasibility.

8.8.10.2 Organisational feasibility - low

One health worker raised concerns about influential leaders being hard to convince to act as 'influencers' as they have unhealthy dietary habits which may be difficult to change:

'I agree that people would easily follow them [religious leaders] which would be the best option. However, it will be difficult for us to convince the religious leaders. That is because the religious leaders do not have lentils or eggs or fish or any kind of meat [healthy food]... We know that our politicians are happy to eat fried meat [unhealthy food] when they go to Dhulikhel. So, I think that it will be difficult for us to bring them into the fold as well.' Health worker workshop

Evidently, there are challenges involved in persuading influential leaders to lead by example when they themselves may have unhealthy dietary habits. This does present an opportunity to improve the dietary behaviour of the leaders themselves. However, another drawback with this intervention would be the health worker time that would be needed to train the leaders, which could be challenging as health workers time is often difficult to find. The intervention therefore ranked low on organisational feasibility.

8.8.10.3 Scalability - medium

Using influential leaders to disseminate messages could be scalable to other regions of Nepal and amongst a range of religious, ethnic and age groups. In the patient workshops, participants stated that younger people are increasingly less interested in religion. Therefore, using cultural figures such as celebrities may be more able to influence their behaviour amongst this age group. To do this an intervention tool (video, social media, printed materials) would be needed alongside an intervention delivery strategy (health worker training to compile and then disseminate the messages). Therefore, to be scalable, this intervention requires further investigation. For these reasons it scores medium for scalability.

8.8.10.4 Sustainability - medium

To make this intervention sustainable, patients discussed the importance of using influential figures within communities who are trusted, accepted and respected. Patients stated that in addition to wards and district health offices, some communities in Kathmandu had important cultural figures who could promote the intervention. In some communities these leaders are members of groups called Guthi which are made up of people with importance in the Newar community based on caste, kinship and religion. This group makes decisions about the welfare activities the communities participate in:

'In the Newar communities within the valley, there are Guthi. All of the cultural and religious aspects and traditions are carried out with the help of the Guthi from the time a person is born to the day that they die.' Female patients' workshops

Obtaining the support and endorsement of the trusted Guthi in Newar communities would be a way of ensuring buy-in from the community and making the intervention more sustainable. Therefore, the intervention ranked medium for sustainability.

8.8.11 Additional intervention proposal – food diaries

From analysis of Study 3 data it became clear that participants liked an intervention which I had previously excluded in after Study 2. Food diaries had been excluded due to ranking it low in

feasibility in Chapter 7 after participants in Study 2 said that they would not like to record their dietary habits as that would be intrusive. However, participants in Study 3, particularly dietician health workers who worked with diabetes patients had discussed the benefits of using food diaries. I have therefore re-introduced this intervention again at this point of the thesis and offer a feasibility analysis of it according to the data I collected in Study 3.

8.8.11.1 Gender, cultural, political feasibility - medium

Some health workers reported positive results from actively monitoring patient's dietary behaviour in line with the Nepalese eating style using a dietary chart. This was reportedly feasible; 24-hour recall was good, but portion sizing was sometimes challenging. Dieticians reported that while some people were willing to keep a record of their eating habits, others were not, with some patients being embarrassed about recording foods they know they should not consume. Research supports the feeling of embarrassment felt by patients about having to record their dietary habits (Ortega et al., 2015). However, food diaries have been used widely to monitor dietary behaviour and instigate change (Vorley, 2018). Gittelsohn et al. (1997) used dietary journals, comprised of both food intake recall and direct observation of meals and found that dietary prescriptions have a direct impact on food consumption behaviour (Shively et al., 2011). Though some patients in both male and female workshops did not have time to record their dietary habits, others were very willing to and saw the benefit of doing so:

'I know it will help me to keep a record of what I eat so I can monitor the good and bad things. I would do it if someone showed me how.' Participant, Male patient workshop

Dieticians stated that food diaries could be incorporated into patients' lives without problems and they were a feasible technique to bring about short-term dietary change. Both men and women were willing to record their habits, though men stated they had more time to do so, women often being more occupied with feeding the rest of the household. This type of intervention would need little resourcing, but an adaptation to health workers work if they do not already use them. Therefore, the political implications of using such an intervention would be limited. Food diaries ranked medium for GCP feasibility.

8.8.11.2 Organisational feasibility - high

Some dieticians stated that the use of food diaries was incorporated into their practice already. To embed these methods in the work of other health workers would require training for the health workers but would not require major structural change. Therefore, food diaries ranked high for organisational feasibility.

8.8.11.3 Scalability - high

Introducing food diaries into health practice was seen as potentially straightforward in both public and private health facilities. This transferability would allow the use of food diaries to be scalable to other parts of Nepal, both urban and rural. Therefore, food diaries ranked high for scalability.

8.8.11.4 Sustainability - medium

Researchers recommended that this intervention be accompanied by training for health workers on how to use food diaries and encourage self-monitoring of behaviour by patients (a BCT found to be effective in Study 1) and the majority of researchers and health workers stated the method would be sustainable if supported by adequate training. Issues with follow-up in the health

system as highlighted by the results from Study 2 in Chapter 5 suggested that ensuring patients monitored their own behaviour may be difficult to reinforce by health workers if patients are unable to return to health facilities for follow-up. This concern was reinforced by health workers. Food diaries therefore rank medium for sustainability.

8.8.12 Compiling overall ranking of interventions

Table 13 indicates the rankings for each of the intervention proposals. I have combined the scores given to each intervention for Studies 2 and 3, working out the mean of those scores and adding up all of the mean scores for each criterion to provide a total ranking for each intervention. Scalability and sustainability were introduced in Study 3 so the score they achieved from Study 3 has been taken as the mean for these two criteria. Shaded in grey (horizontal rows) are the interventions which ranked highest (1-4) after the results from Studies 2 and 3 were synthesised.

Table 13: Results of feasibility assessment of intervention proposals after Study 3

Intervention proposal	TE			OF			GCPF			FF			SC	SB	Total Score	Overall final feasibility ranking after Study 3	Ranking after Study 2
	After Study 2	After Study 3	Mean	After Study 2	After Study 3	Mean	After Study 2	After Study 3	Mean	After Study 2	After Study 3	Mean	After Study 3/ Mean	After Study 3/ Mean			
Printed materials	3	3	3	3	3	3	3	3	3	3	3	3	3	2	17	=1	(1)
Community camps	2	2	2	2	2	2	3	3	3	2	2	2	2	2	13	= 5	(6)
Text messages	2	2	2	2	1	1.5	2	1	1.5	2	2	2	2	2	10.5	9	(=7)
Social media messages	2	2	2	2	2	2	2	1	1.5	2	2	2	2	2	11.5	8	(=7)
Videos	3	3	3	2	2	2	3	3	3	3	3	3	3	3	17	=1	(2)
Training health workers (including FCHVs& community mobilisers)	3	3	3	3	2	2.5	2	3	2.5	2	2	2	3	3	16	3	(=3)
Peer education/ role modelling	3	3	3	2	2	2	3	3	3	2	2	2	3	2	15	4	(=3)
Community gardens	2	2	2	2	1	1.5	2	1	1.5	2	2	2	2	1	10	10	(=7)
Engaging influential leaders	2	2	2	2	1	1.5	3	2	2.5	3	3	3	2	2	13	= 5	(=3)
Food diaries/self-monitoring [reintroduced after Study 3]	2	2	2	2	3	2.5	1	2	1.5	2	2	2	2	3	13	= 5	(=12)

Key: TE = Technical effectiveness; OF = Organisational feasibility; GCPF = Gender, cultural and political feasibility; FF = Financial feasibility; SC = Scalability; SB = Sustainability

The most feasible interventions after Study 3 are therefore: 1. Printed materials and Videos, 3. Training of health workers and 4. Peer education. These highly ranked interventions show consistent high scores with results from Study 2, indicating my two data sets largely correspond and corroborate each other.

It is possible that a combination of these interventions into an intervention package might have wider applicability, although this would need to be investigated further (see Chapter 9). This would enable intervention tools (e.g. health education through printed materials) to be combined with intervention delivery strategies (e.g. training of health workers) alongside other considerations such as setting and how the intervention can be adapted to socio-cultural context (in line with BCW-SCC outlined in Chapter 6). For most of the less feasible interventions, my results from studies 2 and 3 corroborate each other, with several exceptions. These exceptions were; a) community gardens which reduced in their feasibility due to a low scalability score, b) food diaries which increased in their feasibility, scoring high in Study 3 for sustainability, and higher than Study 2 in organisational and GCP feasibility, c) community camps reduced in their feasibility from overall ranking of joint 3rd to 5th after Study 3. This is due to receiving medium scalability and sustainability scores. Camps scored the same in Studies 2 and 3 for the other criteria which therefore illustrates that the introduction of sustainability and scalability as new criteria was valuable as it offered an alternative perspective on feasibility. It is important to state that though some interventions ranked lower than others, this does not mean that they should be excluded completely from future interventions. Community camps, for example, could be useful to use as a mechanism to deliver, promote or instigate peer education programmes or disseminate printed materials. Similarly, food diaries could be a useful tool to encourage self-monitoring of behaviour, a BCT found to be effective in Study 1. This will be further explored in Chapter 9.

8.9 Conclusion

This chapter has addressed which interventions are the most feasible following both Studies 2 and 3 with the aim of investigating the proposed interventions' feasibility with the addition of new criteria – scalability and sustainability. Furthermore this chapter has investigated how interventions can be best transmitted through different forms of media and/or on different scales according to categories created by Hubley and Copeman (2018). I have continued to use qualitative and quantitative data together in a practical, pragmatic way to generate useful knowledge and outputs around feasible intervention design, a process which aligns with the pragmatic paradigm of research (Feilzer, 2010). I have considered multiple opinions and layers of reality from a variety of participant viewpoints to develop solutions to the problem of growing rates of diabetes/HBGLs and the causative factor of dietary behaviour. Such use of qualitative and quantitative data together demonstrates the use of such a ranking method as a tool for progressive research. Using this information, I have been able to generate the overall most feasible intervention proposals to take forward. The most feasible interventions can be split into two main categories:

1. Media methods - print media (printed materials) or electronic media/mass media (videos)
2. Person to person methods including 1-2-1 communication and health promotion in groups (training health workers FCHVs or community mobilisers and role modelling)

These categories are important to consider when putting forward the final suggestions for intervention proposals. The next and final part of the thesis draws together my findings from both Studies 2 and 3 to propose suggestions for feasible interventions to take forward.

Chapter 9 Recommendations from research

9.1 Introduction

This final chapter brings together findings from my thesis to make suggestions for policymakers, practitioners, health workers and researchers in two key areas:

1. Presentation of interventions [intervention packages] for development or piloting
2. Presentation of broader, long-term, macro suggestions for improvements to provision for people with diabetes/HBGLs

After discussing these two areas, I discuss the limitations of Study 3 with reflections on the methods used.

9.2 Presentation of a set of interventions for further development or piloting

Findings from Study 3 revealed the feasibility of shortlisted intervention proposals and indicated their likelihood to improve dietary behaviour amongst people with HBGLs or diabetes. A feasible intervention should consider the contextual behaviours dictated by a complex, intertwined and multi-level ecological environment (Lang and Rayner, 2012, Fletcher et al., 2014, Bonell et al., 2011, Hawe et al., 2009), be adaptable to allow it to be culturally compelling and bring sustainable change as advocated by my adaptation of the behaviour change wheel [BCW-SCC].

During data analysis of Study 3, it became evident that some of the intervention proposals may be effective as components of a larger intervention package which combines intervention tools and delivery strategies. Detailed discussion of the components which could make up an intervention package was not conducted in workshops or interviews in Study 3.

Without a full intervention package design, identifying which components of a multi-component package are effective or not effective is difficult. Furthermore, putting together components/interventions which have been shown to be effective or feasible in isolation of each other may not necessarily lead to the intervention package, which combines such components, being more effective when they are combined. With this in mind it is important to state that any intervention package proposed in this thesis should be further tested regarding its combination of components prior to its implementation. The following chapter outlines several intervention 'packages' made up of components (a combination of intervention tools and intervention delivery strategies) shown to be feasible in Study 3. Intervention packages are widely recognised in health research and are a viable method to improve health outcomes (Lassi and Bhutta, 2015, Nair et al., 2017, Prosnitz et al., 2013, Schiffman et al., 2010).

9.2.1 Activities to take place prior to intervention package delivery to ensure a socio-cultural contextually approach

Participatory methods should be used to elicit conversation between the target population (those with or at risk of HBGLs/diabetes) based on intersectional characteristics including gender. My research has found the importance of using participatory methods to elicit valuable data (Study 2) as well as the importance of encouraging dialogue between genders, ethnicities, religions and others. Therefore participatory methods could include participatory action research which takes a gendered and intersectional approach, for example, training facilitators (e.g. community leaders, researchers, health workers) on dialogue between genders, age-groups and ethnicities, comparing social, ethnic and gender norms/practices around dietary

behaviour, sharing knowledge on diabetes and discussing what needs to be changed for dietary behaviour to improve. Such approaches have been used in LMICs previously in relation to key health issues such as maternal health (Research in Gender and Ethics, 2016). Groups could use drawings, statements and proverbs to explore the relationship different participants have with food. An example of another participatory method which could be used here is the ‘but why’ technique which can be used to probe and understand the rationale behind norms which influence dietary behaviour, the meaning of the norms and whether they are seen as fair (Community tool box, 2019). Through these facilitated discussions, *specific statements* for encouraging dietary change can be negotiated and agreed to take forward into the proposed intervention packages as the key healthy eating messages.

9.2.2 Components of an intervention package

To consider feasible intervention packages I have selected an intervention strategy/tool, mode of delivery and delivery strategy for each package. These serve different roles in the intervention package. The interventions I tested for feasibility in studies 2 and 3 were a mixture of intervention tools and delivery strategies (this often made comparisons difficult – see limitations in 9.4.6). Consideration of setting is also important, and I provide a summary of preferred settings with justification, for each intervention package.

9.2.2.1 Intervention tool

The intervention tool is what is being delivered, that is the BCT, which is delivered to bring about behaviour change. This can include BCTs such as demonstrating behaviour and health education.

9.2.2.2 Intervention mode

Intervention mode is the *means by which* the intervention is delivered. This can include face to face delivery, printed materials, a mobile phone or video.

9.2.2.3 Delivery strategy

The delivery strategy is *how* best to deliver the intervention tool to the target population. This can include training health workers to deliver a face-to-face intervention. The delivery strategy represents a plan of action designed to achieve the overall aim of the package. Previous research has stated that an appropriate delivery strategy should be chosen for the context (Walley and Wright, 2010).

9.2.2.4 Setting

The setting is the place in which an intervention is carried out. Hubley and Copeman (2018) categorise different settings; community, health facility, workplace, those used by young people and institutional settings. They consider that each of these settings is important for different types of intervention. Using findings from studies 1-3 I state the potentially feasible settings which intervention packages could be delivered. These are shown in Table 14.

The proposed intervention packages in Table 14 include seven different interventions tested for feasibility in Studies 2 and 3. All of the top ranking 5 interventions from studies 2 and 3 are incorporated in my intervention package proposals.

Table 14: Suggestions for proposed intervention packages

Intervention tool	Mode of delivery	Intervention delivery strategy	Setting	How adapted to socio-cultural context (behaviour change wheel)
Health education [<i>Instruction of how to perform behaviour</i> – BCT 4.1 (Michie et al., 2013)]	Printed materials (1) [pamphlet, poster, advice/flip book] (both text and visual) containing dietary advice	Training of health workers (3) (including FCHVs and community mobilisers where appropriate) to deliver culturally adapted dietary advice. Includes positive reinforcement of health messages. Dissemination of health materials by health workers with culturally sensitive advice in health facilities and in communities. This involves <i>adding objects to the environment and social support</i> from a <i>credible source</i> to stimulate behaviour change.	Training to take place in a <u>health facility</u> (hospital, community health centre). Dissemination of materials to be in <u>community settings</u> . Strategic dissemination is important. Materials could be disseminated in <u>community camps (5)</u> .	Materials will be culturally adapted to context (considering ethnicity, religion, socio-economic group, region). [See 9.2.1 participatory methods to elicit contextually appropriate dietary advice messages] <i>Social support</i> will be used e.g. education of partner and family members of patient. Ensure the process of training health workers is participatory. Training should include a participatory discussion with health workers about what would be appropriate for their patients (according to region, socio-economic group, ethnicity)
1. <u>Self-monitoring of outcome of behaviour [food diary]</u> 2. <u>Action Planning</u> according to dietary advice	1. Face to face delivery by health workers of how to use a Food diary (5) 2. Face to face delivery of Meal plan	Training of health workers (3) (including FCHVs and community mobilisers where appropriate) on enabling culturally appropriate healthy eating planning and monitoring of food intake. Planning of healthy meals can be aided by the use of plate models. Implementation of food diaries and planning healthy meals with culturally sensitive advice in health facilities and in communities.	Training to take place in <u>health facility</u> (hospital, community health centre). Implementation of food diary and planning in health facilities and <u>community based</u> in community health centres. Food diaries and planning could be taught at <u>community camps (5)</u> .	Planning of healthy meals will be adapted to context (considering ethnicity, religion, socio-economic group, region). [See 9.2.1 participatory methods to elicit contextually appropriate dietary advice messages] <i>Social support</i> will be used e.g. teaching family members to support diary writing and planning of healthy meals including both genders. As above for health worker training.
<u>Demonstrations of healthy dietary behaviour</u> according to dietary advice	1. Face to face delivery of demonstrations of behaviour by peer educators (4) to demonstrate at risk or recently diagnosed groups how to cook healthy meals. E.g. live cooking demonstrations 2. Health education videos (1) which record influential	Two options of delivery strategy: 1. Peer educators (4) and to be trained how to explain and demonstrate healthy cooking practices. 2. Health education videos (1) to be shown to people with suspected/diagnosed HBGLs/diabetes in	Demonstrations can be: 1. Live in-person demonstrations in a <u>community setting</u> 2. Recorded demonstrations which can be disseminated through television or online in a <u>community setting</u>	Demonstrations will be of culturally specific food appropriate to ethnicity, religion, socio-economic group and region. [See 9.2.1 participatory methods to elicit contextually appropriate dietary advice messages] Allow peer educators to feel ownership of their demonstrations to ensure culturally specific adaptation. Ensure influential, trusted leaders provide culturally sensitive messages.

Intervention tool	Mode of delivery	Intervention delivery strategy	Setting	How adapted to socio-cultural context (behaviour change wheel)
	leaders (5) demonstrating healthy dietary behaviour.		hospital/clinic waiting rooms and also to be disseminated on YouTube.	

In **bold** are the interventions tested in Study 3 with key stakeholder groups. Numbers in brackets (x) denote the overall feasibility number of the intervention stated based on final rankings after Study 3.

In *italics* are BCTs according to (Michie et al., 2013).

In *italics and underlined* are BCTs shown to be potentially effective in Study 1.

In underlined text are settings are those highlighted as significant by Hubley and Copeman (2018).

9.2.3 Intervention package 1: Health education through printed materials

[Print media – Media methods]

Health education (BCT) through printed materials (posters, pamphlets, advice book, flip-book) both text and visual, ranked joint first for feasibility. I suggest printed materials comprise an intervention mode in an intervention package to improve dietary behaviour by delivering dietary advice to people with diabetes/HBGLs or at risk of developing diabetes (who have been made aware of their condition through blood glucose testing). Printed materials in the intervention will involve positively reinforcing health messages. Such positive health messages were requested by patients in both Studies 2 and 3 who stated that the health advice they receive is often focused on negatives such as what they should not eat, and they were often unsure what they should eat. Existing research has found that health advice which draws on positive emotions and focuses on positive messages to improve health and control diabetes can be effective in diabetes care (Huffman et al., 2015, Jaser et al., 2014). Such positive messages could include healthy food which could help control and limit diabetes and healthy ways to cook these to make desirable meals. Printed materials can constitute adding objects to the environment (a BCT proposed by (Michie et al., 2013)). Materials could be disseminated in community camps (an intervention which joint 5th for feasibility overall) and were seen by many participants as positive events which provided an opportunity to improve their health knowledge and drew on elements of social support. This would represent a further example of health promotion in groups as advocated by (Hubley and Copeman, 2018). Materials should be adapted to members of the community so as to be culturally appropriate (as outlined by BCW-SCC). Social support will be engaged, for example the education of a partner and/or family member of a patient to reinforce the messages the materials provide. This is because social support (within the socio-cultural environment in the ecological model) was found to be an important influence and determinant of dietary behaviours in Study 2.

9.2.3.1 Accompanying delivery strategy: training of health workers/volunteers

[1-2-1 communication - Person to person methods]

To accompany printed materials this package would include training of health workers (including FCHVs and community mobilisers where appropriate) to deliver the culturally adapted dietary advice on printed materials. Training of health workers ranked third for feasibility which warrants its inclusion in the intervention package. Health workers will be trained on where and when to best deliver printed materials in the community, depending on context and region. Then they will provide supporting verbal advice and positive encouragement to patients and their families about improving dietary behaviour. This interaction between health workers and patients will constitute social support which is a BCT and has shown in Chapter 4 to be an important determinant of dietary behaviour in my ecological model. Elements of social support provided by the health workers will include establishing rapport and building on a trusted relationship. Health workers constitute a credible source (BCT 9.1 (Michie et al., 2013)) to deliver information and by disseminating key messages via printed materials they capitalise on the trust patients have in health workers, as was shown by data collected in Studies 2 and 3. To ensure the process of training the health workers is participatory, training should include a participatory discussion with health workers from different locations. This discussion would include consideration of what would be appropriate for the patients (according to gender, region, socio-economic group and ethnicity).

9.2.4 Intervention package 2: Food diaries and planning of healthy meals

Food diaries ranked fifth for overall feasibility in Study 3. They were suggested as a helpful mode for documenting and improving food intake. These were used by dieticians I interviewed and are an established tool for documenting food intake (DAPA, 2018). The results of Study 1 concluded that self-monitoring of the outcome of behaviour was an effective technique for improving behaviour. This self-monitoring would be undertaken using a food diary. Self-monitoring of behaviour using food diaries have been criticised as they can be affected by recall error. Additional problems are related to the high burden posed on respondents, some have reported difficulties in writing down the foods and beverages consumed or in describing the portion sizes (Ortega et al., 2015). However, the method was endorsed by the dieticians and patients I interviewed in studies 2 and 3 as feasible in the context of Kathmandu and is therefore included in my final proposed packages.

9.2.4.1 Action planning: planning of healthy meals

The food diaries intervention package would also include action planning, a BCT advocated by Michie et al. (2013) and found to be effective by Study 1. This would involve planning healthy meals to ensure dietary behaviour was thought about and planned regularly. Patients and health workers both agreed that this could be an effective way to encourage dietary improvements. Such meal planning could be aided by the use of plate models. Health workers in Study 3 stated that if all foods are shown in a picture showing a plate, patients can visualise the plate when they have meals at home. This also helps patients to monitor their food intake. Plate models are an established method for encouraging dietary improvements, originally used by dieticians in HICs (Camelon et al., 1998) but now endorsed by the latest guidelines from the Diabetes and Endocrinology Association of Nepal [DEAN] (DEAN Nepal, 2018) who advocate use of the American Diabetes Association's 'Diabetes Plate Model' (Diabetes Forecast, 2018) adapted to the Nepalese context. These changes indicate wider support for the use of plate models for planning food intake in Nepal. Teaching of healthy meal planning to patients and use of food diaries will be according to the most up to date dietary advice for diabetes prevention/control. Health workers will keep up to date with this advice (e.g. DEAN guidelines).

9.2.4.2 Accompanying delivery strategy: training of health workers/volunteers

[1-2-1 communication - Person to person methods]

Patients should be taught by health workers (including FCHVs and community mobilisers where appropriate) how to use food diaries and monitor their habits themselves. Similar to intervention package 1, this strategy constitutes the use of a credible source (health worker) [BCT 9.1] to provide social support (shown to be an important determinant of dietary behaviour in Chapter 4) to further encourage behaviour change. This could also begin to address the problem of follow-up for patients who find it difficult to access health facilities. Health workers should be engaged in participatory discussions to establish what would be feasible for their patients (regarding gender, region, socio-economic group and ethnicity). Health workers would be trained to deliver culturally appropriate healthy eating planning and monitoring of food intake, for example how to monitor food intake during festival periods. These methods of monitoring and planning of meals can be implemented by health workers in health facilities (where they will be trained) and also in communities such as in community health centres or as part of community camp promotion events. Recent research has found that community based intervention approaches to diabetes are more effective than more technological interventions

such as mobile phone messaging (Fottrell et al., 2019). Social support, shown to be an important determinant of dietary behaviour in Study 2, should be used to encourage family members to help patients to record their food intake and plan healthy meals. Encouraging collective food monitoring and planning of healthy meals aims to expose and address unhealthy dietary practices. A greater understanding of unhealthy and healthy food practices could then be used to encourage healthier eating practices which is supported by all family members. This could potentially encourage men to take more of a role in preparing and consuming healthy food which could reduce the often double burden of food preparation placed on diabetic women.

9.2.5 Intervention package 3: Demonstrations of healthy dietary behaviour

The third package I propose involves the intervention tool of demonstrating healthy behaviour which was found to be an effective BCT in Study 1. This package would enable people at risk of or with diabetes to learn how to prepare healthy meals (according to the most up to date dietary advice) and embed these meals into daily routines. This is likely to involve demonstrations of how to cook culturally specific food appropriate to gender, ethnicity, religion, socio-economic group and region. An example may be that around the time of particular religious festivals important to different ethnicities, demonstrations are provided about how to prepare healthy but culturally acceptable food to consume during the festival period. Demonstrations of healthy dietary behaviour can be delivered by peers to those with or at risk of diabetes. Peer education ranked fourth for overall feasibility as a potential intervention and has been used to improve nutrition in Nepal (Singh et al., 2018b). Peer education involves social support from peers. Social support was shown to be an important determinant of dietary behaviour in Chapter 4. An alternative mode of delivery for demonstrating healthy dietary behaviour is health education videos which can then be disseminated online or in health facilities. Videos ranked joint first for overall feasibility. These video demonstrations could be presented by influential, trusted leaders, an intervention which ranked joint fifth overall for feasibility.

9.2.5.1 Accompanying delivery strategies option 1: peer education

[Health promotion in groups OR 1-2-1 communication - Person to person methods]

Demonstrations by peers could be delivered in the form of live cooking demonstrations outside strategic locations (temples, shopping malls, community health centres, health facilities such as hospitals) as advocated by health workers and patients. All peer educators will be allowed to feel ownership of their demonstrations and encouraged to provide culturally specific adaptation of dietary behaviours.

9.2.5.2 Accompanying delivery strategy option 2: health education videos

[Electronic media and internet OR mass media - Media methods]

Cooking demonstrations would present audio and visual representations of positive healthy examples of dietary behaviour which will be contextually tailored to the people they target. Influential leaders will be encouraged to provide culturally sensitive messages for these videos.

9.2.6 Factors likely to influence intervention package success

9.2.6.1 Culturally compelling factors

Each intervention package should have strong cultural components as have been shown to be important in Chapter 4, and by the proposed behaviour change wheel adaptation from Study 2

(Chapter 6). Content of this intervention should be culturally adapted using a combination of official guidelines (American Diabetes Association, 2015, American Diabetes Association, 2018, Diabetes UK, 2018, NHS England, 2018, WHO and Food and Agriculture Organization of the United Nations, 2002, WHO, 2004b, WHO, 2019) and recommendations from local dieticians and consultation with patients and health workers to establish the culturally appropriate and significant foods in a specific population. I have included a review of current dietary advice materials in Nepal which can be found in Appendix C.1. This review, and the data collected in Study 2 and 3 showed that YouTube videos, checklists, food diaries and guidelines for measuring food portions were useful in encouraging positive dietary behaviour change in Nepal (Hamilton, 2015, Mash, 2010, Shrestha, 2018). I have incorporated some of these (videos, food diaries) in the proposed intervention packages and existing materials could be used as templates for making more culturally compelling content for the proposed packages. As Nepal is so rich in cultural festivals and events, it is important that the intervention is timed appropriately, for example to be just before or just after the major festivals of Dashain and Tihar, or more localised festivals such as Jatras [festivals which occur annually and involve street carnivals]. As established in Study 2, this would also enable dietary advice to be provided to people prior to festival periods when social pressures to consume often unhealthy foods or fast foods are strong. Combining these considerations will allow for the intervention packages to be culturally compelling and in line with BCW-SCC. A summary of the ways the proposed intervention packages incorporate SCC adaptation is provided in the final column of Table 14.

9.2.6.2 Consideration of Gender

As stated in 9.2.1, I advocate participatory activities take place prior to implementation of the intervention packages to establish gender and intersectional appropriateness of the dietary messages according to SCC. Such activities should result in interventions which are gender empowering and ensure harmful gender stereotypes are not reinforced but are rather challenged. A successful intervention package should be targeted at all genders and should not reinforce unequal gender roles which can have a detrimental effect on women with HBGLs or diabetes, which has been shown to be a double burden on many female participants in this research. Participants from Study 3 agreed that if an intervention only informed women, when they tried to improve the food eaten in the home, there could be backlash from men in the household. Female patients from Study 3 stated that the advice that they would like to receive must target cooking methods and which foods to buy. This is because, as established in Study 2, and supported by other research (Muller and Mobarak, 2013, Oli et al., 2015b), women participate in decision-making when buying food for the household. As stated by the gender analysis framework used throughout this thesis (Research in Gender and Ethics, 2016), consideration of decision-making is important whilst conducting data analysis. Health workers and patients advocated engaging men in why and how healthy food is prepared for the household, such as explaining to them why certain foods or cooking methods are healthier than others. This should be accompanied by imparting skills (e.g. demonstrations of behaviour) so that both genders have the capability to prepare healthy food. Findings from Study 3 suggest that gender roles are inherently culturally and socially defined (Lindsey, 2015). Some social theories, such as feminist materialism, argue that gender roles dictate that women must undertake more household labour than men (Hennessy and Ingraham, 1997, Hennessy, 2012, Kuhn and Wolpe, 2013). My intervention packages do not perpetuate culturally and socially constructed gender roles, rather they offer alternatives within socio-cultural context which encourage all genders to actively engage in healthy eating practices. My intervention packages

therefore contribute to Nepal's drive for gender equality and social inclusion (International Development Partners Group Nepal, 2017).

9.2.6.3 Consideration of Intersectionality

My data analysis has shown that the identities of patients are often complex and overlapping, for example female patients were influenced not only by culturally constructed gender roles and expectations, but also expectations around their age, ethnicity, religion, socio-economic status and the place they live (rural/urban). I advocated the importance of considering intersecting aspects particularly within individual and socio-cultural environments and within the overlapping environments conceptualised in my ecological model (Chapter 4). Such overlapping and intersecting influences have been shown to be important by research, for example in relation to gender intersecting with ethnicity (Bowleg, 2012). This raises significant questions about how multiple individual identities (in the individual environment in my ecological model) intersect with those at the macro level (in the socio-cultural, political and physical environments in my ecological model) and ultimately influence behaviour. Research which has found intersectionality to be an important consideration in public health theory, research and policy (Bowleg, 2012, Krieger et al., 1993, Schulman et al., 1999, van Ryn and Burke, 2000, Waldman et al., 2018). This challenges us to think in multi-faceted and multi-dimensional ways about gender, religion, ethnicity and other characteristics in the individual environment and how these intersect with religious, ethnic or gender roles at the socio-cultural, political and physical levels. I begin to do this with the activities proposed prior to the implementation of the intervention packages which aim to draw out participatory solutions to intersecting and often competing factors which can impede healthy dietary behaviour. Such considerations lead to the development of multi-faceted interventions, with enough adaptability to individual, often intersecting characteristics. The proposed intervention packages consider cultural influences on dietary behaviour, as explored in Chapter 4 and Chapter 6, and also characteristics individuals may possess which influence how they receive the intervention. I have proposed, for example, adapting dietary advice to religious/ethnic traditions, and these to be adopted by both genders, different ages and different socio-economic groups accordingly. Considering how my intervention package proposals map onto my ecological model (Figure 16) further encourages intersectional thinking.

9.2.7 Mapping interventions on to my ecological model

As explored in Chapter 4 considering the importance of influences on dietary behaviour is important in establishing which interventions are likely to be feasible. Figure 16 provides a mapping of the components of the proposed intervention packages onto my ecological model from Chapter 4.

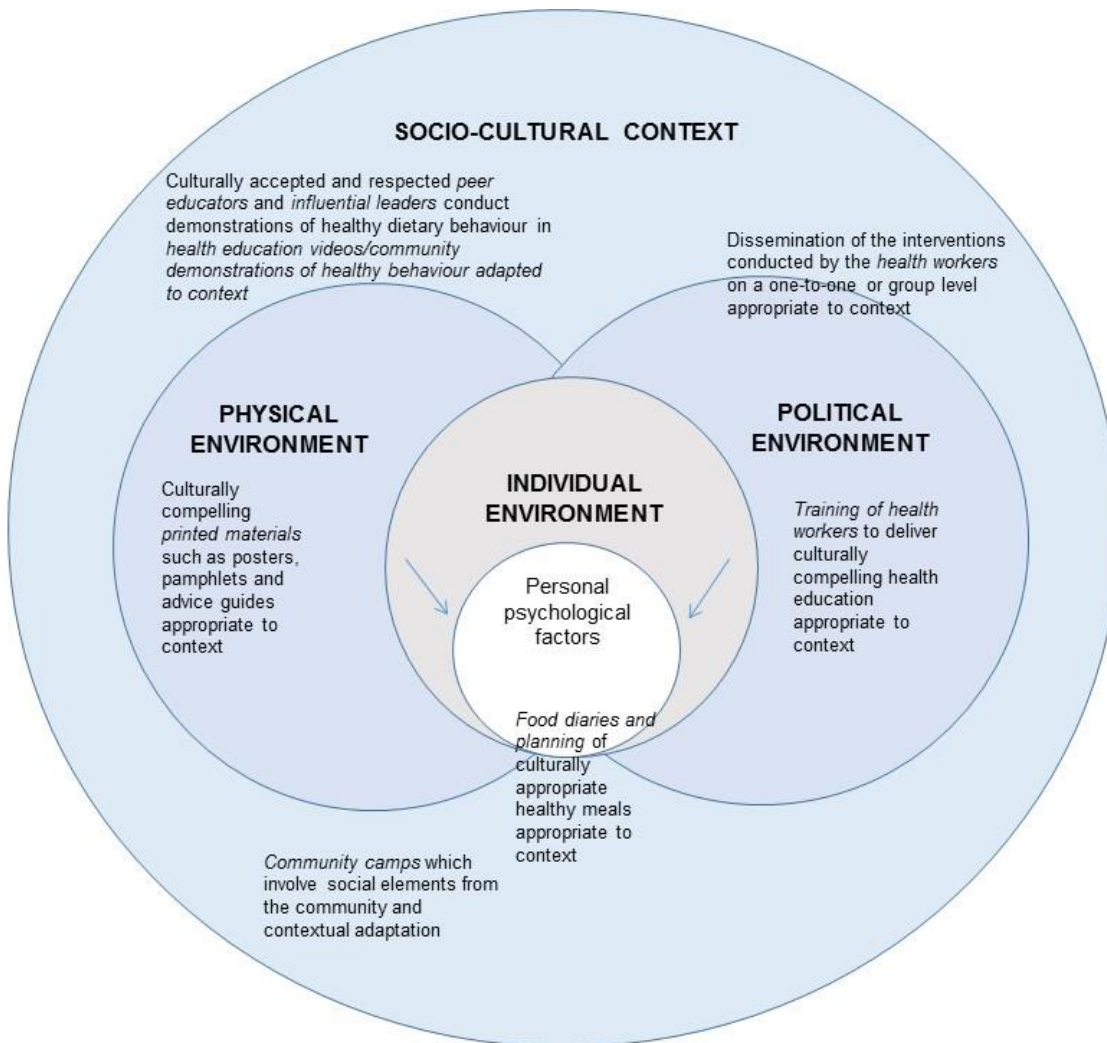


Figure 16: Mapping intervention packages to my ecological model

Printed materials fit into the physical environment because they involve adding physical objects to the environment to influence behaviour. Printed materials also consider the overarching socio-cultural context because they should include culturally tailored dietary advice. *Food diaries and planning healthy meals* use the socio-cultural environment to change personal psychological capabilities (individual environment) to improve dietary behaviour. They consider culturally appropriate food according to individual ethnicity, age, gender and religion (personal characteristics). *Demonstrations of behaviour by peer educators and influential, trusted leaders* involve socio-cultural influences on dietary behaviour as the demonstrations either in communities (*live demonstrations* to groups) or as *health education videos* involve socio-cultural elements of social persuasion and social support made appropriate to cultural context. *Training of health workers*, an intervention included in two of the proposed intervention packages, involves changes to the political environment as it requires policymakers to improve provision for the training of health workers in health facilities. The subsequent one-to-one or group dissemination of the interventions conducted by the newly trained health workers involves socio-cultural elements (e.g. social support, cultural adaptation of advice to patients). Such socio-cultural sensitivity will be encouraged by health workers undertaking participatory discussion about the needs of their patients depending on regional differences, gender, ethnicity

and age profiles of patients. Subsequent adaptation of dietary advice to these contextual specific characteristics represents a culturally compelling change to the social environment. As is evident in Figure 16 all interventions which fit into environments contain aspects of socio-cultural adaptation reflecting the impact of the overarching socio-cultural environment.

9.3 Broader, long-term, macro suggestions for improvements to provision for people with diabetes/HBGLs

To accompany the proposed intervention packages, I make broader longer-term macro suggestions for improvements to provision for people with diabetes/HBGLs. I do so in two stages. First, I look at suggestions made in Chapter 5. Second, I look at suggestions gathered from synthesised data from studies 2 and 3.

Following data analysis after Study 2 I compiled a list of potential suggestions for improving the supply of interventions for people with diabetes/HBGLs (see Chapter 5.3.4). Many of these suggestions are addressed by the proposed intervention packages. The list of suggestions from Study 2 is provided in Table 15 alongside proposals for actions which relate to each suggestion, the proposed intervention packages and later suggestions for policy improvements (9.3.1-9.3.3). Of the twenty suggestions made in Chapter 5, six are to take forward as macro-level policy suggestions unchanged, nine can be addressed in the intervention package proposals and five are connected with proposals made in (9.3.1-9.3.3) which synthesise findings from Study 2 and 3.

Table 15: Actions associated with suggestions from Study 2 to improve the supply of interventions to improve dietary behaviour amongst patients with HBGLs/diabetes

Suggestions from Study 2 for improvements for the supply of interventions to improve dietary behaviour amongst patients with HBGLs/diabetes	Action at the end of research project
<ul style="list-style-type: none"> • Strengthening structures within the political system, such as health facilities, so that health workers can undertake professional development programmes, fellowships and secondments for skill-sharing between institutions to improve their skills. Implementation of these under the mentoring or supervision of senior employees • Pilot dietician training programmes to test effectiveness. If shown to be effective, encourage policymakers to invest in larger scale programmes • Encourage dieticians to work in public health facilities by offering good and fair working conditions • Improve teaching skills in organisations which provide medical training 	Suggestions to take forward
<ul style="list-style-type: none"> • Demonstrate the value and importance of investing in medical education by providing evidence from organisations which offer high standards of medical training (see above) • Build mechanisms within organisations to ensure doctors refer patients to dieticians, fostering trust between both professions 	
<ul style="list-style-type: none"> • Knowledge and awareness of the value of dieticians should be developed amongst patients within health facilities and at a community level. E.g. awareness events involving dieticians offering free dietary advice in communities 	Dieticians should be included in the health workers trained to deliver proposed intervention packages 1 and 2 (including community camps)
<ul style="list-style-type: none"> • Re-emphasising and funding community health clinics at the same time as encouraging health workers from tertiary health facilities to undertake regular prevention awareness-raising activities in community health clinics • Health clinics to act as a base from which to deliver prevention awareness-raising and educational (dietary education) activities to the community • Piloting of community based projects. If successful use this evidence to persuade policymakers to invest in community based projects • Policymakers to develop a habit of using community mobilisers and FCHVs in community engagement projects to promote healthy dietary behaviour 	Ensure intervention packages are delivered in community settings (using FCHVs where appropriate) and involve working with or from community health clinics. After further feasibility testing intervention packages can be piloted and if successful can be used to persuade policymakers of the importance of investing in such community based projects

Suggestions from Study 2 for improvements for the supply of interventions to improve dietary behaviour amongst patients with HBGLs/diabetes

Action at the end of research project

<ul style="list-style-type: none"> • Skills should be developed in running community programmes by offering training to health workers and community volunteers • Organisations to develop a habit of using community mobilisers and FCHVs in community engagement projects to promote healthy dietary behaviour 	<p>Training for health workers and volunteers is a core delivery strategy of intervention packages 1 and 2</p>
<ul style="list-style-type: none"> • Health workers to present evidence to policymakers about the inadequate facilities (e.g. counselling rooms for delivering dietary support) and the impact not having adequate facilities has on service provision. This evidence should foster an understanding amongst policymakers about the importance of investing in improved facilities and infrastructure 	<p>Linked to the suggestion after Study 3 to encourage the integration of services and facilities with other NCD care services to improve services and facilities (see 9.3.1)</p>
<ul style="list-style-type: none"> • Harnessing accepted and respected leaders and figures in the communities in Kathmandu, for example community mobilisers and FCHVs, as well as peer educators, to take part in dietary awareness activities which are ethnically, religiously and culturally acceptable to the local population • Transmission of messages about healthy dietary behaviour through prominent cultural leaders. 	<p>Using influential leaders is part of intervention package 3</p>
<ul style="list-style-type: none"> • Pilot new systems for improving follow-up. If successful use this evidence to encourage policymakers to provide better investment in developing systems to improve patient records 	
<ul style="list-style-type: none"> • Organisations get involved with pilots of follow-up systems to trial how they would work. If successful, organisations can then present evidence to policymakers that such systems are effective, can operate effectively within healthcare facilities and should receive government investment to be scaled-up • Organisations should also undertake socio-culturally appropriate health promotion activities within and outside facilities to promote the importance of follow-up for diabetes 	<p>Linked to suggestion after Study 3 to improve follow-up and therefore sustained dietary support (see 9.3.2.2)</p>
<ul style="list-style-type: none"> • Ensure health promotion campaigns run by organisations/health facilities promote the importance of regular follow-up care for diseases such as diabetes and HBGLs to maintain treatment and prevent the condition from getting worse (linked to increasing role of community health clinics in health promotion). 	

Following the suggestions made to improve diabetes support made in Chapter 5, data from Study 3 also elicited further insights for broader, longer-term improvements to government policy and should accompany the proposed intervention packages. I summarise these insights (synthesised sometimes with findings from Study 2 which support them) in the form of suggestions for broader, macro changes to improve support for those with diabetes/HBGLs. These suggestions are in addition to those made in Chapter 5 and should be considered *in combination* with those suggestions [see table 15]. The following suggestions refer to issues or gaps in policy in relation to diabetes support with a focus on dietary behaviour. These issues/gaps need to be considered by policymakers, practitioners, researchers and health workers, and addressed for longer-term change. As discussed in Chapter 5, existing structures (political, social and organisational) as well as software and hardware elements, play a key role in the delivery of health care to the Nepali population. I therefore frame my discussion around the framework I proposed in Chapter 5 considering organisational, political and socio-cultural contexts with consideration of both hardware and software elements within these contexts. This allows for an extension of my conceptualisation of the health system as a dynamic structure in which political, organisation and socio-cultural elements interact. The suggestions I make are displayed visually in Table 16.

9.3.1 Suggestions for improvements within the organisational context

Data from Studies 2 and 3 suggested that within the organisational context, which dictates how health facilities function, there could be improvements to dietary support for people with diabetes/HBGLs. Resources to provide NCD services could be shared within health facilities; for example, counselling rooms can be used for counselling patients not just with diabetes but also with other NCDs such as cancer. In other research there have been calls to better integrate NCD support (Mustapha et al., 2014, Narain, 2011) and PEN (WHO, 2010, WHO, 2017c) demonstrates an example of policy which works towards an integrated approach to NCDs, pooling resources and skills. Therefore, *the sharing of facilities and expertise within health facilities should be encouraged to improve lifestyle of those with NCDs like diabetes*. Such an improvement would provide better facilities (e.g. counselling rooms) in which to deliver the proposed intervention packages and improve expertise for delivering improved dietary support for people with diabetes/HBGLs.

9.3.2 Suggestions for improvements within the political context

9.3.2.1 Improve diabetes policy

There are also several improvements which could be made within the political context. Between data collection for Studies 2 and 3, there were new PEN protocols developed for various NCDs, though none of these referred to diabetes. Between 2017 and 2018, the government adapted the PEN package to include a new checklist based on the Indian Diabetes Association (Ministry of Health Government of Nepal, 2018). This tool ranks patients on a one-page screening tool and provides a score for diagnosis. Though the tool questions patients about their physical activity, it does not ask them about diet. My findings from Studies 2 and 3 show the importance of considering diet as a key contributor to diabetes and the importance of educating patients about diet. Considering diet at screening stage can raise awareness amongst patients and health workers about the importance of healthy dietary behaviour on diabetes prevention and control. *Awareness should therefore be raised amongst policymakers of diet as important in diabetes prevention and support and government screening tools should be adapted to ensure diet is included when screening for diabetes*. Such changes would ensure that more people in need of

dietary counselling are referred and made aware of their need to have such counselling. More people would be successfully screened using an adapted tool for diabetes where diet was raised as a lifestyle issue they need to address. Subsequently, more people may be encouraged take part in the proposed interventions with the potential that they could have greater impact.

Additionally, the PEN package was focused on rural areas in Nepal at the time of data collection for Study 3. Policymakers in Study 3 said there were no plans to imminently roll PEN out in urban areas such as Kathmandu. There was a perception amongst government officials that people in Kathmandu did not need as much support for tackling NCDs including diabetes as those in rural areas (where PEN is focused). Policymakers stated that this was because those in urban areas have better access to tertiary facilities. My research, however, indicates, that there is a great need in Kathmandu to improve support services for those with diabetes. There is therefore a need for the government to more firmly develop NCD and diabetes policy for urban areas, specifically Kathmandu valley, where approximately 1.5 million people live in one of the densely packed areas in the world and where the annual growth rate is 6.5% (World Population Review, 2018). Urban populations of Nepal in 2017 consisted of 5.6 million inhabitants out of a population of 29.2 million (Statista, 2018), thereby making up nearly 20% of the population. The demand for an improved diabetes policy for this growing urban population is vitally important. Therefore, *a greater understanding needs to be developed about the problem of diabetes and unhealthy dietary behaviour in Kathmandu and other urban areas*. Such an awareness would ensure that the proposed intervention packages would be supported by government and advocated in urban areas including Kathmandu.

My research revealed problems with the implementation of policy, for example, the establishment of health promotion centres in Kathmandu which were not introduced possibly due to a political issue noted by a policymaker interviewed in Study 3. This illustrates the issue of political stalemate and gridlock in Nepal often caused by unknown problems. This is supported by evidence in the multi-sectoral nutrition plan 2018-22 (Ministry of Health Government of Nepal, 2017) which found that weak institutional structures and poor political communication and coordination between authorities hindered the implementation of the multi-sectoral nutrition plan of 2013-17 (Government of Nepal, 2013), with sectoral ministries giving low priority to nutrition. These problems have prevented the delivery of services and resources which could improve the lives of those in Kathmandu suffering from NCDs such as diabetes, as the health promotion centres promised to do. There was a demand from health workers, researchers and policymakers in both studies 2 and 3 for the introduction of procedures to ensure transparency and accountability in government to eliminate political gridlock and inactivity and ensure policy commitments are followed through. This demand can be met by *developing measures such as clear, transparent processes for policy implementation to ensure transparency in government and eliminate political gridlock*. This can include advocacy meetings at all three levels of government (federal, provincial and municipal) and oversight by coordination committees including ward level steering committees and developing leadership skills for the office holders in these committees (such as ward chair persons and district mayors). Improving processes in policy implementation would heighten the likelihood that intervention packages would be delivered with support from government.

Additionally, there are no evaluation mechanisms in place for government policies and campaigns, for example, policymakers interviewed stated there were currently no evaluations planned for the PEN package. Similarly, no evaluation has been done of the government campaign 'My Year' which aimed to improve lifestyle by promoting healthy living, including

healthy diet messages. Evaluation mechanisms are vital to ensure health policy is working as has been argued in research on health policy in low income countries (Adam et al., 2012, Borghi and Chalabi, 2017, English et al., 2017, Tashobya et al., 2014). There is therefore a gap in the use of evaluation mechanisms of existing government policies such as PEN which it is important to fill. These mechanisms can be implemented if *resource is given to developing them*. Evaluation mechanisms could include annual reviews on progress, the introduction of oversight or coordination committees, organisation and management surveys and improved human resources management. Evaluation mechanisms would benefit the implementation of intervention packages because it would allow for the process of evaluation of the packages to ensure improvements could be made.

9.3.2.2 Provide sustained dietary counselling

Data collected from health workers in studies 2 and 3 suggests the government provides funding for basic dietary counselling for patients with diabetes/HBGLs in a few public hospitals in Kathmandu. This counselling involves long waiting periods and crowded consultations. Furthermore, if patients want follow-up treatment, they must always pay for test results and often must pay a fee if they choose to attend further dietary counselling in a private health facility. Many patients interviewed in studies 2 and 3 stated that they were therefore unlikely to seek follow-up medical care including dietary counselling. Follow-up in government funded facilities was rare and difficult to instigate within fractured and inadequate internal systems (such as no electronic record keeping). This makes it difficult to maintain dietary support for patients in a sustainable way. As discussed in Chapter 5, new systems should be piloted for improving follow-up. If successful, this evidence should be used to encourage policymakers to provide better investment in developing systems to improve patient records. Evidence suggests that electronic management systems would bring many benefits to health facilities in Nepal, and should be a government priority (Mishra et al., 2009, Raut et al., 2017, Watkinson-Powell and Lee, 2012, Dhungel, 2017, Raut and Chand, 2017). Therefore, *a greater understanding must be developed of the importance of improved and frequent counselling and how developing follow-up systems can enable more frequent counselling*. Tools highlighted in the intervention packages such as cooking demonstrations, food diaries and printed materials are ways of providing nutrition education which would benefit from being delivered to patients over a sustained time (i.e. not one-off). Patients in Studies 2 and 3 showed a desire to receive these interventions more than once to sustain change and provide continued support. Health workers confirmed that food diaries were more effective when delivered repeatedly to the same patients. By engaging policymakers in improving such sustainable dietary interventions, the proposed packages could be embedded into new follow-up mechanisms.

9.3.2.3 Take a multi-sectoral approach to dietary support for diabetes

There was also suggestion from policymakers and researchers in Study 3 that government departments, such as Health, should not work in silos (as several researchers stated they currently do), and should rather work with other sectors to deliver joined up policy at national scale. Multi-sectoral working is taking place to some extent in Nepal as demonstrated by the multi-sector nutrition plan (International, 2016, Strengthening Partnerships et al., 2016, UNICEF and The World Bank Group, 2013). Additionally, a multi-sector plan is in place for NCD prevention until 2020 (World Health Organisation Country Office for Nepal, 2014). These plans have been designed to work across sectors for maximum effect. The multi-sector nutrition plan has been evaluated as effective in improving maternal and child health, though it is too early to

evaluate the effectiveness of the multi-sector plan in place for NCD prevention which largely focused on PEN. These examples demonstrate the importance of cross-sector working in Nepal to ensure resource sharing and effective policy delivery which the government should be working towards. Furthermore, research has shown that multi-sectoral approaches to NCDs on other LMICs can be effective (Mustapha et al., 2014, Bonilla-Chacin and Luis, 2012) . I recommend further *encouraging a culture of multi-sectoral working across different government sectors*. Particularly relevant for dietary behaviour would be working with the ministries for agriculture who influence food production, education who can influence health promotion such as in schools or communities, and women’s development which can help to ensure women (who often face a burden of feeding their families healthy food) are enabled with skills to maintain healthy dietary behaviour for themselves and their families. Engaging multiple sectors to be involved with the intervention packages would help to ensure they were made relevant and tailored to needs; specific sectors would offer perspectives on how to tailor the interventions more effectively. An example of this would be engaging the sector for women’s development in designing and distributing printed materials to ensure messages are made relevant and appropriate for women.

9.3.2.4 Integrate multi-disciplinary team working in health facilities

Several participants advocated the importance of the government deploying multi-disciplinary teams [MDTs] (including dietitians, clinicians, nurses, podiatrists) to health facilities. Though this would require a change in the organisational context, it is also a higher level political issue, as government support is needed to encourage MDTs in public health facilities. One policymaker interviewed in Study 3 stated that the government has started to take interest in the activities of an independent organisation Nick Simons Institute (NSI) to deploy MDTs to districts in Nepal. NSI in Kathmandu has been successful in sending multi-disciplinary teams to hospitals in many districts (Zimmerman et al., 2016). Multi-disciplinary teams have been used in diabetes support in HICs (Centres for Disease Control and Prevention, 2018, Ridge, 2012) and in LICs including Nepal (World Health Organisation, 2018) and hold potential to be effective on a larger scale in Nepal. I recommend *beginning to integrate multi-disciplinary teams in health care* to improve dietary behaviour, by, for example, referring people with diabetes/HBGLs to dietitians for dietary support. Such systems would ensure smoother delivery of intervention tools such as food diaries and printed materials delivered by health workers such as dietitians to patients who are referred to them by other members of MDTs.

9.3.2.5 Provide sustained supervision after training health workers

As already stated in Chapter 5 there have been repeated criticisms of government handling of the training of trainers and training of health workers. Participants in both studies 2 and 3 stated that this has had a negative effect on healthcare outcomes. Importantly, several researchers stated that the training delivered by the government must be reinforced by supervision of its implementation in practice after the training is given so that government training is not a one-off process but a sustainable one involving monitoring. These calls from my findings are corroborated by research which has found that more attention needs to be given to the monitoring and supervision of health worker training in LMICs (O’Donovan et al., 2018, Lopes et al., 2014, Dieleman and Harnmeijer, 2006). Another study found that health care quality can be improved if training is combined with other components such as supervision or group problem solving, and that a multi-level systems orientated approach which monitors training can be effective in LMIC contexts (Rowe et al., 2018). Furthermore, a recent review of supervision of

health workers found that regular supervision with supportive approaches (quality assurance, problem solving) can be effective in enhancing health worker performance (Hill et al., 2014) and supervision has enhanced health worker performance in many settings (Glenton et al., 2013, Kok et al., 2014, Ndima et al., 2015). There is a need to *develop skills in supervising health workers, for example through health training packages for specific policies*. Such supervision would ensure that the proposed intervention packages would be sustainable as the health workers trained to deliver the intervention tools (e.g. food diaries, printed materials) would be supervised and supported to deliver the intervention over a sustained period.

9.3.2.6 Decentralisation and the potential for local committees

Since 2017, political restructuring has decentralised powers in Nepal to provincial and municipality levels including to local bodies such as District Health Offices. Decentralisation of power could do much to deliver the contextually appropriate and compelling intervention packages this project has found to be important and feasible. Despite the possibilities decentralisation brings, there have been concerns that bureaucracy, ill-prepared government, serious corruption and a culture of patronage, lack of accountability and the possibility that elected representatives will be working in a systemic vacuum, will make decentralisation difficult to succeed (Chalise, 2017, Nepal, 2017). Early evaluations of health outcomes associated with decentralisation are mixed, showing some perceptions of benefits to primary care delivery (planning involving communities, quality of services received, access to services), but also some negative outcomes (lack of power-sharing, poor capacity building, lack of supplies and infrastructure, lack of participation in local health services) (Regmi, 2017). A recent review of successful decentralisation in LMICs indicated that technical skills at local level to perform decentralised tasks and effective decentralisation of decision-making and political leadership are key (Cobos Muñoz et al., 2017). The development of decentralisation in Nepal is not without significant challenges, and the extent to which these challenges can be met with successful solutions requires further investigation. For the purposes of this research, it is important to acknowledge that shifts are occurring in the political environment which could enable more culturally compelling and community focused interventions like the proposed intervention packages, to be implemented across Nepal to reduce the impact of diabetes. A potential suggestion generated from my research is therefore to evaluate and carefully assess the recent moves to decentralise power in Nepal and encourage *the development of skills at local level to perform required decentralised tasks*. The effects of successfully implementing this measure should ensure that decentralisation can be an effective tool in delivering localised, contextually adapted dietary interventions such as the proposed intervention packages, as well as other health interventions which benefit regional communities depending on their varied needs. Developing skills at local level will particularly aid the implementation of community initiatives such as demonstrations of dietary behaviour by peer educators because skilled local officials will be able to effectively engage local community groups (e.g. mothers' groups) and volunteers (e.g. FCHVs and community mobilisers) in the interventions to make them successful.

9.3.3 Suggestions for improvements within the socio-cultural context

As explored particularly in Chapter 4 and Chapter 5, there is a need to *address and account for the socio-cultural factors which influence dietary behaviour with socio-culturally appropriate interventions* (e.g. socio-cultural expectations that female diabetics will cook even when this creates a double burden when combined with illness). Researchers have long believed that to be effective, health behaviour interventions must be responsive to cultural practices of the

groups for whom the interventions are intended (Resnicow et al., 1999, Domenech Rodriguez et al., 2011). Culturally-adapted behavioural health interventions have been found to be more effective in improving health outcomes than usual care (Barrera et al., 2013). Furthermore, studies 2 and 3 have found that dietary behaviour is determined largely by socio-cultural factors (such as social pressures to take part in festivals which could involve consuming large amounts of unhealthy food) which are entrenched and socially enforced. An understanding of the socio-cultural factors influencing dietary behaviour and ways in which these can be accounted for, should be built into intervention packages (as the proposed packages do – see Table 15) to ensure the interventions are culturally compelling (Panter-Brick et al., 2006) and appropriate to context and address important socio-cultural behavioural determinants. Socio-cultural factors will be addressed in the proposed interventions by carefully created materials (e.g. printed materials, food diaries) or content (e.g. healthy food demonstrations by video/peer educators) to ensure that reasons why people may or may not consume particular foods (e.g. religious/ethnic traditions) are sensitively considered and alternatives are offered which are culturally acceptable yet better for diabetes prevention or maintenance. Table 16 provides a summary of the suggestions for broader, macro-level improvements to dietary support provision for people with diabetes/HBGLs.

Table 16: Summary of suggestions for broad, macro-level improvements to dietary support provision for those with diabetes/HBGLs in Nepal

Context	Suggestion	How suggestion will aid implementation of proposed intervention packages
Organisational	Encourage the sharing of facilities and expertise within health facilities to improve lifestyle of those with NCDs like diabetes	Provide better facilities (e.g. counselling rooms) in which to deliver the proposed intervention packages and improve expertise for delivering improved diabetes care.
Political	Awareness should be raised amongst policymakers of diet as important in diabetes care and prevention and government screening tools should be adapted to ensure diet is included when screening for diabetes	More people would be successfully screened using an adapted tool for diabetes where diet was raised as a lifestyle issue they need to address. Subsequently, more people would take part in the proposed interventions with the potential that they could have greater impact.
	A greater understanding needs to be developed about the problem of diabetes and unhealthy dietary behaviour in Kathmandu and other urban areas	Ensure that the proposed intervention packages would be supported by government and advocated in urban areas including Kathmandu.
	Develop measures such as clear, transparent processes for policy implementation to ensure transparency in government and eliminate political gridlock	Improving processes in policy implementation would heighten the likelihood that intervention packages would be delivered with support from government.
	Give resource is to developing evaluation mechanisms to evaluate diabetes-related policies and campaigns	Improved evaluation mechanisms would allow for the process of evaluation of the packages to ensure improvements could be made.
	A greater understanding must be developed of the importance of improved and frequent counselling and how developing follow-up systems can enable more frequent counselling	Tools highlighted in the intervention packages such as cooking demonstrations, food diaries and printed materials can be aspects of dietary counselling which would benefit from being delivered to patients over a sustained period of time (i.e. not one off). By engaging policymakers in improving more sustainable dietary interventions, the proposed packages could be more sustainable and feasible and could be embedded into new follow-up mechanisms.

Context	Suggestion	How suggestion will aid implementation of proposed intervention packages
	Encourage a culture of multi-sectoral working across different government sectors	Engaging multiple sectors to be involved with the intervention packages would help to ensure they were made relevant and tailored to needs; specific sectors would offer perspectives on how to tailor the interventions more effectively. An example of this would be engaging the sector for women's development in designing and distributing printed materials to ensure messages are made relevant and appropriate for women.
	Begin to integrate multi-disciplinary teams in health care	Would ensure smoother delivery of intervention tools such as food diaries and printed materials delivered by health workers such as dieticians to patients who are referred to them by other members of MDTs.
	Develop skills in supervising health workers, for example through health training packages for specific policies	Would ensure that the proposed intervention packages would be sustainable as the health workers trained are given to deliver the intervention tools (e.g. food diaries, printed materials) would be supervised and supported to deliver the intervention.
	In the wake of decentralisation, develop of skills at local level to perform required decentralised tasks	Developing skills at local level will particularly aid the implementation of community initiatives such as demonstrations of dietary behaviour by peer educators because skilled local officials will be able to effectively engage local community groups (e.g. mother's groups) and volunteers (e.g. FCHVs and community mobilisers) in the interventions to make them successful.
Socio-cultural	Address and account for the socio-cultural factors which influence dietary behaviour	Socio-cultural factors will be addressed in the proposed interventions by carefully created materials (e.g. printed materials, food diaries) or content (e.g. healthy food demonstrations by video/peer educators) to ensure that reasons why people may or may not consume particular foods (e.g. religious/ethnic traditions) are sensitively considered and alternatives are offered which are culturally acceptable yet produce improved health outcomes for diabetes prevention or maintenance.

9.4 Reflections on methods used in Study 3

In workshops, the contribution of one participant can often trigger another to share their opinions or experiences (Hardon et al., 2004). This occurred in my workshops and was highly valuable at this stage of my project as it led to the evolution of discussions to explore multiple ideas which one participant may not have thought of alone. I found it challenging during the workshops held in Nepali when I did not understand the discussions, though a translator helped my engagement. I did understand enough at points to add questions or probes, though I was never sure if my exact meaning had been translated adequately. This was an inevitable challenge with working with a population whose language I do not speak. However, I took steps to minimise the impact of this by reflecting with the Nepali research team after each workshop and discussing ways in which the workshops could be improved. I also asked the researchers to explain in detail how they thought the workshops went, as well as discussing with them the main findings from each workshop before we moved to the next one. Overall, I was pleased with how the Nepali workshop was facilitated by the HERD researcher and felt I was still able to input into the discussions because of the translation I was provided with.

A particular challenge when conducting workshop discussions was managing group dynamics as has been found as a common challenge with this method (Skovdal and Cornish, 2015). The success of a group discussion was less predictable than individual interviews, as dynamics and flow of the conversation depended on the participants in the workshop. However, the participants in the health worker workshop were particularly good at allowing everyone to speak, and on several occasions, participants asked the quietest participant for her opinions. The facilitator was also effective at ensuring everyone's opinions were heard in all of the workshops and quieter participants were encouraged to participate fully. I had good rapport with many of the participants before and after the workshops and took time to talk to them outside the workshop environment. This built on good relationships I had previously established with many of the health workers and policymakers who I had interviewed in Study 2. This aided participant engagement with the project and encouraged enthusiasm during the discussions. Overall, I was happy with the way each workshop and interview went and I minimised the impact of three workshops being conducted in a language I do not speak.

9.4.1 Limitations of sampling

A limited number of patients, health workers and policymakers were recruited to take part in Study 3. This was due to time and availability constraints of those I wanted to recruit. The number of policymakers interviewed was a particular limitation and continuity was not always possible with health workers and policymakers who had been interviewed in Study 2 due to those individuals being unavailable for Study 3. However, new, different policymakers were interviewed, allowing for different views and perspectives to emerge in the data, adding richness to my findings. All policymakers had some interest in diabetes or NCDs to ensure they had relevant expertise. Policymakers less interested in diabetes/NCDs may have provided alternative perspectives on issues (e.g. on health resourcing). However, the sample I had time to gather was limited and therefore I focused on those policymakers with some diabetes/NCD expertise. The sample of patients did not contain many young patients, as they were the hardest age group to recruit for the interviews in Study 2 due to work commitments. However, the participants interviewed did discuss how young people may respond to the intervention proposals. The sample of patients and health workers showed some convergence and similarity in experiences of the health services available to people with diabetes/HBGLs. Finally, I did not include partners

of patients in the workshops. Discussions between patients and their partners had been useful in Study 2 and elicited detailed data on determinants of behaviour (see Chapter 4). It could have been useful to include some partners of patients in the workshop discussions to provide a broader view on the social support elements (provided by partners) involved in an intervention's potential success. This was particularly the case after social support was found to be important in influencing behaviour in Chapter 4. However, time and practical constraints around recruitment as well as a focus on patient needs from interventions meant only patients [the target population] were recruited to the workshops. In future it could be useful to include partners in similar workshops.

9.4.2 Separate workshops for men and women

In separate male and female patient workshops I found that conversation between the participants in their separate groups was open and uninhibited and elicited valuable discussions about what would work well for different genders. Therefore, the separation of male and female patients in different workshops was an effective method in this study.

9.4.3 Workshop iterations

There were several aspects of the workshops which I changed as the workshops were conducted. This was because I included reflection after each workshop, demonstrating an iterative approach and a willingness to adapt the workshops to improve them. First, during the course of the female patients' workshop, it became clear that participants believed that different interventions would work well for different genders. I therefore adapted the workshop to include discussion of these differences. Second, I intended to include ranking exercises in all workshops which would act as a trigger to build rapport and discussion around the main intervention proposals. In the researcher workshop, participants were asked to put a post-it note on the interventions which they thought were most organisationally feasible, GCP feasible and scalable and sustainable. I found that these were quite complex and sometimes abstract concepts for the researchers to understand in relation to the interventions. Therefore, after the researchers' workshop, I was cautious about how the ranking activity would work in other workshops. I tried ranking in the health worker and patient workshops, but participants found the feasibility criteria confusing and though they discussed many of the issues (e.g. whether an intervention would work in the health system), categorising these issues within labels such as 'organisational feasibility' did not work. Therefore, I altered the ranking activity so that in the patient and health worker workshops, participants were simply asked to put a post-it on the two interventions they preferred. They were then subsequently asked to discuss the reasons for their choices (with the facilitator making reference to the feasibility criteria within the free-flowing discussion). This activity worked well and sparked useful discussion. The fact the ranking activity in the workshops was not successful meant that I tried to use the criteria to rank the interventions with the data from Study 3 after the interventions, as can be seen in the evidenced ranking in Chapter 8. In comparison, it was easier for participants to understand the concepts of the types of groups in each intervention (e.g. one to one communication), though these were self-evident from most of the interventions (e.g. peer support).

9.4.4 Use of logic models

Participants in the researcher workshop responded well to the logic model task, providing five well thought out completed logic models (see Appendix C.7). The logic models allowed participants to draw out useful information (e.g. the resources and actions needed for each

intervention to be successful) about what practical considerations would be needed for the development of each intervention proposal. These considerations can be seen throughout my analysis of interventions in Chapter 8. For example, regarding sending text messages (8.8.4), the logic models sparked discussion about the need to consider the amount of the population covered, the characteristics of participants, the frequency of messages and the time and resource involved in developing a database of people to contact and the challenges involved in delivering the intervention at federal level. Ideally, I would have used the logic model activity with policymakers as well as researchers, because many policymakers also have a good overarching understanding of the resources and activities needed to implement an intervention. However, due to the limited time policymakers were free this was not possible. Using logic models proved an effective and efficient way of engaging stakeholders in such detailed consultation and I would use them again in the future.

9.4.5 Use of the feasibility criteria for feasibility assessment

Following the use of the feasibility criteria for feasibility assessment I found that it was not an ideal way of assessing the interventions. The initial criteria used in Chapter 7 outlined by Walley and Wright (2010) did not cover all aspects of feasibility I found that I needed to consider. The addition of sustainability and scalability as criteria after Study 3 in Chapter 8 helped to make the feasibility assessment more rigorous. However, I found it difficult to rank many of the interventions in the restrictive and often subjective scale of high (3), medium (2) and low (1). As the data collected in studies 2 and 3 was qualitative, it did not lend itself to quantitative ranking into three categories. I often found that the ranking I decided on was dependent on multiple (sometimes hypothetical) factors and therefore was not perfect. However, I found the ranking exercise important because it gave a clearer idea about which interventions were most likely to be feasible, and therefore which ones should be included in the intervention packages proposed in this chapter. The exercise also allowed me to draw together my qualitative and quantitative findings from all three studies as well as evidence from other research in a rigorous process.

I found that criteria overlapped which made categorising them challenging. An example of this was that financial feasibility often overlapped with other criteria such as sustainability (an intervention might have been highly financially feasible if it was delivered only once but not if it was delivered over a sustained period). This made it hard to assess how to score the interventions. However, I dealt with the criteria separately, seeing sustainability being more about longevity of the intervention and financial feasibility more about cost and expense. To ensure that these two criteria were reporting different variables I conducted a sensitivity analysis whereby I assessed the rankings of the interventions with and without either financial feasibility or sustainability. This analysis found that the rankings differed from each other when financial feasibility or sustainability were omitted. This indicates that each criterion reported different and distinct characteristics about the interventions and warrants both criteria being included in the analysis to uncover different factors.

Additionally, I found gender/cultural/political feasibility particularly complicated to code. This was because sometimes an intervention would be feasible in terms of gender and/or culture but not in terms of political (or vice versa), but with such disparate concepts grouped together I had to make an overall judgement about how to rank these criteria. These generalised judgements could not take into account the nuances associated with political or cultural aspects of feasibility as they ideally would do. In the future, if using similar criteria again, I would separate each aspect of the gender/political/cultural criterion and assess each one separately to give a more accurate idea of specific feasibility aspects associated with an intervention.

The set of criteria I used did not explicitly include cost effectiveness – putting the effectiveness and cost together to examine how best to spend a fixed budget. Cost-effectiveness is the standard method of appraising interventions in a quantitative way. I chose not to rank interventions according to this cost-effectiveness as I did not have enough data to undertake a full cost-effectiveness analysis. The aims and objectives of the project were not to look in detail at the cost-effectiveness of interventions, an area which warrants in-depth investigation as has been demonstrated (Li et al., 2010, Ramachandran et al., 2007). Therefore, cost-effectiveness would need to be a separate, in-depth investigation, potentially involving more quantitative components than those used in Studies 2 and 3. I therefore allowed financial issues to be considered by ‘financial feasibility’ as a sufficient overarching category to cover cost-effectiveness, as advocated by Walley and Wright (2010) as well as considering aspects of cost-effectiveness in the other feasibility assessments such as sustainability.

However, the use of the financial feasibility criterion was not straightforward. After my first use of the financial feasibility criteria in Study 2 it became clear that it was a difficult criterion to accurately garner from data which predominantly looked at cultural, political, organisational and technical feasibility. Financial aspects of interventions, including cost-effectiveness were often uncertain and dependent on hypothetical variables such as scale and resources required. Interventions could have been delivered with different amounts of resources, leading them to have variable financial feasibility scores. I therefore made informed judgements on the financial feasibility of interventions based on the evidence available to me.

Another limitation with the feasibility criteria used is how all aspects of feasibility may change when combining the individual proposed interventions into intervention packages. Combining interventions can mean combining different assessments of technical effectiveness, financial feasibility, cultural/gender/political feasibility and all other criteria connected with each intervention. Weaker interventions may become more feasible in different aspects when combined with stronger ones and vice versa. I discussed the limitations of using intervention packages at the start of this section (9.2). To address these limitations, further testing and intervention development is required with concrete methods to assess the feasibility of an overall intervention package.

In Chapter 8, following Study 3, I chose not to include a second review of two out of four criteria I explored in Study 2, though I added a review of two new criteria (sustainability and scalability). The two criteria I did not re-review for each intervention proposal were financial feasibility and technical effectiveness. I justified my decision with reasons specified in Chapter 8 [8.4] and focused on the other criteria which were more likely to have changed in the light of Study 3 and which would have elicited more discussion from participants. This also focused my analysis and saved space in an already long chapter. However, with more time I would include a full second review of the financial feasibility and technical effectiveness of interventions following Study 3 to make my Study more thorough. Instead of providing a second review of these criteria I summarised any major changes relating to them from my Study 3 data and included them in my analysis and the final intervention ranking. Therefore, I do not believe that not providing a full second review of financial feasibility and technical effectiveness was a major impediment in my intervention development process. My analysis remains strong and a second in-depth review of these criteria would not have altered my final conclusions or rankings.

An alternative way to analyse my data would have been narrative description or thematic analysis, as is often used to present qualitative data, and which I used to present findings from Study 2. However, I chose not to use these methods as I tried to create a process by which I

could incorporate previous quantitative findings (Study 1) with my qualitative findings to produce practical outputs. By synthesising these findings and ranking the most popular interventions I generated a clear result about which interventions were the most feasible considering several important feasibility criteria. Narrative description or thematic analysis of the interventions would not have allowed for a clear ranking process leading to conclusive evidence about which interventions were the most and least feasible according to important criteria. I acknowledge that my feasibility ranking method may be criticised by qualitative researchers for trying to quantify data which may not be completely quantifiable, pointing to the dominance of the quantitative paradigm in international health research. However, the method could equally be criticised by quantitative researchers for not being as robust as they would like. Therefore, I have tried to deliver a compromise between these two and though there were many limitations with the feasibility criteria I used, a positive output from the process and from the data demonstrates an innovative and tangible process to combine qualitative and quantitative data to deliver socially useful outputs. This process, though limited by the subjective need to categorise according to the feasibility criteria which sometimes had overlapping components, demonstrates a practical way (in line with the pragmatic research paradigm (Feilzer, 2010)) of synthesising multiple realities and perspectives from a range of stakeholders into pragmatic solutions to address the real world problem of growing rates of diabetes/HBGLs by tackling an important risk factor - unhealthy dietary behaviour.

9.4.6 Content of intervention proposals

Another challenge with the data analysis of Study 3 was the actual content of the intervention proposals. The way the interventions were designed meant that some interventions were broad in scope such as community camps, whereas others, such as printed materials were more specific intervention tools. Other interventions such as peer educators, constituted modes of delivery. Therefore, the final interventions assessed for feasibility were a mixture of intervention tools and strategies. This meant that feasibility assessment was based on a combination of these two different types of intervention when ideally the tools would have been considered separately from modes of delivery and strategies. If I were to do this research again, I would ensure the types of intervention were defined clearly and tools/modes of delivery/strategies were considered separately from the outset. I would also consider combining some tools with some modes of delivery and strategies to test the feasibility of already constructed intervention packages.

9.4.7 Proposals for broader, long-term, macro suggestions for improvements to provision for people with diabetes/HBGLs

My proposals for longer-term macro suggestions are made for political, socio-cultural and organisational contexts. Though I have tried to present tangible suggestions for the low income context of Nepal, I acknowledge that there are some limitations to these recommendations regarding their potential cost. In a resource-limited setting such as Nepal getting financial support for improvements to the health system (e.g. beginning to integrate multi-disciplinary teams in health care) could be challenging. However, I believe it is important to state these suggestions for improvements which policymakers should strive for despite potential challenges around implementation.

9.4.8 Reflexivity

Important considerations of reflexivity involved how my personal experience and background affected my interpretations and interactions with participants. I used a research diary throughout my data collection process to reflect on both of these factors. Taking a pragmatist approach to research (Feilzer, 2010) accepts that there are multiple realities that are open to empirical enquiry and my data reflected these multiple realities from both my perspective as a researcher, and those participants I engaged with. As the pragmatic paradigm also suggests, research requires researchers to ask what and who the research is for and reflect on how the researcher's values influence the research (Feilzer, 2010). I considered these questions throughout my qualitative enquiry, reflecting on them in my research diary, to ensure my research mirrored reality. In Study 3, I did not conduct the health worker or patient workshops as they were conducted in Nepali. However, I was present during these workshops and contributed to the discussion when appropriate through a translator. My presence could have influenced the participants' behaviours in the workshops. However, I took steps to limit my impact by assuming a position at the back of the room and allowed the facilitator to lead all aspects of the workshops. I also tried to limit my impact on participants by establishing or re-establishing rapport with them prior to the workshop, greeting them warmly in Nepali and conversing with them either in English or through a translator. Some participants had met me before, others had been part of the project before and some were new to the project. I was concerned that some new participants or those who had not met me before may see me as a western visitor with funding to bring improvements to their lives (as many western visitors to Nepal bring funding for projects, particularly since the earthquake of 2015). However, to address this concern I clarified my research aims and constraints from the outset to manage expectations. Prior to the facilitators running the workshops, I briefed them carefully on key objectives and we reflected together on how the workshops had gone after each one, improving practice where possible. I was aware that I was interpreting the research findings through a British cultural lens. To limit the impact of my own culture on my findings, and ensure that Nepali culture was considered appropriately, I had regular discussions with Nepali researchers about findings and interpretations of them. I frequently asked Nepali researchers questions about meanings and interpretations from a Nepali perspective. These discussions with Nepali researchers were invaluable in adding richness to the data and limiting my own cultural interpretations from taking too much influence in the Nepali context. Though my personal perspective brought some drawbacks, my knowledge of the research area [diabetes, NCDs, dietary behaviour, behaviour change] and a broad perspective on potential interventions to improve dietary behaviour, provided ideas and an additional source of evidence to contribute to the shaping of the project.

9.5 Conclusion

This chapter has proposed suggestions for potentially feasible intervention packages to improve dietary behaviour to be piloted or developed further. It has also proposed broader, macro-level suggestions for improving dietary support for people with HBGLs/diabetes in political, organisational and socio-cultural contexts. These suggestions have been linked to how they may aid the implementation of the proposed intervention packages. This chapter has therefore drawn together findings from studies 1-3 and presented tangible suggestions for taking this research forward to improve the lives of those with HBGLs and diabetes in Nepal by introducing mechanisms to support the improvement of their dietary behaviour.

Chapter 10 Conclusion

10.1 Reflective assessment of methodological process taken

10.1.1 Process taken for Study 1

My aim for this thesis was to establish how dietary behaviour can be improved in LMIC contexts, with a focus on a specific LMIC context – Nepal, to tackle the increase in NCDs, particularly diabetes. My thesis aimed to critique the hegemony of Eurocentric models of behaviour change (Airhihenbuwa, 1995). I decided to conduct a systematic review to see how behaviour change theories have been used in LMICs. I made this decision because systematic reviews have previously been used to investigate behaviour change interventions (e.g. (Dombrowski et al., 2016, Greaves et al., 2011, Thomson and Ravia, 2011)). I also decided to undertake a systematic review because such reviews represent a conventional approach to establish the evidence base and one often recommended by public health intervention frameworks, which underpin intervention development and evaluation (Medical Research Council, 2006, Wight et al., 2015). Taking this conventional and recommended approach therefore strengthened my voice and the credibility of my research with certain audiences, especially within public health and psychological disciplines. This was important because of the interdisciplinary nature of my research project.

The methodological process I took with the review was a complex and challenging one involving a series of decisions which moved the project in various directions at different stages. The primary outcome of the review was dietary behaviour, but it also considered physiological outcomes as secondary outcomes given the availability of such data and interest in physiological outcomes (particularly those related to diabetes/HbGLs). In the review sex was categorised instead of gender as these were the reported measures in the RCTs in the review. In Chapter 3 [3.1.1.2] I discuss the limitations of looking only at sex as a categorisation and, on reflection, I see this as a limitation of Study 1 and the conclusions which can be drawn from the data about gender.

One of the strengths of the review is that it used a BCT taxonomy (Michie et al., 2013), which provided a shared language with which to synthesise evidence across studies. However, after a complex and time-consuming process, I found that the systematic review could only offer tentative suggestions about the potential effectiveness of specific BCTs in improving dietary behaviour. Analysis using this taxonomy also left me asking questions about my initial anxieties about the hegemony of taking HIC approaches in LMIC contexts.

After undertaking the review process, I began to question the use and scope of taking such a conventional approach to establishing the evidence base. The risk of bias tests conducted as part of the review could only go so far in attempting to limit bias and as with any approach, there are limitations and drawbacks to conducting a systematic review, such as missing out more qualitative data and only taking a quantitative approach towards data extraction and analysis. There were disciplinary expectations from a multi-disciplinary supervisory team that a systematic review addressing psychological theories would reveal findings about health behavioural outcomes, which it did, though it also raised questions about the need to include other more sociological approaches to my research which could reveal more about the social context in which health behaviours played out. This additional understanding was important because I discovered from this initial scoping work that I needed to know more about the

complex socio-cultural context within a specific LMIC (Nepal) including the health system in Nepal and food cultures in order to understand the multiplicity of factors which lead to a risk behaviour (unhealthy diet). From a sociological perspective, for example, using Michie et al's BCT taxonomy (2013) to consider LMIC interventions in the systematic review was imperfect and it did not allow me to consider in detail the impact of gender and intersectionality on behaviour as they are not explicit within the BCT taxonomy.

Limiting the studies in my review to RCTs meant that I had potentially missed out many qualitative studies and studies of social innovations which could provide rich detail about how interventions could be appropriate for settings like Nepal. Such qualitative and social innovation studies were important to consider because they directly support universal health coverage by providing new solutions to providing access to health care. Such innovations involve the active engagement of community members and other actors in the health system to identify issues, develop solutions and implement them sustainably with the aim of adding value to existing health interventions and making health care delivery more inclusive, affordable and effective. Social innovations are initiated in response to complex challenges and structural failures which result in people's health needs not being met (van Niekerk et al., 2017). Examples of social innovations include; a) the Indigenous Community Health Agent Professionalisation Programme in Brazil which seeks to incorporate the cultural underpinnings and voices of indigenous people in their community health agents (van Niekerk et al., 2017), b) the 'business in a box' model which provides micro-financing to improve socio-economic conditions for women in rural areas of Pakistan by socially responsible micro-franchising (Cheema and Mehmood, 2019), c) the MoPoTsyo peer-education programme to tackle diabetes in Cambodia (van Olmen et al., 2016). Social innovations, such as the examples provided, are important to consider because researchers argue that they represent a sustainable way of improving health systems and reaching Universal Health Coverage (Gardner et al., 2007). Furthermore, emerging social innovations are increasingly concerned with people-centred approaches which are participatory and therefore can respond directly to health needs (Mason et al., 2015). Including such studies would enhance my research and provide a wider range of people-centred examples to draw on compared with only looking at RCTs (as I did in Study 1). I reflected at the end of Study 1 that such social innovations or other qualitative or mixed methods studies were valuable to consider when answering my overall research question - how to develop an intervention to improve dietary behaviour. However, these studies and the insights they could provide had been left out of the systematic review, representing a clear limitation of Study 1. Therefore, after Study 1, I set out to try and fill the gaps left by the review and consider social innovations and qualitative studies which could demonstrate examples of feasible interventions to bring about dietary change considering socio-cultural context in LMIC settings. I did so working across multiple disciplines in an international health department and seeking for my research to address multiple audiences whilst being as thorough as possible.

10.1.2 Process taken for Study 2

To start Study 2 investigations, I decided to conduct a literature search to capture all evidence not captured in Study 1 (e.g. qualitative studies, social innovations, mixed methods studies). This helped to fill the gap left by Study 1 which only considered RCTs and not social innovations or community-led interventions which could show evidence of ways to bring about positive dietary change. Evidence of these searches are found in appendices B.6 and B.7. This literature search provided evidence of other interventions, such as nutrition gardens and community events to promote healthy eating, which had been conducted in Nepal and formed the basis for my

interview guides for Study 2 in which I asked questions about the potential feasibility of various intervention strategies. Other findings from the literature review included social innovations such as the MoPoTsyo peer education project for diabetes patients in Cambodia (van Olmen et al., 2016), which I later used to support my investigation of peer education interventions in Part 3 (see 7.3.1.4.3).

In addition to this literature review I also decided to do a literature search on the health system in Nepal and how NCDs had been managed up to that point. Evidence of this can be found in the document review in Appendix B.10. Finally, at this point I decided to do a detailed review on food culture in Nepal (see Chapter 1.2.2). These two literature reviews provided invaluable context to the issues I wanted to further investigate in the context of Nepal. I then decided that the next stage was to collect data from the setting about these key areas and consider how they influenced dietary behaviour.

I decided to collect data in Study 2 from a range of participants; people with diabetes/HBGLs and their partners from a variety of different groups (varying in ethnicity, gender, religion, socioeconomic group and age). As a result, the data I collected from the interviews in Study 2 was rich and diverse, with multiple views on dietary behaviour and the determining factors leading people with diabetes to change or not to change their behaviour. Socio-cultural influences came out of the data as central and important and informed the ecological model presented in Chapter 4. Though my ecological model shows multiple levels of interaction and multiple variables of interaction across and within these levels, I am aware that sometimes ecological models do not adequately specify the most important hypothesised influences or provide enough information about how the broader levels of influence interact or the interaction of variables across levels. My ecological model is also not exhaustive, it would be difficult to capture all determinants of behaviour within the environments, and I am aware of others which were not discussed by participants such as body image (Acharya et al., 2016, Crawford et al., 2008). Furthermore, I acknowledge that my research has not provided an extensive investigation into the globalised forces which drive food availability and the complex food system in Nepal. These forces are acknowledged to be important in fighting NCDs (Branca et al., 2019). With the time and resource constraints such a complex area was beyond the scope of my research. Instead, I was able to embed considerations of access to and availability of food within the physical environment of my ecological model in Chapter 4. This, as with many factors within my ecological model, would benefit from further extensive research.

After analysing the data collected in Study 2, I found that the data led me to critique the behaviour change wheel by Michie et al. (2014). I decided to develop an adapted behaviour change wheel with my findings from Study 2, which attempted to consider socio-cultural context in intervention development [Chapter 6]. I did this because my data had shown the importance of socio-cultural context in dietary behaviour, for example the influence of religious beliefs on adhering to religious dietary practices during key festival times such as the Hindu festival of Dashain.

Though the behaviour change wheel presented ways of categorising interventions (e.g. intervention function such as education), I had found during Study 2 that it did not offer a way to evaluate the *feasibility* of interventions. I did a search for literature to guide my assessment of the feasibility of intervention proposals which had emerged from Study 2. However, I found a gap in the literature and that any research on how to develop interventions was very limited. Though I had been guided by existing standard frameworks for complex intervention design (MRC and 6squad) which are good practice to use in public health research, these frameworks

did not break down the details of how to develop an intervention. Therefore, in Chapter 7 I drew on existing tools, such as feasibility criteria by Walley and Wright (2010), to tease out a mechanism that might be repeatable in other studies. I decided to put the behaviour change wheel to one side and instead began to attempt to assess the feasibility of potential interventions using the criteria outlined by Walley and Wright (2010). Taking suggestions from the data collected in Study 2 I assessed the feasibility of potential interventions with both the Nepali and UK-based research teams. I decided to engage with multiple stakeholders at this stage to gather multiple opinions on intervention feasibility including assigning a numerical value to interventions which was a challenging and subjective process. This process, though informative, was not participatory and did not include the people who would be delivering or receiving the proposed intervention(s). Furthermore, the feasibility criteria were flawed and problematic. The ranking process with use of three criteria (1-3) was often prone to subjective and hypothetical judgements of the researcher(s). This was further complicated by overlap within or between the criteria and a lack of ability to assess nuance and complex aspects of the target population (e.g. gender norms conflicting with cultural expectations in certain groups). I expanded the feasibility criteria after its initial use in Chapter 7 to include sustainability and scalability. Adding these extra criteria strengthened my analysis of interventions in Chapter 8, though added a further layer of complexity as more feasibility criteria had been added to the process.

10.1.3 Process for Study 3

To ensure the feasibility assessment involved participatory input from those who would deliver or be the target of the intervention, I then decided to take the process back to those groups with the aim of empowering them to take part in the intervention development as the foundation of Study 3. Though this was a positive, participatory experience, it involved grappling with complex, multifaceted issues around the identity of the participants (e.g. around gender roles and expectations - how some men thought community gardens presented a positive intervention idea as they would not manage the gardens, whereas busy urban female diabetics thought this a bad suggestion as they would not have time to manage the gardens). Furthermore, the detail of the feasibility criteria was complex to convey to the patient and health worker groups, so much of the mapping of the feasibility of the interventions was conducted by the research team, primarily the lead researcher [LC] after the data was collected, leaving it open to bias. I found the feasibility criterion gender, cultural, political feasibility particularly difficult to assess from the data. I felt that bunching these three concepts together was detrimental to the analysis as the concepts were so different and often conflicting. I would have preferred to disaggregate the concepts into three distinct categories to ensure that one of these concepts was not chosen over the others and all were given equal importance. An example which demonstrates the difficulty of treating gender, cultural and political feasibility together is provided below.

Example intervention: Interventions using influential leaders

Gender feasibility

Many influential leaders in Nepal are male religious leaders who hold large amounts of power. Therefore, there is a gender imbalance in the identity of influential leaders which could lead to inevitable gender bias in the guidance such leaders may provide. For example, male religious leaders may be more likely to uphold gender bias that, for example, women should cook in the household. An absence of female role models in positions of power and influence is likely to negatively impact females in Nepali society. If, for example, there were influential female

leaders who had successfully adapted their diet and improved dietary practices by not conforming to traditional gender roles, this could act as a strong influence on Nepali women. However, such demonstrations of resistance against traditional gender roles (e.g. women preparing traditional Nepalese food for the husband) may never be acceptable to some men in Nepali society.

Cultural feasibility

Religious leaders present issues regarding cultural adherence to certain ideologies and ways of living. If most influential leaders in Nepal are male and from the dominant Hindu religion, this could positively influence the behaviours of male Hindus. However, it would not influence religious minorities such as Buddhists or Christians, or those with no religion. In fact, such preaching may disincentivise non-Hindus and non-males to make changes in the way the religious leaders dictate. This would therefore make such an intervention feasible for one group of people but not feasible for others.

Political feasibility

Politically, and in terms of who holds power to influence, on the one hand an intervention involving the influential religious leaders of the moment in Nepal could be highly feasible. This is because religious leaders could wield large amounts of political influence if endorsed to do so by the state and because those leaders have previously demonstrated their influence over large numbers of people by, for example, selling their own products (Doshi, 2016, Nawaz and Trivedi, 2017). Conversely however, upholders of the secular political system (as technically exists in Nepal) may not want to integrate religious preaching as part of a government endorsed intervention.

As can be seen by the example provided, it is clear that decisions in one realm may present real challenges in another. Furthermore, there may be multiple conflicts *within* the feasibility criteria, such as different opinions of different genders. This example further serves to support my assertion that each element of the 'gender, cultural, political' criterion should be considered as a separate criterion, and even then, considerations should be made for the potential conflicts within the criteria categories.

10.1.4 Original contributions

In this research I have made original contributions to the literature with the systematic review (chapter 2), qualitative studies 2 and 3 (chapters 3-9), development of ecological model (chapter 4), adaptation of the behaviour change model (chapter 6) and the development of the intervention process (chapters 7-9). These contributions have demonstrated how I have met my overall aim of developing a feasible intervention to improve dietary behaviour in Nepal. In doing so, I have demonstrated a process by which culturally appropriate and compelling interventions can be developed with consideration of several aspects of feasibility as well as important factors such as gender and intersectionality. This process has demonstrated the importance of challenging the one-size-fits-all approach.

10.1.5 Challenging existing models and methods

The conventional public health methodological process taken in this thesis, models and taxonomies (behaviour change technique taxonomy (Michie et al., 2013), behaviour change wheel (Michie et al., 2014) as well as methods (feasibility criteria outlined by Walley and Wright (2010) have been used, assessed and found to be constraining. Such models and methods have

only been able to take my research so far. In the case of the feasibility criteria used, I have found that no one list of criteria will be able to sufficiently address all of the multi-faceted aspects which would affect an intervention. Ultimately, this research presents the reality that decisions need to be made about whether to continue to gather more data or utilise more or adapted models/methods to further assess people's preferred choices of interventions, or whether to pilot an intervention with the evidence available and evaluate the outcome. This decision will also be influenced by political will in the context where the intervention would be implemented, (as explored in Chapter 5 and Chapter 9.3), availability of funding to conduct further research or pilot an intervention and time constraints on any one given project.

10.2 Key recommendations for taking my research forward

My in-depth investigation of a LMIC context has led me to challenge theories developed in HICs to understand effective behaviour change. My research has challenged analyses based on assumptions about diet by looking in-depth at the determinants of dietary behaviour in a multi-faceted cultural context. The new political landscape in Nepal means that decentralisation represents opportunities to implement community based, localised and appropriate interventions to improve dietary behaviour at a localised level. Furthermore, Nepal has a young population, it is estimated that 44% of its 28.4 million people are under 19 years old. This creates a challenge, as left to their own devices, they may be likely to adopt increasingly popular unhealthy dietary behaviours (Sherpa, 2018, Oli et al., 2018, Oli et al., 2015b, Pries et al., 2017, Menger-Ogle et al., 2018, Boseley, 2019). However, there is great potential to change and improve behaviours in young people and thereby reduce rates of diabetes as the country strives towards a higher international standing. As government funding grows annually on nutrition (Ministry of Health Government of Nepal, 2017) there is increased potential to increase the amount of spending on behaviour change interventions. I have learnt, however, throughout this research journey that political decisions in Nepal are complicated by organisational, political and socio-cultural constraints which can limit the amount of political support available to such interventions as I recommend.

10.2.1 Impact Pathway

An impact pathway can be used as a basis for projecting, monitoring and evaluating interventions or research impact and describes detailed outputs (direct/tangible results) to outcomes (changes in awareness, skills or understand resulting from the use of research results) and impact relations, with indicators for output and outcome (Economic and Social Research Council, 2019). I chose to present the projected impact of my research in such a form because impact pathways aim to present a framework showing how change is predicted to occur. Impact pathways overlap with aspects of theory of change (Centre for Theory of Change, 2019) and logic models (as used in Study 3). Table 17 documents a projected impact pathway for my research, summarising stakeholders, activities/outputs, short- and medium-term outcomes. Impact pathways are increasingly used to measure or project research impact [e.g. Olney et al. (2013)] and toolkits encouraging their use are becoming more common (Economic and Social Research Council, 2019). Ideally, impact pathways will be created as a participatory process with stakeholders (Consultative Group for International Agricultural Research, 2019). However, with limited resources at the end of the project I created my projected impact pathway [Table 17] with insights from my research project without consulting key stakeholders. When this research is taken further, it should include a participatory process to map research impact. The impact pathway in Table 17 uses the idea of contribution to explain how research is taken up and used

to influence policy and practice. However, it is important to acknowledge that all of the factors explored in Table 17 are outcomes that are based on variables which are hard to control in Nepal. The activities/outputs listed in Table 17, for example demonstration of behaviour or community focused one-to-one intervention packages, were decided upon in the light of limited knowledge. Furthermore, these activities/outputs will always be political, involve trade-offs and choices involving some activities/outputs having potential effects on others.

Table 17: Projected Impact pathway for research impact

Uptake/ engagement [people who are interested in research, who read it, discuss it and/or act on it]	Stakeholders	Activities/Outputs
	<ul style="list-style-type: none"> • Health workers at community health centres • Health workers at health facilities (e.g. district health hospitals) • Female Community Health Volunteers • Community mobilisers • Peer educators 	<ul style="list-style-type: none"> • Participatory training of health workers, FCHVs, community mobilisers and peer educators on appropriate dissemination of nutrition education involving social support (including dissemination of printed materials)
	<ul style="list-style-type: none"> • Members of communities in participating health facility's catchment areas • People diagnosed with HBGLs/diabetes • Family/friends of people diagnosed with HBGLs/diabetes • Committees functioning within communities (e.g. mothers' groups, ward committees) 	<ul style="list-style-type: none"> • Use of printed materials and one to one training on food diaries and action planning with patients • Community camps and community focused one-to-one intervention packages (e.g. involving demonstrations of behaviour) which engage communities (including key committees and groups, patients and their family/friends) with dietary interventions including health education
	<ul style="list-style-type: none"> • Influential leaders • Peer educators 	<ul style="list-style-type: none"> • Demonstrations of healthy dietary behaviour including peer educators and influential leaders [one to one and by video]
	<ul style="list-style-type: none"> • Policymakers • Elected leaders including ward chairpersons and municipality mayors • District public health offices 	<ul style="list-style-type: none"> • Guidance on potential improvements to policy provision for those with or at risk of HBGLs/diabetes according to recommendations in Chapter 9
Use [people use the research, change their views, disseminate it, apply it to practice or policy]	Short term outcomes Awareness/reactions and capacity for use (including changes in skills, knowledge and understanding) <ul style="list-style-type: none"> • Evidence of improved, healthier dietary behaviour (behaviour change to improve diet) amongst those with or at risk of diabetes [measured by follow up SSI interviews, workshops and/or survey with health workers/FCHVs/community mobilisers and patients] • Evidence of skills amongst those with or at risk of diabetes to prepare healthier food [measured by follow up SSI interviews, workshops and/or survey with health workers/FCHVs/community mobilisers and patients] • Evidence of improved practice of health workers/FCHVs/community mobilisers in providing nutrition education, guidance and support to target population [measured by follow up SSI interviews, workshops and/or survey with health workers/FCHVs/community mobilisers and patients] 	
Impact [contribution to change as a result of research use]	Medium term outcomes/Impact Changes in behaviour/practices and final contribution <ul style="list-style-type: none"> • Evidence of feasible (scalable, sustainable, technically feasible, financially feasible, GCP feasible and organisationally feasible) piloted intervention package(s) [measured by follow up SSI interviews, workshops and/or survey with health workers/FCHVs/community mobilisers, patients and policymakers] • Change in government policy to improve care for those with diabetes/HBGLs [measured by document review, follow up SSI interviews, workshops and/or survey with health workers/FCHVs/community mobilisers, patients and policymakers] • Evidence of sustained healthy dietary behaviour change amongst people with or at risk of diabetes leading to prevention/management of diabetes/HBGLs [measured by recorded diagnosis of HBGLs/diabetes in survey and/or by follow up SSIs] 	

Table 17 indicates a range of stakeholders should be involved in taking findings from my research forward using a range of activities which draw on a) intervention packages proposed and b) suggestions for policy improvements (both in Chapter 9). Though these are ideal projected outcomes, the reality remains that the decisions taken to choose the outcomes of this project were difficult to make in the light of limited investigation. Therefore, the impact pathway works only as a guide and must be adapted to circumstances depending on the political influences and trade-offs needed to make choices.

10.3 Plans for the uptake of my research

10.3.1 Regionally

Two articles have been published in respected peer reviewed journals from this research and three further publications are in progress (one relating to Chapter 6, my adaptation of the behaviour change wheel, one relating to the intervention development process and another relating to the factors influencing diabetes care in the health system [Chapter 5]). It is intended that from this research a policy brief and briefing note/research brief will be produced for leading stakeholders including policymakers in Nepal. Dissemination of the results of my research has already been provided to the NGO who aided data collection for Studies 2 and 3, as well as at the 6th Annual Agriculture to Nutrition Scientific Symposium held in Kathmandu in 2018. My results are available to the participants in Studies 2 and 3 in Kathmandu, including government officials and policymakers with the intention of influencing and informing future policy and behaviour change strategies (the publications from this research are available online to inform key policy decisions and further research).

The next stages of this research include two options; firstly, to undertake further investigation of the target populations of the intervention, with further participatory processes to establish feasibility. The second option for this research is to develop, pre-test and pilot the intervention packages proposed. This should be done in a relevant setting in Kathmandu through discussion with local leaders and key decision-makers including local government officials and the local district health office. Following this, it would be important to formulate intervention materials which are appropriate to the context by accounting for factors such as gender, religion and ethnicity (as explored throughout the thesis, especially in Chapter 4 and Chapter 6) or at least to acknowledge trade-offs and tensions between those within an intervention. It will also be important to consider logistical arrangements for piloting/pre-testing the intervention packages. A full pre-test and subsequent evaluation of the intervention packages should take place before scaling them up to other communities in Kathmandu. Such potential options for taking this research forward reflect the conflict discussed earlier in this chapter about how the research in this project has only taken us so far in understanding how feasible interventions will be. Therefore, difficult decisions need to be made about whether to gather more data to further assess people's preferred choices of interventions, or to go ahead with a pre-test and pilot of the intervention packages found to be feasible from this limited research project.

10.3.2 Nationally

If the intervention packages are piloted in Kathmandu, and if favourable evaluation results indicate the intervention packages have been successful, the next stage would be to test them

in scaled-up pilots in other regions in Nepal. Further evaluation should be carried out to indicate how transferable the intervention package has been in other regions.

10.3.3 Globally

As stated, publications from this research are available online for key stakeholders, researchers and interested global decision makers such as the World Food Programme, UN, WHO and others to inform them about the process undertaken to develop the process for a feasible intervention. This research will be useful to global organisations such as the ones listed because my findings and the process of formulating these findings are transferable to other LMICs and in some cases HIC contexts. Research findings have also been presented at the World Conference on Health Promotion 2019 [New Zealand]. Table 18 shows the applicability of my key research findings to different contexts.

Table 18: Applicability of key research findings to LMIC or HIC contexts

Key finding from research	Applicability
Systematic review into effective dietary interventions in LMICs	LMICs NCDs other than diabetes
Framework for understanding influences on policy (political, organisational and socio-cultural)	LMICs and potentially HICs Further testing needed
Socio-ecological model of dietary behavioural determinants	LMICs and potentially HICs Further testing needed
Behavioural change model incorporating socio-cultural influence ring [BCW-SCC]	LMICs and potentially HICs Further testing needed
Intervention packages and suggestions for policy improvement	Nepal
Process for intervention development (identifying evidence base, identifying theory, modelling intervention – testing feasibility)	LMICs and HICs NCDs other than diabetes

Looking at diet and diabetes my approach could be applied to other settings to produce contextually relevant intervention packages. If tested across several settings, these findings could form part of global efforts to address diabetes and could contribute to international guidelines and approaches taken by the WHO, International Diabetes Federation, World Food Programme, World Diabetes Foundation, UN and others.

10.4 Areas for further research

My research could be developed in the following areas:

- An investigation of the determinants of dietary behaviour amongst very low income populations [many living in urban slums] in Kathmandu could be explored following the same process I took in Part 2 to develop an ecological model. This is because there is a need for interventions to reduce unhealthy dietary behaviour amongst very low income populations in the slum areas where diabetes is underreported and risk behaviours are prevalent (Oli et al., 2013). Furthermore, in slum areas there are no labs near community health centres which means that diagnosis rates are minimal. Therefore, the process for delivering an intervention would have to be community based in the slum communities

and involve health workers reaching out to the community by conducting interventions with them.

- An investigation could be undertaken of the determinants of dietary behaviour of Nepali migrant workers who work in the Middle East and have high rates of diabetes (Bener, 2017). An intervention could be developed to encourage positive behaviour change in these workers whose health is becoming an increasing public health concern (Adhikary et al., 2011, Joshi et al., 2011, Pratik et al., 2018, Simkhada et al., 2018).
- My approach could be adapted to tackle other NCDs. An example of how this could be done is considering CVD in Nepal. Rates of CVD have been linked with unhealthy dietary behaviour in urban populations in Nepal (Anil et al., 2019). My approach could be used to investigate this further and propose interventions to reduce unhealthy dietary behaviour amongst target populations to tackle rates of CVD. This could also be applied to other NCDs (e.g. hypertension, cancer) in other contexts.
- My approach could also be applied to other risk factor causes of NCDs (such as physical inactivity or stress). An example could be that physical activity could be taken as I have taken dietary behaviour. A systematic review and determinants assessed with my approach could lead to the development of an intervention to improve levels of physical activity in specific contexts.

10.5 Wider applications

The methodological limitations outlined in 10.1 highlight that several lessons can be learnt from this research which have wider applications. Firstly, lessons can be learnt from the use of models (e.g. behaviour change wheel) throughout this project and how they have been challenged and have only been able to take this project so far in developing a feasible intervention package to tackle diabetes in Nepal. Secondly, researchers and policymakers should consider that often difficult decisions need to be taken throughout an intervention development process about whether to pilot an intervention based on limited participation from the targets of the intervention, or whether further investigation should be carried out. Third, considering these limitations it is possible to develop a process which attempts to understand the problem of unhealthy dietary behaviour and develop a feasible intervention to tackle this problem. This process, together with a critical understanding of the models and frameworks used, could be transferred to tackle other NCDs such as cancer or other risk factors, such as physical activity. Both the intervention developed and process of developing the intervention contribute to the attempt to tackle the rise in NCDs deaths which are increasing dramatically year on year. NCDs currently result in more than two and a half times as many deaths as other causes (WHO, 2018b). However, they still commonly draw less notice than infectious disease outbreaks. In September 2018, the UN General Assembly adopted a declaration that committed to cutting NCD deaths by one third by 2030 (General Assembly of the United Nations, 2018). There has been progress in reducing tobacco consumption in LMICs (Myers, 2018). However, the need to find solutions to tackle the growing world problem of NCDs, which are intersectional, gender-transformative and tackle the socio-cultural determinants of health are needed urgently, including in relation to unhealthy dietary behaviour and diabetes. My research represents an attempt to develop such a solution and paves the way for further, similar investigations which use existing models and frameworks critically in an attempt to bring about tangible solutions to tackling the global health challenges we face.

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Appendix A Part 1 Appendices

A.1 Inclusions studies for systematic review

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A.2 Example search strategy

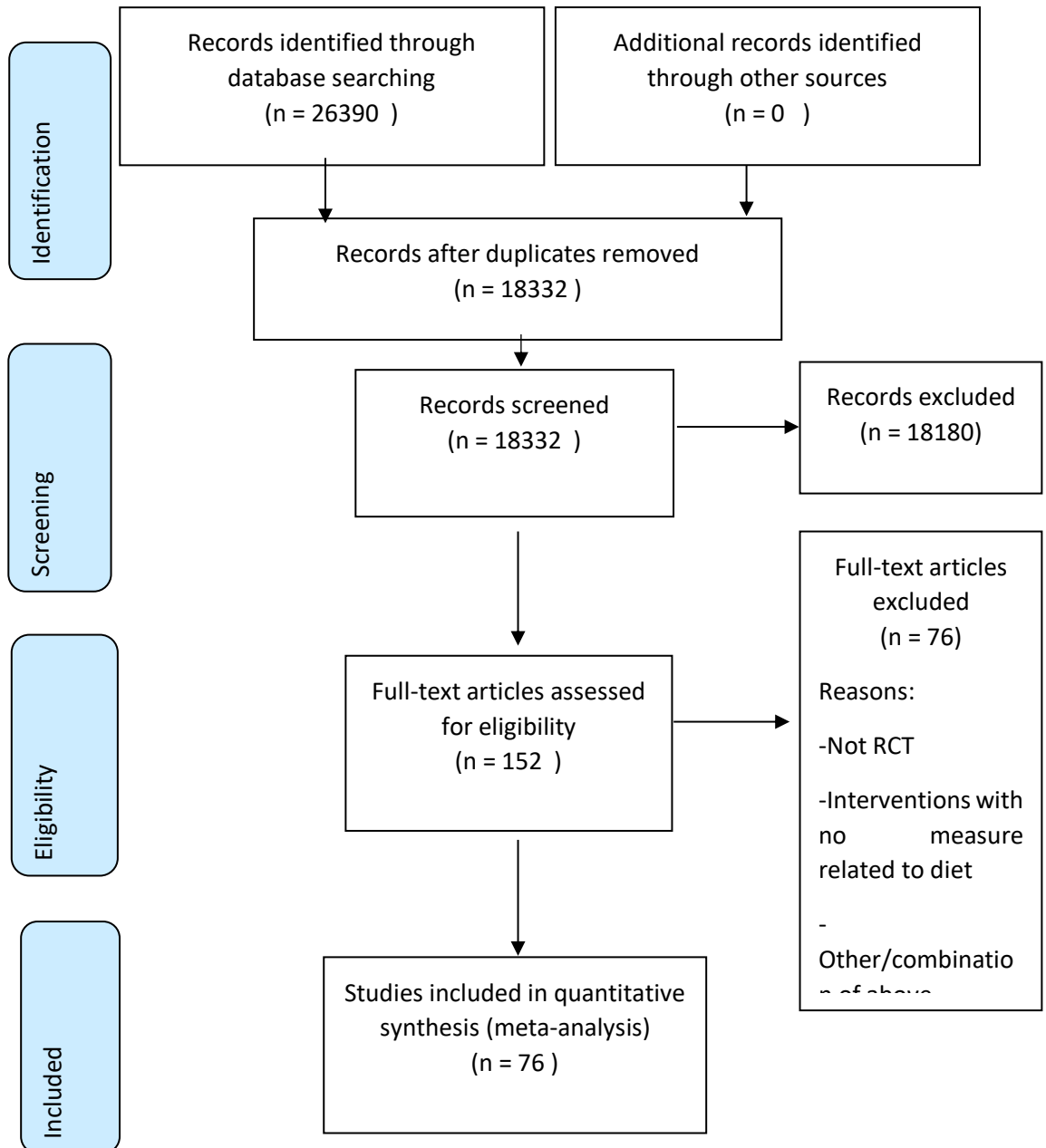
PsycINFO

- 1 (Africa or Asia or Caribbean or West Indies or South America or Latin America or Central America).hw,kf,ti,ab,cp. (27599)
- 2 (Afghanistan or Albania or Algeria or Angola or Antigua or Barbuda or Argentina or Armenia or Armenian or Aruba or Azerbaijan or Bahrain or Bangladesh or Barbados or Benin or Byelarus or Byelorussian or Belarus or Belorussian or Belorussia or Belize or Bhutan or Bolivia or Bosnia or Herzegovina or Hercegovina or Botswana or Brasil or Brazil or Bulgaria or Burkina Faso or Burkina Fasso or Upper Volta or Burundi or Urundi or Cambodia or Khmer Republic or Kampuchea or Cameroon or Cameroons or Cameron or Camerons or Cape Verde or Central African Republic or Chad or Chile or China or Colombia or Comoros or Comoro Islands or Comores or Mayotte or Congo or Zaire or Costa Rica or Cote d'Ivoire or Ivory Coast or Croatia or Cuba or Cyprus or Czechoslovakia or Czech Republic or Slovakia or Slovak Republic or Djibouti or French Somaliland or Dominica or Dominican Republic or East Timor or East Timur or Timor Leste or Ecuador or Egypt or United Arab Republic or El Salvador or Eritrea or Estonia or Ethiopia or Fiji or Gabon or Gabonese Republic or Gambia or Gaza or Georgia Republic or Georgian Republic or Ghana or Gold Coast or Greece or Grenada or Guatemala or Guinea or Guam or Guiana or Guyana or Haiti or Honduras or Hungary or India or Maldives or Indonesia or Iran or Iraq or Isle of Man or Jamaica or Jordan or Kazakhstan or Kazakh or Kenya or Kiribati or Korea or Kosovo or Kyrgyzstan or Kirghizia or Kyrgyz Republic or Kirghiz or Kirgizstan or Lao PDR or Laos or Latvia or Lebanon or Lesotho or Basutoland or Liberia or Libya or Lithuania or Macedonia or Madagascar or Malagasy Republic or Malaysia or Malaya or Malay or Sabah or Sarawak or Malawi or Nyasaland or Mali or Malta or Marshall Islands or Mauritania or Mauritius or Agalega Islands or Mexico or Micronesia or Middle East or Moldova or Moldovia or Moldovian or Mongolia or Montenegro or Morocco or Ifni or Mozambique or Myanmar or Myanma or Burma or Namibia or Nepal or Netherlands Antilles or New Caledonia or Nicaragua or Niger or Nigeria or Northern Mariana Islands or Oman or Muscat or Pakistan or Palau or Palestine or Panama or Paraguay or Peru or Philippines or Philipines or Phillipines or Phillippines or Poland or Portugal or Puerto Rico or Romania or Rumania or Roumania or Russia or Russian or Rwanda or Ruanda or Saint Kitts or St Kitts or Nevis or Saint Lucia or St Lucia or Saint Vincent or St Vincent or Grenadines or Samoa or Samoan Islands or Navigator Island or Navigator Islands or Sao Tome or Saudi Arabia or Senegal or Serbia or Montenegro or Seychelles or Sierra Leone or Slovenia or Sri Lanka or Ceylon or Solomon Islands or Somalia or South Africa or Sudan or Suriname or Surinam or Swaziland or Syria or Tajikistan or Tadzhikistan or Tadjikistan or Tadjhik or Tanzania or Thailand or Togo or Togolese Republic or Tonga or Trinidad or Tobago or Tunisia or Turkey or Turkmenistan or Turkmen or Uganda or Ukraine or Uruguay or USSR or Soviet Union or Union of Soviet Socialist Republics or Uzbekistan or Uzbek or Vanuatu or New Hebrides or Venezuela or Vietnam or Viet Nam or West Bank or Yemen or Yugoslavia or Zambia or Zimbabwe).mp. or Rhodesia.hw,kf,ti,ab,cp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures] (177744)
- 3 ((developing or less* developed or under developed or underdeveloped or middle income or low* income or underserved or under served or deprived or poor*) adj (count* or nation? or population? or world)).ti,ab. (12309)
- 4 ((developing or less* developed or under developed or underdeveloped or middle income or low* income) adj (economy or economies)).ti,ab. (248)
- 5 (low* adj (gdp or gnp or gross domestic or gross national)).ti,ab. (28)

- 6 (low adj3 middle adj3 countr*).ti,ab. (1469)
- 7 (lmic or lmics or third world or lami countr*).ti,ab. (1157)
- 8 transitional countr*.ti,ab. (50)
- 9 Developing Countries/ (4463)
- 10 exp developing countries/ (4463)
- 11 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 (196794)
- 12 Clinical trial/ (9197)
- 13 CONTROLLED TRIAL.mp. (16730)
- 14 RCT.mp. (2552)
- 15 (RANDOM* adj3 TRIAL).mp. (23187)
- 16 (CLIN* adj3 TRIAL).mp. (11046)
- 17 (SING* adj2 BLIND*).mp. (1826)
- 18 (DOUB* adj2 BLIND*).mp. (19947)
- 19 PLACEBO.mp. or exp PLACEBO/ (33638)
- 20 LATIN SQUARE.mp. (470)
- 21 (RANDOM* adj2 ASSIGN*).mp. (30609)
- 22 PROSPECTIVE STUDIES/ (481)
- 23 (PROSPECTIVE adj STUD*).mp. (12331)
- 24 (COMPARATIVE adj STUD*).mp. (12587)
- 25 TREATMENT EFFECTIVENESS EVALUATION/ (19332)
- 26 (EVALUATION adj STUD*).mp. (2221)
- 27 exp POSTTREATMENT FOLLOWUP/ (1127)
- 28 FOLLOWUP STUD*.mp. (12779)
- 29 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 (146410)
- 30 diet*.ti,ab. (32409)
- 31 healthy eat*.tv. (1817)
- 32 diets/ or drinking behavior/ or eating behavior/ or health behavior/ or nutrition/ or obesity/ (57755)
- 33 eating behavior?.tv. (6397)
- 34 Fruit/ (3041)
- 35 fruit*.ti,ab. (13996)
- 36 Vegetables/ (0)
- 37 vegetable*.ti,ab. (4033)
- 38 salt*.ti,ab. (4749)
- 39 oil*.ti,ab. (3759)
- 40 or/30-39 (98118)
- 41 11 and 29 and 40 (257)
- 42 limit 41 to (english language and yr="1990 -Current") (238)

A.3 PRISMA diagram

PRISMA diagram (2009) <http://prisma.thetacollaborative.ca/>



A.4 Characteristics of Included Studies

Study	Setting	Participants	Country	Region	Delivery duration [days] (experimental)	Delivery duration [days] (control)	Population	Pre-existing condition	BCTs (Experimental)	BCTs (Control)
Abujudeh et al. 2012.	Medical	Jordanian adults at high risk of diabetes mellitus	Jordan	Middle East	182.52	1	Individuals (adult)	Yes	1.4, 3.1, 4.1	0
Akhu-Zaheya and Shiyab 2017.	Other	Adult patients with cardiovascular disease	Jordan	Middle East	91.26	91.26	Individuals (adult)	Yes	4.1, 5.1, 7.1	0
Amini et al. 2016	Educational	Overweight/obese primary school children	Iran	Middle East	126	126	Individuals (child)	Yes	4.1, 5.1, 9.1	0
Anetor et al. 2012	Educational	Undergraduates from two of the three first generation universities in south-west Nigeria	Nigeria	Africa	56	56	Individuals (adult)	No	4.1, 5.1	0
Armitage 2014.	Educational	High risk Romanian adolescents	Romania	Europe	1	1	Individuals (child)	No	1.1, 10.7, 10.9	1.4
Bandoni et al. 2011.	Other	Managers and employees	Brazil	South America	182.52	182.52	Individuals (adult)	No	4.1, 7.1, 12.1	0
Bacardí-Gascon et al. 2012.	Educational	Elementary school children	Mexico	South America	56	56	group (family)	Yes	4.1, 12.1	0
Bhurosy and Jeewon 2013.	Medical	Participants were adults (n = 189) aged ≥ 40 years old from 2 urban community based centres	Mauritius	Africa	182.52	182.52	Individuals (adult)	Yes	1.2, 1.4, 2.3, 4.1, 5.1, 7.1, 8.2	4.1

Cakir and Pinar, 2006.	Medical	persons (N = 320) who had visited the outpatient hypertension clinic between November 2000 and September 2001	Turkey	Europe	182.52	182.52	Individuals (adult)	Yes	1.1, 1.4, 2.3, 2.4, 3.3, 4.1, 9.1, 11.2	0
Cappuccio et al. 2006.	Community	local villagers in a community based cluster trial	Ghana	Africa	182.52	182.52	group (family)	No	4.1, 9.1	0
Cespedes et al. 2013.	Educational	Children	Colombia	South America	152.1	152.1	Other	No	3.2, 4.1	0
Cunha et al. 2013.	Educational	Students average age 11	Brazil	South America	273.78	273.78	Individuals (adult)	No	1.2, 3.2, 4.1, 8.2, 12.1	0
De Villiers et al. 2016	Educational	School children	South Africa	Africa	730	730	Individuals (child)	No	4.1, 9.1	0
Diaz-Ramirez et al. 2016	Educational	School children and their parents	Mexico	South America	182.52	182.52	group (family)	No	3.1, 4.1	0
Duan et al. 2017	Educational	University students	China	Asia	243.36	243.36	Individuals (adult)	No	1.1, 1.4, 2.7, 3.1, 5.1, 6.1, 7.1, 10.6	0
Esfarjani et al. 2013.	Educational	Obese children and their parents	Iran	Middle East	182.52	182.52	group (family)	Yes	1.2, 3.2, 4.1, 12.1	0
Golshahi et al. 2015.	Medical	Hypertensive patients and their families	Iran	Middle East	182.52	182.52	Individuals (adult)	Yes	3.1, 4.1, 9.1	0
Gunawardena et al. 2016	Community	Mothers of school children	Sri Lanka	Asia	365.04	365.04	group (family)	No	1.2, 2.4, 2.5, 2.7, 4.1, 9.1	0
Habib-Mourad et al. 2014.	Educational	School children	Lebanon	Middle East	91.26	91.26	Individuals (child)	No	1.1, 1.4, 2.3, 3.1, 4.1, 5.1, 5.2, 6.1, 7.1, 8.1, 8.2, 8.6, 12.1, 12.5	0
He et al. 2015.	Educational	Children	China	Asia	106.47	106.47	Individuals (child)	No	1.4, 3.2, 4.1, 5.1, 5.2, 5.3, 8.1, 8.4	0

Hu et al. 2010.	Educational	Children and their parents	China	Asia	365.04	365.04	group (family)	No	4.1, 9.1	0
In-Iw et al. 2012.	Educational	Adolescent girls	Thailand	Asia	121.68	121.68	Individuals (child)	Yes	4.1	0
Jahangiry et al. 2017.	Virtual	Patients with metabolic syndrome	Iran	Middle East	182.52	182.52	Individuals (adult)	Yes	1.2, 2.4, 2.5, 2.6., 2.7, 3.2, 4.1, 7.1, 9.1	4.1
Jaime et al. 2007.	Community	Households	Brazil	South America	21	21	group (family)	No	4.1, 5.1, 6.1, 8.1	0
Jamal et al. 2016	Other	Obese adults in the workplace	Malaysia	Asia	168	168	Individuals (adult)	Yes	1.1, 1.2, 1.4, 1.7, 2.2, 2.3, 2.5, 2.6., 2.7, 3.1, 4.1, 7.1, 9.1, 11.2, 13.1, 15.3	2.3, 4.1
Jemmott III et al. 2011.	Educational	Adolescents	South Africa	Africa	6	6	Individuals (child)	No	3.1, 4.1, 5.1, 8.1	0
Kabahenda et al. 2011.	Community	Less literate, low-income rural female caregivers and the children in their care (6-48 months).	Uganda	Africa	365.04	365.04	group (family)	No	4.1	0
Kain et al. 2014.	Educational	To evaluate the effectiveness of a 12-month multicomponent obesity prevention intervention.	Chile	South America	365.04	365.04	Individuals (child)	Yes	4.1	0
Karavetian et al. 2015.	Medical	hemodialysis patients	Lebanon	Middle East	182.52	182.52	Individuals (adult)	Yes	4.1, 9.1	0
Kreausukon et al. 2012.	Educational	full time undergraduate students	Thailand	Asia	2	2	Individuals (adult)	No	1.1, 1.2, 1.4, 1.6, 6.1, 15.1	0
Leitão 2015.	Medical	Patients With Type 2 Diabetes and Uncontrolled Hypertension	Brazil	South America	28	21	Individuals (adult)	Yes	1.4, 3.1, 4.1, 7.1, 9.1, 12.5	0

Lima et al. 2014.	Medical	patients aged 20 years old and above who were participants of the Program HiperDia were recruited for the Study.	Brazil	South America	182.52	182.52	Individuals (adult)	No	1.1, 1.4, 3.1, 4.1, 9.1	0
Lin et al. 2016.	Educational	Children aged 3-6 years and their parents	China	Asia	121.68	121.68	group (family)	No	1.3, 2.3, 3.1, 4.1, 5.1, 8.1, 9.1, 10.3, 12.1, 13.1	0
Martinez-Andrade et al. 2014.	Educational	parent and child were actively engaged in practicing new knowledge during intervention sessions	Mexico	South America	42	42	group (children)	Yes	1.1, 3.1, 4.1, 5.1, 8.1, 9.1	0
Menezes et al. 2015.	Community	women in the Primary Health Care in Brazil	Brazil	South America	182.52	182.52	Individuals (adult)	No	4.1, 5.3, 8.1, 9.2	4.1
Mohd Razif et al. 2013.	Educational	University students	Malaysia	Asia	70	70	Individuals (adult)	No	4.1, 7.1	0
Muchiri et al. 2016.	Community	Adults with Type 2 diabetes	South Africa	Africa	365.04	365.04	Individuals (adult)	Yes	1.1, 1.2, 3.1, 4.1, 5.1, 7.1, 8.1, 8.3, 9.1, 12.1	4.1
Najimi and Ghaffari 2013.	Educational	School children	Iran	Middle East	28	21	Individuals (adult)	No	4.1, 6.1, 8.1	0
Nawi and Jamaludin 2015.	Educational	Adolescents	Malaysia	Asia	84	84	Individuals (child)	Yes	2.4, 2.7, 3.1, 4.1, 5.3	4.1
Nayak and Bhat 2010.	Educational	obese/overweight school children in selected English medium schools of Udupi district, Karnataka	India	Asia	28	28	Individuals (child)	Yes	4.1	0

Nichols et al. 2014.	Educational	Primary school children	Trinidad and Tobago	Caribbean	28	28	Individuals (child)	No	4.1	0
Nourian et al. 2017	Medical	Adolescents with obesity	Iran	Middle East	91.26	91.26	Individuals (child)	Yes	1.2, 3.1, 4.1, 5.1, 7.1, 9.1	0
Ojieabu et al. 2017	Medical	Elderly Type 2 diabetic patients	Nigeria	Africa	121.68	121.68	Individuals (adult)	Yes	3.2, 4.1, 5.1, 9.1	0
Olney et al. 2015.	Community	Mothers of young children	Burkino Faso	Africa	730.08	730.08	group (family)	No	3.1, 3.2, 4.1, 12.5	0
Paes-Barreto et al. 2013.	Medical	Patients With Stages 3 to 5 Chronic Kidney Disease	Brazil	South America	152.1	152.1	Individuals (adult)	Yes	4.1, 5.1, 8.1, 9.1	4.1, 9.1
Pan et al. 1997	Medical	People With Impaired Glucose tolerance	China	Asia	2190.24	2190.24	Individuals (adult)	Yes	1.1, 3.1, 4.1, 9.1	4.1, 9.1
Philippi et al. 2015	Educational	School girls	Brazil	South America	182.52	182.52	Individuals (child)	No	2.3, 4.1, 7.1, 8.2, 9.1, 13.1, 13.2	0
Pichayapinyo et al. 2015.	Medical	population at risk of diabetes	Thailand	Asia	56	56	Individuals (adult)	No	1.1, 1.2, 1.4, 1.5, 2.3, 3.1, 4.1, 6.1	4.1
Pimentel et al. 2010.	Medical	Brazilians with impaired glucose tolerance	Brazil	South America	365.04	9	Individuals (adult)	Yes	4.1, 9.1	0
Quizan-Plata et al. 2012.	Educational	Children from official primary schools open during the day	Mexico	South America	273.78	273.78	Individuals (child)	Yes	4.1, 6.1, 8.1	0
Ram et al. 2014.	Community	Asian indian men	India	Asia	730.08	730.08	Individuals (adult)	Yes	4.1, 7.1	4.1
Rausch Herscovici, et al. 2013.	Educational	Primary school children (and their parents but outcome measures only taken for children)	Argentina	South America	182.52	182.52	group (family)	No	4.1, 5.1, 12.1	0
Rerksuppaphol and Rerksuppaphol 2017	Educational	School children	Thailand	Asia	121.68	121.68	Individuals (child)	No	2.2, 2.4, 2.6, 4.1, 9.1	2.3, 2.6, 4.1

Ribeiro et al. 2011.	Community	Adult women	Brazil	South America	152.1	152.1	Individuals (adult)	Yes	1.1, 3.1, 4.1, 5.1, 6.1	4.1, 5.3
Safdie et al. 2013.	Educational	4th and 5th grade students	Mexico	South America	547.56	547.56	Individuals (child)	No	3.1, 4.1, 12.1, 12.3	0
Salehi et al. 2011.	Community	Elderly iranians	Iran	Middle East	21	21	Individuals (adult)	Yes	1.1, 3.1, 5.1, 5.1, 5.3, 10.3, 10.9	0
Saneei et al. 2013.	Community	Post-pubescent adolescent girls	Iran	Middle East	42	42	Individuals (child)	Yes	1.1, 1.4, 2.3, 3.1, 4.1, 5.3, 9.1	0
Saraf et al. 2015.	Educational	Middle School Children	India	Asia	243.36	243.36	Individuals (child)	No	4.1	0
Sarrafazadegan et al. 2009.	Community	community residents	Iran	Middle East	1460.16	1095.12	Individuals (adult)	No	3.1, 4.1	0
Sartorelli et al. 2005.	Medical	Brazilian adults	Brazil	South America	182.52	182.52	Individuals (adult)	Yes	1.1, 1.4, 4.1, 5.3	0
Schreinemachers et al. 2017a	Educational	School children	Bhutan	Asia	365.04	365.04	Individuals (child)	No	1.8, 3.2, 4.1, 5.1, 7.7, 8.1, 9.1, 12.1, 12.5	0
Schreinemachers et al. 2017b	Educational	School children	Nepal	Asia	730.1	730.1	Individuals (child)	No	3.2, 4.1, 5.1, 6.1, 7.1, 7.7, 8.1, 9.1, 12.1, 12.5	0
Shahid et al. (2015)	Medical	Diabetes patients in rural areas	Pakistan	Asia	121.68	121.68	Individuals (adult)	Yes	2.4, 2.6, 9.1	4.1
Shamah Levy et al. 2012.	Educational	Mexican school children	Mexico	South America	182.52	182.52	Individuals (child)	No	2.1, 4.1, 7.1, 9.1, 12.1	0
Shojaei et al. 2016	Medical	Patients who have had heart bypass surgery	Iran	Middle East	30.42	30.42	Individuals (adult)	Yes	3.1, 4.1, 9.1	0
Tamban et al. 2013.	Medical	Subjects with diabeties mellitus	Philippines	Asia	182.52	182.52	Individuals (adult)	Yes	4.1, 5.1, 7.1	0
Tan et al. 2011.	Educational	patients with poorly controlled diabetes	Malaysia	Asia	84	84	Individuals (adult)	Yes	3.1, 6.1	0

Toral and Slater 2012.	Educational	Adolescents	Brazil	South America	182.52	182.52	Individuals (child)	No	1.2, 4.1, 5.1, 10.3	4.1
Toulabi et al. 2012.	Educational	Adolescents	Iran	Middle East	730.08	730.08	Individuals (child)	Yes	2.3, 4.1, 9.1	0
Van Rooijen et al. 2010.	Medical	Individuals with Type 2 Diabetes Mellitus	South Africa	Africa	112	112	Individuals (adult)	Yes	3.1, 4.1, 7.1	0
Wafa et al. 2011.	Community	obese children	Malaysia	Asia	182.52	182.52	Individuals (adult)	Yes	1.8, 2.3, 2.7, 3.1, 4.1, 8.1, 10.3, 10.6	0
Wang et al. 2015.	Educational	Adolescents	China	Asia	182.52	182.52	Individuals (child)	No	1.1, 3.1, 4.1	0
Wei et al. 2017	Medical	Patients at risk of cardiovascular disease in rural China	China	Asia	365.04	365.04	Individuals (adult)	Yes	3.1, 4.1, 7.1, 9.1	0
Wong et al. 2013.	Community	People with non-alcoholic fatty liver disease	China	Asia	365.04	365.04	Individuals (adult)	Yes	4.1, 9.1	0
Xavier et al. 2016	Medical	Patients with acute coronary syndrome	India	Asia	365.04	365.04	Individuals (adult)	Yes	1.2, 1.4, 2.3, 2.7, 3.1, 4.1, 5.1, 7.1, 9.1	0
Zhou et al. 2010.	Community	Older Rural chinese population	China	Asia	273.78	273.78	Individuals (adult)	No	3.1, 4.1, 9.1	0

1.1= Goal setting (behaviour), 1.2 = Problem solving, 1.3 = Goal setting (outcome), 1.4 = Action planning, 1.5 = Review behaviour goal(s), Discrepancy between current behaviour and goal, 1.7 = Review outcome goal(s), 2.1 = Monitoring of behaviour by others without feedback, 2.3 = Self-monitoring of behaviour, 2.4 = Self-monitoring of outcome(s) of behaviour, 2.7 = Feedback on outcome(s) of behaviour, 3.1 = Social support (unspecified), 3.2 = Social support (practical), 3.3 = Social support (emotional), 4.1 = Instruction on how to perform the behaviour, 5.1. Information about health consequences, 5.2 = Salience of consequences, 5.3 = Information about social and environmental consequences, 6.1 = Demonstration of the behaviour, 7.1 = Prompts/cues, 8.1 = Behavioural practice/rehearsal, 8.2 = Behaviour substitution, 8.4 = Habit reversal, 8.6 = Generalisation of target behaviour, 9.1 = Credible source, 9.2 = Pros and cons, 10.3 = Non-specific reward, 10.6 = Non-specific incentive, 10.9 = Self-reward, 11.2 = Reduce negative emotions, 12.1 = Restructuring the physical environment, 12.5 = Adding objects to the environment, 15.1 = Verbal persuasion about capability

A.5 Meta-regressions: BCTs regressed on dietary behaviour effect sizes

	Use of each BCT across all studies included in the review ($k = 76$)			Self-report & physiological outcomes directly linked with behaviour						Self-reported diet only					
	Intervention only (+1)	Neither condition or both (0)	Control only (-1)	Inc. outliers ($k = 67$)			Exc. outliers ($k = 64$)			Inc. outliers ($k = 58$)			Exc. outliers ($k = 55$)		
				beta	Std. error	p -value	beta	Std. error	p -value	beta	Std. error	p -value	beta	Std. error	p -value
1.1 Goal setting (behaviour)	17	58	1	.13	.09	.16	.10	.08	.21	.05	.12	.65	.00	.10	.98
1.2 Problem solving	12	64	0	-.01	.12	.96	.03	.09	.72	-.02	.12	.86	.03	.10	.73
1.4 Action planning	13	63	0	.16	.10	.12	.20	.08	.02*	.17	.13	.18	.21	.10	.03*
2.3 Self-monitoring of behaviour	9	66	1	.10	.14	.49	.12	.11	.29	.07	.16	.65	.11	.13	.38
2.4 Self-monitoring of outcome(s) of behaviour	6	70	0	.31	.18	.096†	.38	.15	.01*	.05	.21	.80	.13	.16	.44
2.7 Feedback on outcomes of behaviour	7	69	0	-.03	.16	.84	.02	.13	.90	-.06	.16	.70	.00	.13	.98
3.1 Social support (unspecified)	30	46	0	.07	.09	.45	.05	.07	.45	.11	.10	.26	.09	.08	.25
3.2 Social support (practical)	9	67	0	-.12	.11	.28	-.09	.09	.31	-.17	.12	.17	-.13	.09	.18
4.1 Instruction on how to perform a behaviour	54	21	1	-.08	.08	.35	-.08	.07	.25	-.04	.09	.67	-.04	.08	.65
5.1 Information about health consequences	22	54	0	.06	.09	.47	-.04	.07	.63	.06	.10	.53	-.05	.08	.56
5.2 Salience of consequences	4	72	0	.19	.16	.24	.03	.14	.85	.18	.17	.30	.02	.15	.88
5.3 Information about social and environmental consequences	7	69	0	.19	.14	.18	.09	.13	.48	.30	.16	.06†	.19	.14	.21
6.1 Demonstration of the behaviour	10	66	0	.12	.12	.34	.15	.10	.13	.11	.13	.40	.16	.10	.14
7.1 Prompts/cues	20	56	0	.03	.09	.78	-.03	.08	.68	.05	.10	.60	-.01	.08	.90

8.1 Behavioural practice/rehearsal	15	61	0	-.04	.10	.71	-.01	.08	.92	-.05	.11	.64	-.01	.09	.87
8.2 Behaviour substitution	4	72	0	.05	.18	.80	.06	.14	.66	.04	.19	.84	.06	.15	.68
9.1 Credible source	32	44	0	-.10	.08	.22	-.06	.07	.41	-.13	.09	.18	-.07	.08	.33
10.3 Non-specific reward	4	72	0	.20	.19	.29	-.06	.19	.74	.18	.20	.36	-.07	.20	.72
12.1 Restructuring the physical environment	13	63	0	-.07	.11	.49	-.05	.08	.58	-.08	.12	.48	-.05	.09	.60
12.5 Adding objects to the environment	4	72	0	-.21	.16	.20	-.18	.12	.14	-.22	.17	.20	-.19	.13	.14

	All outcomes						Self-reported fruit and vegetables intake						Self-reported fat intake					
	Inc. outliers (k = 76)			Exc. outliers (k = 72)			Inc. outliers (k = 29)			Exc. outliers (k = 28)			Inc. outliers (k = 24)			Exc. outliers (k = 22)		
	beta	Std. error	p-value	beta	Std. error	p-value	Beta	Std. error	p-value	beta	Std. error	p-lue	beta	Std. error	p-value	beta	Std. error	p-value
1.1 Goal setting (behaviour)	.16	.11	.13	.05	.07	.47	.24	.11	.048*	.13	.10	.21	.03	.18	.86	-.08	.14	.58
1.2 Problem solving	.09	.13	.49	.00	.08	1	-.16	.13	.24	-.10	.10	.36	.00	.19	.99	-.16	.17	.35
1.4 Action planning	.23	.12	.06†	.14	.07	.06†	.27	.17	.11	.35	.12	.01*	.18	.25	.48	-.18	.23	.44
2.3 Self-monitoring of behaviour	.04	.13	.74	.08	.07	.28	.08	.22	.74	.14	.17	.41	-.02	.23	.94	.06	.17	.71
2.4 Self-monitoring of outcome(s) of behaviour	.05	.18	.77	.14	.10	.16	-.21	.23	.37	-.15	.19	.42	-.02	.31	.95	.07	.25	.78
2.7 Feedback on outcomes of behaviour	-.11	.16	.51	-.03	.09	.79	.04	.19	.85	.11	.15	.48	-.30	.24	.22	-.22	.19	.26
3.1 Social support (unspecified)	.07	.10	.47	.01	.06	.88	.23	.11	.048*	.13	.09	.16	-.08	.16	.64	.04	.13	.74
3.2 Social support (practical)	-.14	.13	.29	-.09	.07	.19	-.24	.12	.05†	-.18	.08	.04*	.16	.22	.47	-.06	.20	.78
4.1 Instruction on how to perform a behaviour	-.10	.09	.29	-.05	.06	.35	-.11	.11	.29	-.04	.09	.66	.12	.17	.47	.00	.13	.98

5.1 Information about health consequences	.05	.10	.66	-.02	.06	.77	.01	.12	.90	-.05	.09	.55	-.19	.17	.27	-.08	.13	.56
5.2 Salience of consequences	.13	.19	.50	-.03	.11	.79	.26	.16	.11	-.01	.15	.97	.35	.42	.42	.43	.33	.22
5.3 Information about social and environmental consequences	.11	.16	.51	.02	.10	.81	.72	.16	.000*	.51	.30	.10	.38	.30	.21	-.18	.33	.60
6.1 Demonstration of the behaviour	.27	.14	.07†	.12	.09	.17	.14	.14	.31	.18	.10	.09†	.36	.23	.14	.45	.17	.01*
7.1 Prompts/cues	-.01	.11	.93	-.04	.06	.49	.00	.12	.97	.07	.09	.43	-.19	.16	.25	-.09	.13	.50
8.1 Behavioural practice/rehearsal	.00	.12	1	-.07	.06	.29	-.11	.12	.36	-.07	.09	.42	.04	.18	.85	.14	.14	.32
8.2 Behaviour substitution	.04	.21	.85	.07	.12	.55	-.07	.18	.69	-.03	.13	.82	.21	.22	.36	-.05	.22	.84
9.1 Credible source	-.02	.09	.82	-.02	.05	.73	-.11	.12	.38	-.05	.09	.56	-.24	.15	.13	-.13	.12	.31
10.3 Non-specific reward	.08	.20	.67	-.07	.13	.58	.53	.19	.01*	-.18	.36	.61	.10	.35	.77	.19	.24	.44
12.1 Restructuring the physical environment	-.10	.12	.40	-.04	.06	.51	-.23	.11	.05†	-.17	.08	.047*	.24	.18	.20	.16	.16	.33
12.5 Adding objects to the environment	-.21	.19	.26	-.16	.09	.08†	-.18	.15	.23	-.13	.10	.22	-.01	.28	.98	.04	.21	.84

A.6 Effect of other intervention characteristics

Intervention characteristic	Frequency of characteristic (k = 76)			Self-report & physiological outcomes directly linked with behaviour						Self-reported diet only					
	1	0	-1	Inc. outliers (k = 67)			Exc. outliers (k = 64)			Inc. outliers (k = 58)			Exc. outliers (k = 55)		
TYPE OF PARTICIPANT	1	0	-1	Beta	Std. err.	p-value	beta	Std. error	p-value	Beta	Std. error	p-value	Beta	Std. err.	p-value
Pre-existing condition (yes/no)	39	37	-	.11	.08	.18	.03	.07	.64	.14	.09	.14	.03	.08	.63
Overweight (yes = 1/no = 0)	17	56	-	-.01	.12	.91	-.11	.11	.31	.01	.14	.93	-.09	.12	.47
Hypertension (yes = 1/no = 0)	6	67	-	.41	.16	.01*	.16	.16	.31	.65	.21	.002*	.28	.23	.22
Diabetes (yes = 1/no = 0)	7	66	-	.11	.14	.45	.18	.11	.12	.18	.19	.35	.25	.15	.10
Individual vs. group (1=individual, 0=group)	66	10	-	.10	.13	.44	.07	.10	.49	.03	.14	.84	-.01	.12	.91
Adult vs. child (1=adult, 0=both, -1=child)	37	9	30	.14	.04	.001*	.10	.03	.004*	.15	.05	.003*	.10	.04	.01*
Family (yes = 1/no = 0)	9	67	-	-.12	.13	.36	-.10	.11	.37	-.05	.15	.75	-.01	.12	.96
SETTING															
Asia (yes = 1/no = 0)	26	50	-	-.11	.09	.23	-.02	.07	.76	-.11	.10	.26	-.01	.08	.89
Africa (yes = 1/no = 0)	10	66	-	-.04	.12	.72	-.02	.09	.86	.00	.14	1	.03	.11	.81
Middle East (yes = 1/no = 0)	16	60	-	.22	.10	.04*	.03	.10	.78	.29	.11	.02*	.07	.11	.50
South America (yes = 1/no = 0)	21	55	-	-.05	.10	.62	-.01	.08	.90	-.07	.11	.51	-.03	.09	.71
INTERVENTION/other Study CHARACTERISTICS															
Preparation (yes = 1/no = 0)	15	61	0	.00	.11	.97	-.09	.09	.30	.06	.12	.64	-.06	.10	.58
Targeted multiple behaviours (1=multi-behaviour; 0=diet only)	45	29	-	.01	.09	.91	.01	.07	.91	.01	.10	.94	.00	.08	.99

Follow-up without BCTs (yes = 1/no = 0)	18	58	-	-.10	.10	.30	-.06	.08	.49	-.09	.11	.42	-.04	.09	.69
Period of intervention days [experimental]	-	-	-	-.00	.00	.40	.00	.00	.53	.00	.00	.38	.00	.00	.51
Face to face [experimental] (yes = 1/no = 0)	70	6	-	-.33	.15	.03*	-.11	.14	.41	-.32	.17	.06†	-.07	.15	.66
Computer-based [experimental] (yes = 1/no = 0)	6	70	-	.03	.17	.86	.07	.14	.62	-.02	.17	.89	.02	.13	.87
Telephone-based [experimental] (yes = 1/no = 0)	10	66	-	.09	.11	.43	.00	.09	1	.17	.14	.21	.02	.11	.84
Print-based [experimental] (yes = 1/no = 0)	63	13	-	-.10	.11	.38	.00	.09	.98	-.08	.13	.56	.07	.10	.50
Video-based [experimental] (yes = 1/no = 0)	8	68	-	-.06	.12	.61	.00	.10	.99	-.07	.13	.58	.00	.11	1
Face to face [experimental v control] (inter.only=1/both/neither=0/con.only=-1)	55	20	1	-.12	.08	.17	-.03	.07	.62	-.18	.10	.08†	-.05	.09	.54
Computer-based [experimental v control] (inter.only=1/both/neither=0/con.only=-1)	5	71	-	.03	.17	.86	.07	.14	.62	-.02	.17	.89	.02	.13	.87
Telephone-based [experimental v control] (inter.only=1/both/neither=0/con.only=-1)	9	67	-	.12	.11	.31	.02	.09	.86	.17	.14	.21	.02	.11	.84
Print-based [experimental v control] (inter.only=1/both/neither=0/con.only=-1)	44	31	1	-.05	.08	.56	.03	.07	.68	-.10	.10	.31	.01	.08	.94
Video-based [experimental v control] (inter.only=1/both/neither=0/con.only=-1)	8	67	1	-.06	.11	.63	.00	.10	.99	-.04	.12	.75	.02	.10	.86

RISK	OF															BIAS/METHODOLOGY		
<i>I = low risk; 0 = high or unclear risk of bias</i>																		
Type of randomisation [individual vs. group] (1=individual, 0=group)	38	38	-	.24	.08	.003*	.19	.06	.005*	.24	.09	.009*	.17	.07	.03*			
Adequate randomization (1 = yes/0 = no)	49	27	-	-.01	.09	.93	.04	.08	.60	.02	.10	.88	.07	.08	.42			
Allocation concealment [claimed] (1 = yes/0 = no)	6	70	-	-.15	.15	.32	-.12	.12	.31	-.13	.19	.51	-.10	.14	.51			
Allocation concealment [adequate] (1 = yes/0 = no)	4	72	-	-.18	.19	.36	-.14	.15	.36	-.15	.31	.62	-.11	.22	.63			

Any blinding [claimed] (1 = yes/0 = no)	19	57	-	-.18	.09	.04*	-.15	.07	.04*	-.18	.11	.09†	-.15	.08	.09†
Blinding Participants [claimed] (1 = yes/0 = no)	6	70	-	-.21	.13	.12	-.18	.10	.08†	-.13	.15	.39	-.11	.12	.36
Blinding Deliverer [claimed] (1 = yes/0 = no)	8	68	-	-.17	.12	.16	-.14	.10	.16	-.26	.14	.06†	-.22	.11	.04*
Blinding Data Collector [claimed] (1 = yes/0 = no)	5	71	-	.03	.16	.86	.04	.12	.76	.20	.22	.37	-.15	.16	.36
Blinding Analysis [claimed] (1 = yes/0 = no)	5	71	-	-.27	.15	.08†	-.23	.12	.048*	-.13	.20	.51	-.11	.15	.49
Contamination prevention [claimed] (1 = yes/0 = no)	3	72	-	-.13	.20	.54	-.12	.16	.48	.10	.28	.72	.15	.24	.53
Contamination prevention [adequate] (1 = yes/0 = no)	1	75	-	.05	.38	.90	.09	.33	.78	.04	.39	.92	.09	.33	.80
Informed consent (1 = yes/0 = no)	73	3	-	-.19	.27	.48	-.23	.24	.34	-.18	.27	.52	-.22	.24	.36
Attrition rate [experimental]	-	-	-	.00	.00	.53	.00	.00	.17	.00	.00	.83	.00	.00	.41
Ethics approval reported (1 = yes/0 = no)	67	9	-	-.04	.14	.78	-.06	.11	.61	-.02	.14	.89	-.05	.12	.70

Appendix 3 (Continued): Effect of other intervention characteristics

Intervention characteristic	All outcomes						Self-reported fruit and vegetable intake						Self-reported fat intake					
	Inc. outliers (k = 76)			Exc. outliers (k = 72)			Inc. outliers (k = 29)			Exc. outliers (k = 28)			Inc. outliers (k = 24)			Exc. outliers (k = 22)		
TYPE OF PARTICIPANT	beta	Std. err.	p-value	beta	Std. err.	p-value	beta	Std. error	p-value	beta	Std. error	p-value	Beta	Std. err.	p-value	beta	Std. err.	p-value
Pre-existing condition (yes/no)	.04	.09	.63	.02	.05	.67	.24	.12	.05†	.12	.11	.28	.01	.16	.94	.02	.13	.90
Overweight (yes = 1/no = 0)	-.06	.12	.51	-.07	.07	.32	.27	.14	.06†	.09	.13	.52	-.14	.19	.46	-.27	.14	.07†
Hypertension (yes = 1/no = 0)	.40	.18	.03*	.15	.13	.25	.59	.32	.08†	.66	.25	.02*	-	-	-	-	-	-
Diabetes (yes = 1/no = 0)	.04	.17	.83	.16	.09	.099†	-.09	.33	.79	-.03	.28	.91	.20	.29	.49	.31	.21	.16

Individual vs. group (1=individual, 0=group)	.08	.15	.58	.03	.08	.71	.07	.16	.65	.02	.13	.89	-.06	.21	.78	-.15	.15	.34
Adult vs. child (1=adult, 0=both, -1=child)	.14	.04	.002*	.09	.03	.002*	.14	.05	.02*	.10	.04	.03*	.00	.08	.98	.01	.07	.85
Family (yes = 1/no = 0)	-.09	.15	.57	-.04	.09	.65	-.10	.18	.59	-.04	.14	.76	-.03	.23	.89	.07	.17	.70

SETTING

Asia (yes = 1/no = 0)	-.07	.10	.44	-.05	.06	.41	-.03	.12	.80	.01	.09	.93	-.14	.16	.38	.01	.13	.96
Africa (yes = 1/no = 0)	-.01	.14	.94	.03	.07	.67	-.10	.17	.56	-.04	.13	.74	-.18	.27	.52	-.10	.21	.63
Middle East (yes = 1/no = 0)	.20	.11	.07†	.06	.07	.45	.37	.12	.005*	.23	.12	.08†	-.07	.24	.77	.00	.18	.99
South America (yes = 1/no = 0)	-.09	.11	.40	-.02	.06	.73	-.12	.12	.36	-.06	.10	.53	.22	.16	.20	-.03	.15	.85

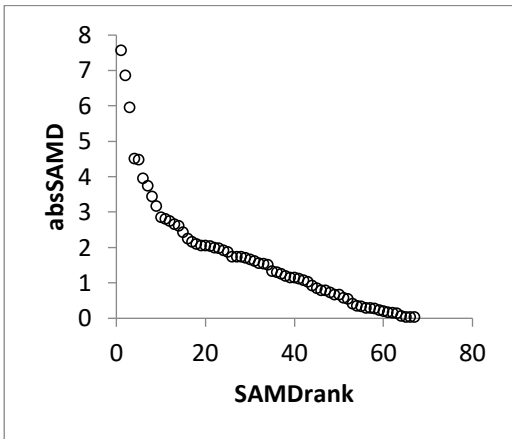
INTERVENTION/other Study CHARACTERISTICS

Preparation (yes = 1/no = 0)	.04	.12	.76	-.02	.07	.79	-.13	.14	.37	-.08	.11	.50	.08	.25	.76	.13	.20	.50
Targeted multiple behaviours (1=multi-behaviour; 0=diet only)	-.07	.10	.50	-.02	.05	.69	-.10	.11	.37	-.02	.09	.82	.01	.16	.97	.06	.13	.68
Follow-up without BCTs (yes = 1/no = 0)	-.06	.11	.56	-.01	.06	.89	.02	.12	.88	.06	.09	.54	.01	.19	.95	-.12	.15	.43
Period of intervention days [experimental]	.00	.00	.40	.00	.00	.49	.00	.00	.19	.00	.00	.35	.00	.00	.60	.00	.00	.68
Face to face [experimental] (yes = 1/no = 0)	-.29	.18	.10	-.08	.12	.48	-.10	.22	.66	-.17	.17	.34	-.07	.27	.80	-.16	.19	.41
Computer-based [experimental] (yes = 1/no = 0)	-.06	.17	.74	.02	.09	.87	.01	.16	.93	.06	.12	.63	.19	.22	.40	-.02	.21	.92
Telephone-based [experimental] (yes = 1/no = 0)	.06	.13	.67	.00	.07	.98	.04	.17	.84	.09	.13	.48	-.19	.19	.33	-.09	.15	.54
Print-based [experimental] (yes = 1/no = 0)	-.09	.12	.46	-.03	.07	.68	.11	.14	.43	.08	.11	.44	.22	.24	.38	.14	.19	.48
Video-based [experimental] (yes = 1/no = 0)	-.05	.15	.74	.02	.08	.83	-.14	.14	.30	-.10	.10	.32	.30	.19	.13	.17	.18	.35
Face to face [experimental v control] (inter.only=1/both/neither=0/con.only=-1)	-.09	.09	.32	-.06	.06	.32	-.17	.13	.20	-.04	.11	.72	.22	.20	.29	.11	.16	.49
Computer-based [experimental v control] (inter.only=1/both/neither=0/con.only=-1)	.00	.19	.98	.08	.10	.45	.01	.16	.93	.06	.12	.63	.19	.22	.40	-.02	.21	.92

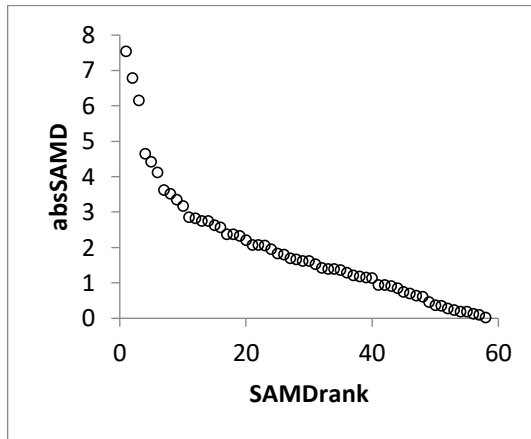
Telephone-based [experimental v control] (inter.only=1/both/neither=0/con.only=-1)	.08	.13	.55	.01	.08	.90	.04	.17	.84	.09	.13	.48	-.19	.19	.33	-.09	.15	.54
Print-based [experimental v control] (inter.only=1/both/neither=0/con.only=-1)	-.08	.09	.36	.01	.05	.82	.01	.12	.96	.09	.09	.33	.18	.17	.29	.07	.13	.61
Video-based [experimental v control] (inter.only=1/both/neither=0/con.only=-1)	-.04	.14	.76	.01	.08	.87	-.07	.12	.59	-.05	.09	.59	.21	.17	.22	.09	.15	.56

RISK	OF									BIAS/METHODOLOGY								
<i>1 = low risk; 0 = high or unclear risk of bias</i>																		
Type of randomisation [individual vs. group] (1=individual, 0=group)	.21	.09	.02*	.14	.05	.01*	.31	.10	.004*	.24	.08	.008*	.02	.16	.92	.00	.13	.98
Adequate randomization	-.07	.10	.47	.05	.06	.39	-.29	.13	.03*	-.12	.12	.33	.06	.19	.76	-.03	.15	.86
Allocation concealment [claimed]	-.16	.16	.33	-.09	.09	.29	-.10	.26	.71	-.04	.18	.81	-	-	-	-	-	-
Allocation concealment [adequate]	-.16	.20	.43	-.08	.11	.48	-.10	.26	.71	-.04	.18	.81	-	-	-	-	-	-
Any blinding [claimed]	-.18	.10	.09†	-.11	.06	.06†	-.02	.14	.90	.03	.10	.75	.04	.19	.83	-.10	.16	.55
Blinding Participants [claimed]	-.17	.15	.29	-.11	.08	.15	-.06	.16	.69	-.02	.12	.84	.36	.28	.21	-.05	.26	.84
Blinding Deliverer [claimed]	-.18	.14	.20	-.12	.08	.13	-.14	.17	.42	-.08	.12	.54	-.16	.23	.50	-.07	.18	.71
Blinding Data Collector [claimed]	-.04	.18	.82	-.01	.10	.91	-.15	.19	.45	-.09	.14	.53	-.13	.36	.71	-.05	.26	.84
Blinding Analysis [claimed]	-.26	.17	.12	-.18	.09	.04*	.21	.29	.48	.27	.22	.22	-.22	.37	.56	-.13	.28	.63
Contamination prevention [claimed]	-.04	.24	.86	-.02	.14	.86	.06	.26	.83	.12	.22	.61	.21	.42	.62	.29	.34	.40
Contamination prevention [adequate]	.07	.44	.87	.14	.29	.62	.08	.35	.82	.14	.30	.65	.21	.42	.62	.29	.34	.40
Informed consent	-.21	.31	.49	-.28	.22	.21	-.04	.31	.91	-.10	.27	.71	-.21	.42	.62	-.29	.34	.40
Attrition rate [experimental]	.00	.00	.54	.00	.00	.13	.00	.00	.92	.00	.00	.35	.00	.01	.72	.00	.01	.57
Ethics approval reported	-.06	.15	.69	-.09	.09	.32	.08	.16	.61	.02	.13	.86	.13	.21	.55	.04	.17	.82

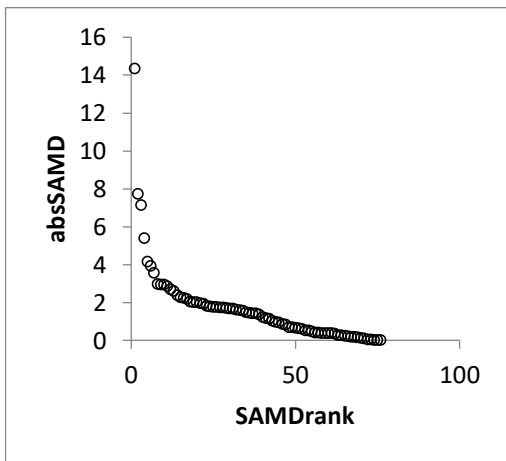
A.7 Scree plots SAMD Study rank (SAMDrank) with SAMD score (absSAMD)



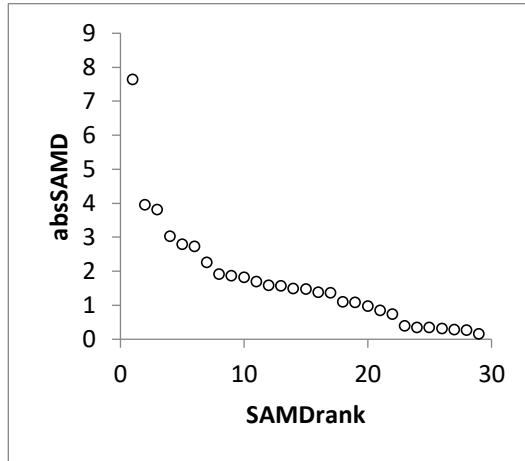
1.1: Self-report and physiological outcomes directly linked with behaviour



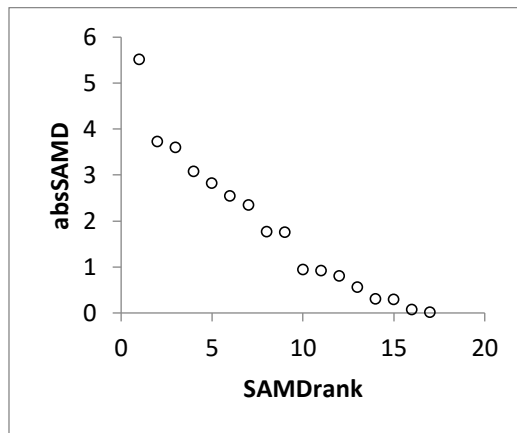
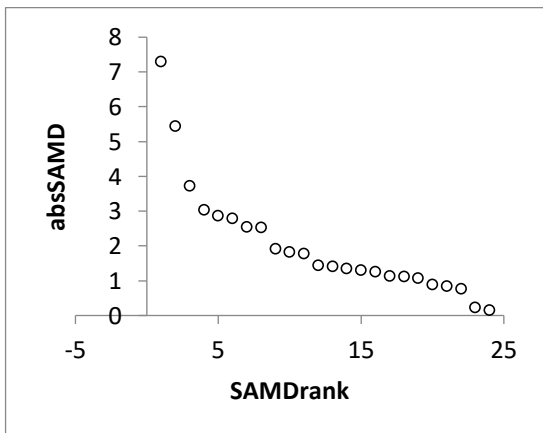
1.2: Self-report outcomes only



1.3: All outcomes

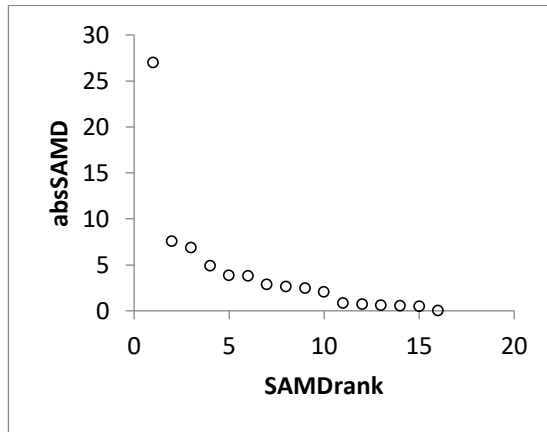


1.4: Self-reported fruit and vegetable intake



1.5: Self-reported fat intake

1.6: Cholesterol



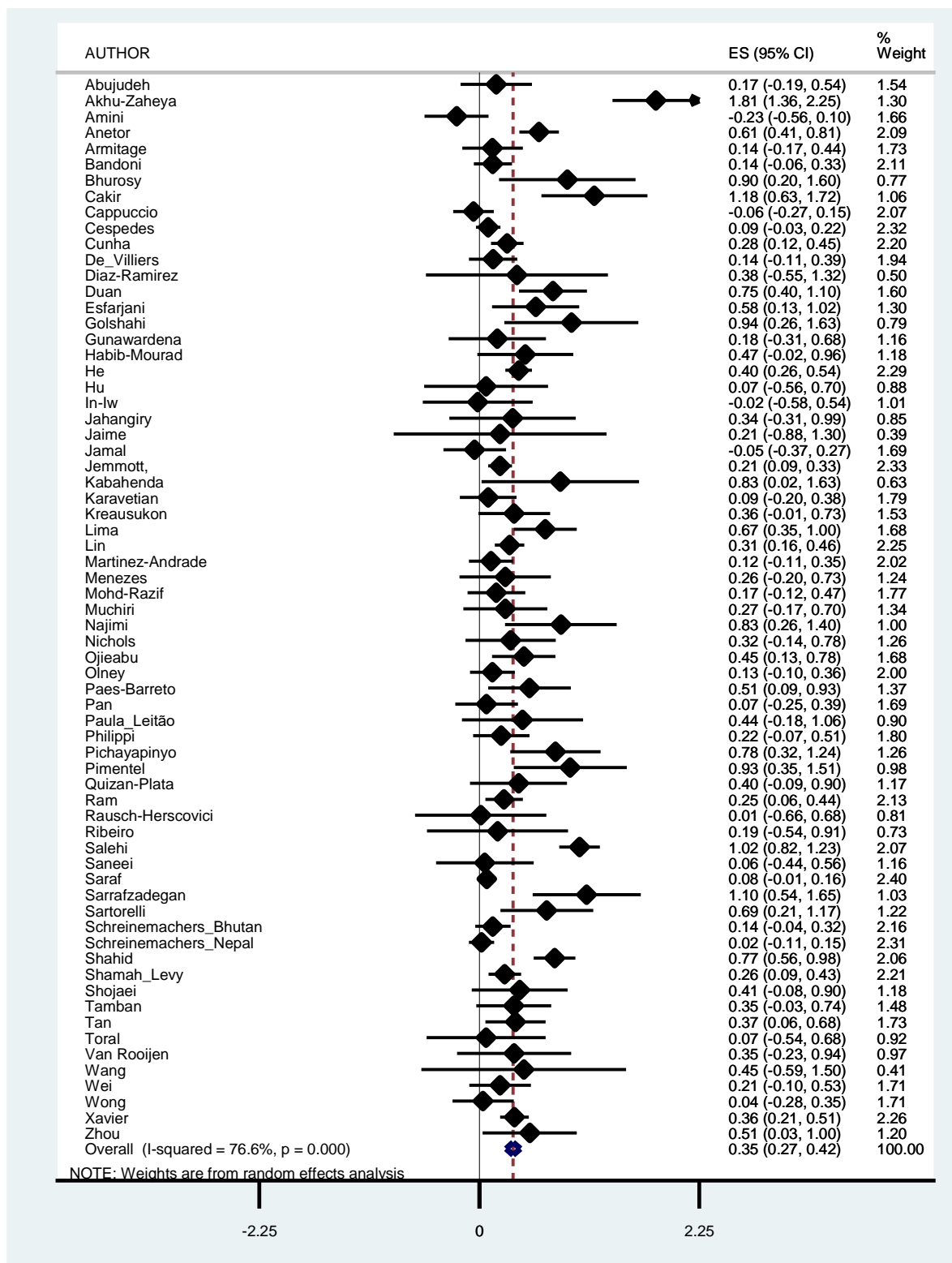
1.7: Blood pressure

A.8 Confounding of Behaviour Change Techniques (k = 76)

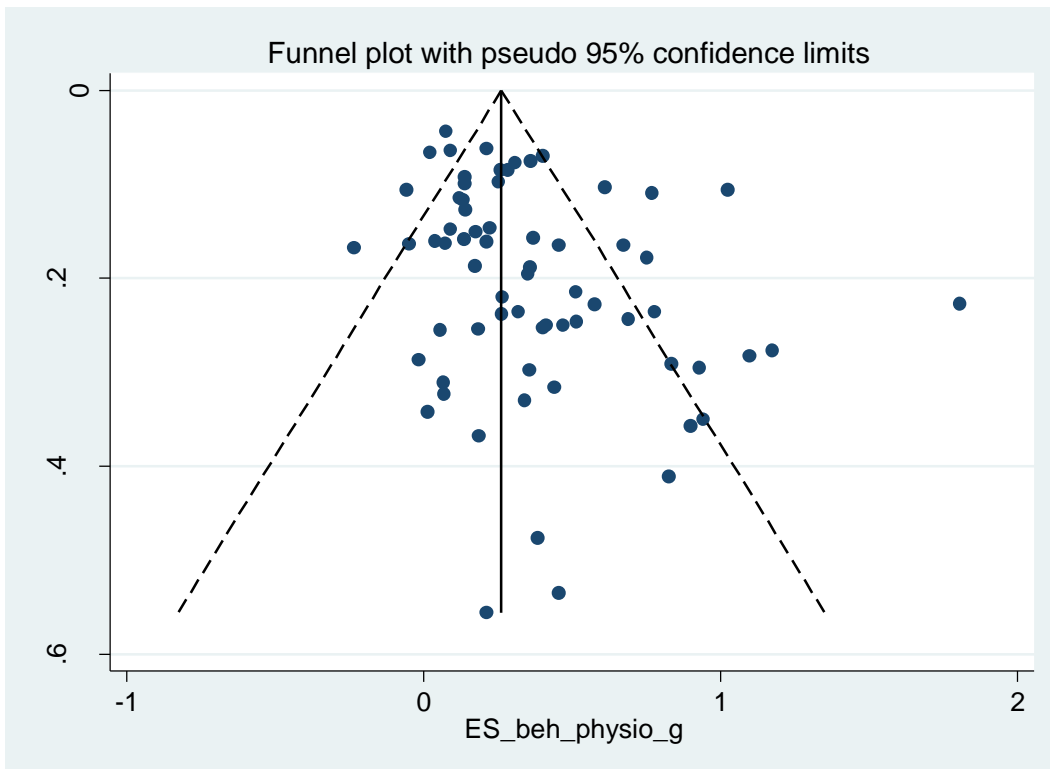
Behaviour change technique	1	2	3	4	5	6	7	8	9
1. Action planning (BCT 1.4)	-	1	.06 [†]	.25	.06 [†]	.03*	1	.34	.58
2. Self-monitoring (outcome) (BCT 2.4)		-	1	.36	.91	.67	1	1	1
3. Demonstration of the behaviour (BCT 6.1)			-	1	.98	1	.06 [†]	.59	1
4. Hypertension				-	.16	.098 [†]	.18	1	.36
5. Adult vs. child					-	.000**	.92	.66	.83
6. Type of randomisation						-	.43	.71	.36
7. Any blinding [claimed]							-	.000**	.001**
8. Blinding deliverer [claimed]								-	.44
9. Blinding analysis [claimed]									-

A.9 Forest plot of intervention effect sizes

(self-report and physiological outcomes directly linked with dietary behaviour, k = 67)



A.10 Funnel plot of observed effect size on self-report and physiological outcomes directly linked with dietary behaviour (ES_beh_physio_g) against standard error (SE_beh_physio_g)



Appendix B Part 2 Appendices

B.1 Interview guide for Study 2: Guide for patients (and their partners)

Record the following information about the participant:

Name and ID number	
Age	
Highest level of education	
Socio-economic group	Less than 50,000 NRS 50,000 – 75,000 NRS 75,000- 100,000 NRS More than 100,000 NRS
Ethnicity	
Religion	
Working	Yes/No
Occupation/previous occupation	
Diagnosis	
Time since diagnosis (months or years)	
Other medical conditions	
How many people live with you most of the time? Who?	

1. I would like to ask you about when you were told you had diabetes/high blood glucose levels. What you knew about diabetes/high blood glucose levels before you were diagnosed?

Note to interviewer: If interviewing a partner of a patient separately, ask the above about their partners diagnosis

2. I would like to ask you about your eating habits and how/if these have changed since you were told you had diabetes/high blood glucose levels

Note to interviewer: If interviewing a partner of a patient separately, ask the following about their own eating habits (not their diagnosed partner). If their eating habits have remained the same, only use one template.

Exercise 1:

Provide a daily routine template. Ask the participant think about their diet BEFORE DIAGNOSIS. Ask them to write on the template (for an average day):

- What did they eat and drink when they got up (if they say they drank tea, did they have sugar in their tea)

- What did they eat and drink during the day, and where (at work, at home etc.)

- What they ate in the evening

Snacks

Now ask the participant to if they ate between meals, if they did, write down when they would eat and what they snacked on. Ask them where they got these snacks from and why they snack on them?

Sugary/sweet things

Ask the participant to write down if they ate sweet/sugary things, if so, how often, what kind of sweet/sugary things and where are they from?

Fruits and vegetables

Ask the participant to write down if they ate fruit and vegetables, why they ate certain fruit and vegetables (probe for pesticide use). Ask them how their vegetables were cooked?

Meat

Ask the participant to write down if they ate meat, if so, how often, what kind of meat and how was it cooked?

Rice or noodles

Ask the participant to write down if/when they ate rice, and how much rice they would eat during one meal?

Drinks

What drinks did you normally have? How much of each drink did you have? Where did you get these from?

Ask the participant if they are happy with what they have written, or if they would like to add anything

Exercise 2:

Provide another daily routine template. Now ask the participant to think about their diet SINCE DIAGNOSIS. Ask them to write on the template (for an average day):

- What they eat and drink when they get up (if they say they drink tea, do they have sugar in their tea)
- What they eat and drink during the day, and where they are (at work, at home etc.)
- What they eat and drink in the evening

Snacks

Now ask the participant to if they eat between meals, if they do, write down when they eat and what they snack on. Ask them where they get these snacks from and why they snack on them?

Sugary/sweet things

Now ask the participant to write down if they eat sweet/sugary things, if so, how often, what kind of sweet/sugary things and where are they from?

Fruit and vegetables

Now ask the participant to write down if they eat fruit and vegetables, why they eat certain fruit and vegetables (probe for pesticide use). Ask them how their vegetables are cooked (probe for fried/steamed, use of salt or oil)?

Meat

Now ask the participant to write down if they eat meat, if so, how often, what kind of meat and how is it cooked?

Rice

Ask the participant to write down if/when they eat rice, and how much rice they eat during one meal?

Drinks

What drinks do they normally have? How much of each drink do you have? Where do they get these from?

Ask the participant if they are happy with what they have written, or if they would like to add anything

Exercise 3: [Optional exercise with food models]

Ask the participants to arrange the food models according to what proportions of each food they think represents a healthy meal. [Take a photo of this model after the interview]

Ask the participant to describe the model they have made up.

[Using the drawings as visual aids ask the following]

Probes:

- How do you think your eating habits have changed since you (or your partner) found out you had high glucose levels/diabetes?
 - Why did you stop/start eating the foods you eat/ate?
 - [Compare the two diagrams] Which, if any, unhealthy foods have you found it hard to give up? Why do you find it hard to stop eating these foods? How much of these foods do you still eat?
 - How you think you can still improve your eating habits? What would help you improve your eating habits?
3. I would like to ask you more about what eating is like for you. Describe the situation when you eat. How do you eat (with family, alone, one big meal, two big meals)? How would you like to eat your meals?
- Who decides what you eat in your household?
 - Who prepares your food?
 - How is their food prepared, e.g. with oil (what kind of oil?), spices, fried or boiled

4. I would like to ask you how you buy your food.

Where do you buy your food and who decides what food to buy?

If you could, would you buy different foods? Which foods would you buy?

5. I would like to ask you how culture and religion effects your eating habits

Exercise 4:

Provide a year calendar with months in Nepali and a pen for the participant.

Ask them to indicate if they observe any festivals/fasts during the year and about any weddings/funerals/other large events they have taken part in/will take part in in the next year, ask them to map these on the calendar.

If the participant provides any events which they observe ask them to indicate:

- why they observe these

- what foods they eat at each event

- Since their diagnosis have they changed what they eat at these events, if so, how do they feel about that? What do their family and friends think about them eating differently?

- if there are any fasting periods throughout the year

- if they fast at any point during the year

- If they don't fast now because of their diagnosis, how does that make them feel

[if interviewing partner, ask if their partner eats different foods to them and why/why not]

6. I would like to ask you about the support you have received since you were told you had diabetes/high blood glucose levels

[if interviewing partner of a diagnosed patient separately, ask them to map the support they AND their partner have received]

Exercise 5:

Provide the participant with a large sheet of paper and a pen, and some post-it notes.

Ask them to place in the middle of the sheet of paper a post-it note or mark indicating where they live.

What has helped you manage your diabetes/pre-diabetes?

What has made it hard to manage your diabetes/pre-diabetes?

House

Then ask them if anyone in their home helps them to eat more healthily. Ask them to indicate how much support they get from home by putting more [post-it notes]. Who does this support come from? [Probe: Support from partner or other family members, or ask if other family members actually make it harder for them to eat more healthily]

Individuals

If partner is present at interview ask:

Do you support your partner is to eat more healthily?

For patient [if they have a partner]

Does your partner support you? How/how not?

Do you visit the houses of other family and friends? If so, mark these on the map. Do they know about your diagnosis? If so, do they make special preparations for you?

Who has helped you since your diagnosis?

Places

Where did they go for diagnosis and then treatment? Do they still go there?

What has helped OR made things hard for them since their diagnosis?

PROBES:

- *Distance to places they get drugs like pharmacy?*
- *Distance to places where they get food?*
- *Hospital, community clinic, food place, medicine shop (any), workplace, pharmacy, community health events?*
- *What support is received? How often is this support received? How useful is this support?*

Ask the patient if they would like to add anything else?

7. I would like to ask you about how you get on with the people who provide you with support for your condition. Who provides you with support? How do you get on with them, do you respect them? Who do you prefer to get support from? Does gender, age or profession (Doctors/nutritionists/family, colleagues, friends) affect how you get on with the people who provide you with support?

8. I would like to ask you about what support you would like to receive for your diabetes/high blood glucose levels. Allow patient to answer unprompted.
 - How likely would you be to attend a community event where you could learn more about healthy eating? Why?
 - How likely would you be to attend nutrition education classes at hospital once per month? If not at hospital, would you be likely to attend classes if they were held in your community? Why/why not? Which would be easiest? [5.3 Information about social and environmental consequences, 11.2 Reduce Negative emotions]
 - How willing would you be to take your partner *[or for partner if interviewed – go with your partner]* to nutrition education events to learn how to eat more healthily? [3.3 Social Support (emotional)]
 - How likely would you be to listen to advice from a family member or friend who had had training on how to eat healthily?
 - How willing would you be in taking part in a program which allows your eating habits to be recorded (e.g. once per month or week) in order to help you eat more healthily? [2.4/2.3 Self monitoring of behaviour]
 - How likely would you be to take a lunchbox into work so you can eat a meal during the day? Why/why not? [1.4 Action Planning]

Probe: What issues would exist if you took a lunchbox into work? Social stigma about different types of food?

 - How helpful would you find a reminder to eat certain foods daily or weekly help you to improve your dietary behaviour? [1.4 Action planning, 7.1 Prompts and Cues]

Probe for whether the participant has a mobile phone and would respond well to a text message reminder to eat healthily

Is there any support you would like to receive for your diabetes which you don't already receive?

Thank you, do you have any question?

B.2 Interview guide for Study 2: Guide for Health workers

1. What service do you provide? How do you treat patients? How often? What support do you provide? How effective do you think this support is? What works/does not work?
Do you have any way to measure how effective the support you deliver is?

IF NO SUPPORT GIVEN: How do you think support could be provided to your patients and others in the community to prevent diabetes and improve dietary behaviour?

2. Where you get guidelines from on how to deliver your service?
Probes: How are your resources provided/decided upon (e.g. District hospitals, government departments, how is it decided how many medicines and resources are available to you to give to patients etc.?)

3. Can you describe the patients that you see?

Probes:

- Age, socio economic group, gender, ethnicity
 - Proportion of patients with diabetes/high blood glucose levels and severity of patients presenting with diabetes/high blood glucose levels
 - Proportion of overweight/underweight patients
 - NON HOSPITAL ONLY: what capacity is there here to measure blood glucose levels?
4. I would like to ask you how you find talking to your patients. Which patients do you find it easier/more difficult to talk to? Which patients are the most receptive to treatment? How does the age, gender or ethnicity/religion or socio-economic group of patients effect how you relate to them?
 5. I would like to ask you about the dietary patterns you observe amongst your patients. Is there a common pattern of dietary behaviour you observe BEFORE diagnosis and AFTER diagnosis? Do you see any changes in dietary behaviour after diagnosis?
 6. [Capacity] I would like to ask you about how aware you think your patients are of the importance of a healthy diet to their health. Can you tell me to what extent you think your patients understand the causes and consequences of diabetes/high blood glucose levels?

Probe: To what extent have you observed differences between men/women's ability to eat more healthily? To what extent are there differences between how poorer/better off patients control what they eat? How do you think the age of patients affects their ability to change what they eat?

7. What factors make it difficult for patients to eat more healthily? What enables them to eat more healthily?

Probe: Religion/culture? Social pressures/support? Eating alone?

8. [Motivation] I would like to ask you about what could encourage your patients to eat more healthily. How do you think your patients could be encouraged to eat more healthily?

Probe: Differences in motivation based on age/religion/gender

Do family/friends encourage/discourage patients to eat more healthily?

9. [Capacity] I would like to ask you how you think you could provide better support for your patients. How do you think long term support could be provided to your patients and others in the community? Could this support be tailored in any way (men/women, old/young, religion/ethnicity)?

10. [Opportunity] I would like to ask you how the service you deliver here could be expanded into communities. Do you know of any good examples of successful services delivered to patients in communities? [ask to expand]

11. [Motivation] I would like to ask you about some specific ideas about improving dietary support for your patients, please could you say whether you think the ideas would work or not, and why:

- How likely would your patients be to attend a community event where you could learn more about healthy eating? Why?
- How likely would your patients be to attend nutrition education classes at hospital once per month? If not at hospital, would you be likely to attend classes if they were held in your community? Why/why not? Which would be easiest? [5.3 Information about social and environmental consequences, 11.2 Reduce Negative emotions]
- How willing would your patients be to take their partner or a family member to nutrition education events to learn how to eat more healthily? [3.3 Social Support (emotional)]
- How likely would your patients be to listen to advice from a family member or friend who had had training on how to eat healthily?
- How willing would your patients be in taking part in a program which allows their eating habits to be recorded (e.g. once per month or week) in order to help you eat more healthily? [2.4/2.3 Self monitoring of behaviour]

- How likely would your patients be to take a lunchbox into work so they can eat a meal during the day? Why/why not? [1.4 Action Planning]

Probe: What issues would exist if your patients took a lunchbox into work? Social stigma about different types of food?

- How helpful would your patients would find a reminder to eat certain foods daily or weekly help you to improve their dietary behaviour? [1.4 Action planning, 7.1 Prompts and Cues]

Probe for whether the participant has a mobile phone and would respond well to a text message reminder to eat healthily

12. [Opportunity] I would like to ask you what affects your ability to provide more support for healthy eating to your patients. What, if any, aspects of the health service here would make it difficult/easy to provide high quality care to your patients?

Probe: What resources would you need to increase support for your patients?

B.3 Ethical Approval letter University of Leeds



UNIVERSITY OF LEEDS

Faculty of Medicine and Health Research Office
School of Medicine Research Ethics Committee (SoMREC)

Room 9.29, level 9
Worsley Building
Clarendon Way
Leeds, LS2 9NL
United Kingdom

© +44 (0) 113 343 1642

05 May 2017

Elizabeth Caperon
PhD Student
Leeds Institute of Health Sciences
Faculty of Medicine and Health
Worsley Building
University of Leeds
Clarendon Way
LEEDS LS2 9JT

Dear Lizzie

Ref no: **MREC16-125**

Title: **Developing an intervention to improve dietary behaviour in patients with high glucose levels (prediabetic) and type II diabetes in urban Kathmandu, Nepal**

Your research application has been reviewed by the School of Medicine Ethics Committee (SoMREC) and we can confirm that ethics approval is granted based on the following documentation received from you and subject to the following condition *which must be confirmed as being fulfilled prior to the study commencing*:

- Evidence of in-country approval from Nepal must be submitted

Document	Version	Date Submitted
E. Caperon Ethical Review Form v5	5.0	24/04/2017
consent_form_interviews_v3	3.0	27/04/2017
consent_form_observation_v1	1.0	27/04/2017
consent_form_workshops_v2	2.0	04/05/2017
data_management_plan_march2017	1.0	08/03/2017
healthworker_interview_guide_summary_v2	2.0	24/04/2017
patient_interview_guide_summary_v2	2.0	24/04/2017
patientsandhealthworkers_workshop_guide_v2	2.0	24/04/2017
PIS_healthworkers_v1	1.0	24/04/2017
PIS_patients_v1	1.0	24/04/2017
PIS_stakeholders_v1	1.0	24/04/2017
risk_assessment_caperon_nepal_2017_v2	2.0	24/04/2017
stakeholder_interview_guide_summary_v2	2.0	24/04/2017
stakeholders_workshop_guide_v2	2.0	24/04/2017

Please notify the committee if you intend to make any amendments to the original research ethics application or documentation. All changes must receive ethics approval prior to implementation. Please contact the Faculty Research Ethics Administrator for further information (fmhuniethics@leeds.ac.uk)

Ethics approval does not infer you have the right of access to any member of staff or student or documents and the premises of the University of Leeds. Nor does it imply any right of access to the premises of any other organisation, including clinical areas. The committee takes no responsibility for you gaining access to staff, students and/or premises prior to, during or following your research activities.

Please note: You are expected to keep a record of all your approved documentation, as well as documents such as sample consent forms, any risk assessments and other documents relating to the study. This should be kept in your study file, which should be readily available for audit purposes. You will be given a two week notice period if your project is to be audited.

It is our policy to remind everyone that it is your responsibility to comply with Health and Safety, Data Protection and any other legal and/or professional guidelines there may be.

We wish you every success with the project.

Yours sincerely

Dr Roger Parslow
Co-Chair, SoMREC, University of Leeds

(Approval granted by Dr Roger Parslow on behalf of SoMREC Co-Chairs)

B.4 Ethical Approval letter Nepal Health Research Council



Government of Nepal
Nepal Health Research Council (NHRC)



Ref. No.: 1877

05 May 2017

Ms. Elizabeth Caperon

Principal Investigator
 University of Leeds, UK

Subject: Approval of research proposal entitled Exploring factors affecting dietary behaviour in patients with high glucose levels (prediabetic) and type II diabetes in urban Kathmandu

Dear Ms. Caperon,

It is my pleasure to inform you that the above-mentioned proposal submitted on **27 March 2017 (Reg.no. 87/2017)** please use this Reg. No. during further correspondence) has been approved by NHRC Ethical Review Board on **27 April 2017**.

As per NHRC rules and regulations, the investigator has to strictly follow the protocol stipulated in the proposal. Any change in objective(s), problem statement, research question or hypothesis, methodology, implementation procedure, data management and budget that may be necessary in course of the implementation of the research proposal can only be made so and implemented after prior approval from this council. Thus, it is compulsory to submit the detail of such changes intended or desired with justification prior to actual change in the protocol before the expiration date of this approval. Expiration date of this study is **November 2017**.

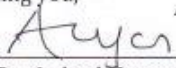
If the researcher requires transfer of the bio samples to other countries, the investigator should apply to the NHRC for the permission. The researchers will not be allowed to ship any raw/crude human biomaterial outside the country; only extracted and amplified samples can be taken to labs outside of Nepal for further study, as per the protocol submitted and approved by the NHRC. The remaining samples of the lab should be destroyed as per standard operating procedure, the process documented, and the NHRC informed.

Further, the researchers are directed to strictly abide by the National Ethical Guidelines published by NHRC during the implementation of their research proposal and submit progress report and full or summary report upon completion.

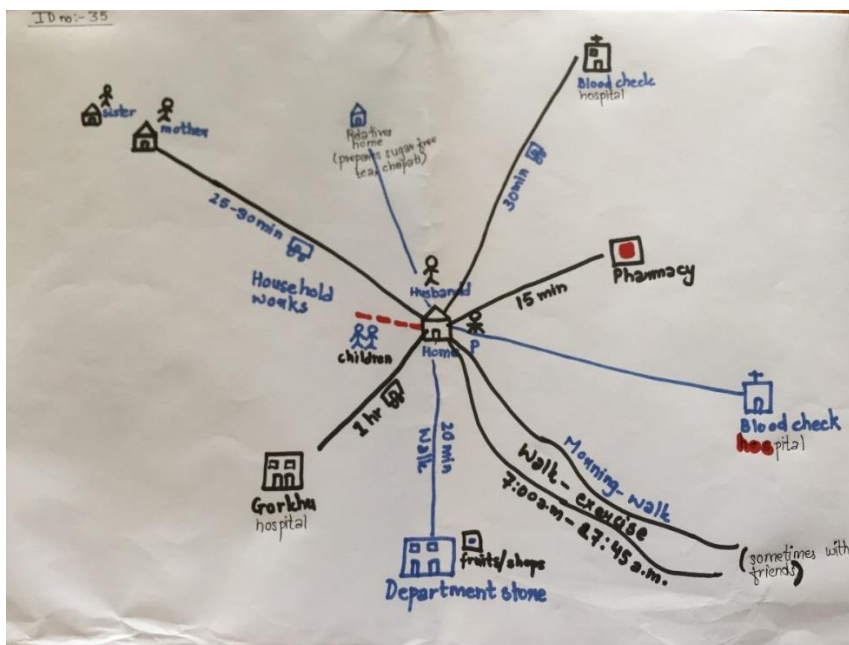
As per your research proposal, the research amount is **NRS.2,03,900.00** and accordingly the processing fee amount to **NRS.10,000.00**. It is acknowledged that the above-mentioned processing fee has been received at NHRC.

If you have any queries, please feel free to contact the Ethical Review M & E section of NHRC.

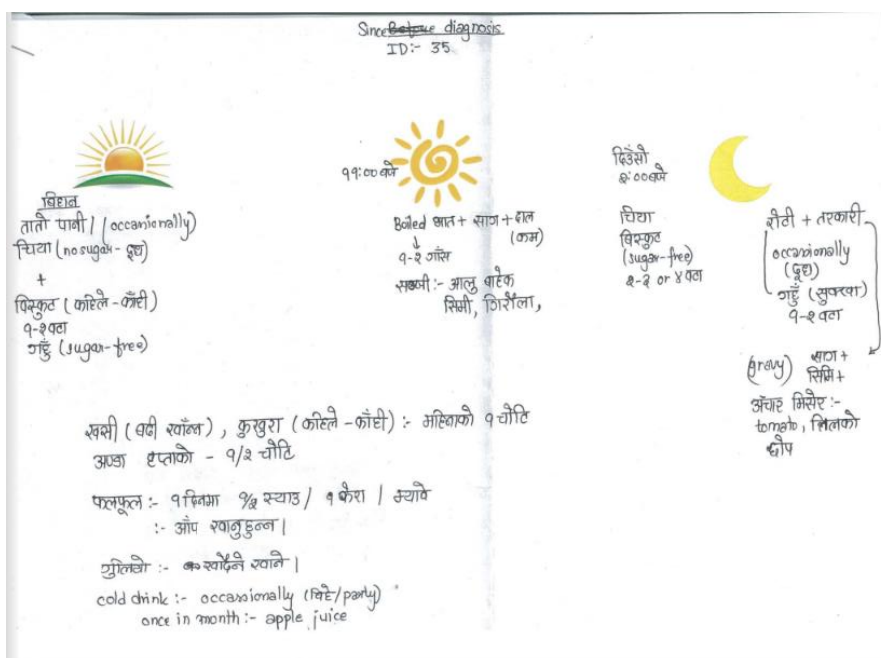
Thanking you,


Prof. Dr. Anjani Kumar Jha
 Executive Chairman

B.5 Examples of data gathered from participatory methods in Study 2



Example of participatory mapping showing key locations regularly visited by participants to spark discussion about distance to important locations



Example of daily dietary patterns mapped by a participant to spark discussion about dietary behaviours

B.6 Search strategy results and terms for literature search

Database searched	Date range	Results 06-11-16	Inclusion after title screening	Results 19- 04-18	Inclusion (2016-2018) after title screening	Search terms
CAB Abstracts	1910-2018	245	10	263	12	See saved search strategy
Global Health	1910-2010	115	9	121	7	See saved search strategy
Medline	1946-2018	101	4	83	7	See saved search strategy
PsycInfo	1806-2018	26	1	21	3	See saved search strategy
Popline	1976-2018	126	16	132	11	(Nepal* AND (Food* OR Diet* OR eat*) AND (Cultur* OR tradition* OR norm* OR behavio*))
JSTOR	1900-2018	1550	51	1720	67	“ ”
Web of Science	1900-2018	211	9	243	15	“ ”
Google Scholar	1970-2018	1590	33	17500	45	nepal diet eating food practices behaviours cultures
TOTAL		3964	133	2583	122	
After de-duplication			98		109	
Final inclusion after abstract screening			61		22	

B.7 Example of search strategy for search on food and diet in Nepal (Study 2)

Database: Ovid MEDLINE(R) <1946 to April Week 2 2018>

Search Strategy:

1 nepal/ (6561)

nepal.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (7793)

3 food*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (481773)

4 home food preparation/ or food consumption/ or food/ or food beliefs/ (30275)

5 identit*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (131085)

6 cultur*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (1511570)

7 culture/ or acculturation/ or anthropology/ or cultural activities/ or cultural behaviour/ or cultural change/ or cultural development/ or cultural environment/ or cultural research/ or cultural values/ or indigenous knowledge/ (39188)

8 anthropology/ or social anthropology/ (3200)

9 anthropolog*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (21224)

10 belie*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (224180)

11 norm*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (1715320)

12 1 or 2 (7793)

13 3 or 4 (481773)

14 5 or 6 or 7 or 8 or 9 or 10 or 11 (3357537)

15 12 and 13 and 14 (65)

16 limit 15 to yr="1910 - 2016" (60)

17 diet*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (600795)

18 diet/ or religious dietary laws/ (142167)

19 eat*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (119870)

20 feeding behaviour/ or eating/ or eating patterns/ or fasting/ or food preferences/ (89916)

21 13 or 17 or 18 or 19 or 20 (1033387)

22 12 and 14 and 21 (92)

23 limit 22 to english language (90)

24 limit 23 to yr="1910 - 2016" (83)

B.8 Reflections by researchers on methods

Method 1: Writing food diaries

Researcher 1

1. In each of the interviews, the participants were asked to write by themselves but majority of them refused to do it. They prefer telling the names of foods rather than to write them. One of my participant was very interested in writing so, she was the only one who responded positively [i.e. she prepared the food diary by her own]. She found writing things more interesting than to say it. Beside her, all of the participants preferred me [the interviewer] to write their food diaries. There were altogether 12 interviews that I conducted among them one of the participant wrote it and the remaining of them told me to write it down. Regarding the persuasion, I would like to share one of the events that happened while I was requesting my participant to write. When I asked one of the participant to write, she told me that it would be better if I do the task. As it was my 2-3rd interview so, I tried to insist her. As a result, what I found was she was so conscious about the recorder that in the record she told ok I will write but she was directing something else by her hand gesture. So, I think I tried in persuading the people but they were not interested in writing. I would like to share some of my observations why they didn't prefer writing.
 - a. First, Nepalese people love to talk rather than to document anything. This is not my statement rather it is the statement of one of the participants who answered me when I was curious to know why most of my participant did not do this exercise. I was so willing to know why people don't write. And during the interview, I happen to meet an educated person who was a retired government officer. He was also my participant. In the end of the interview, while i was having an informal talk with him I had asked him and he replied me this answer. I am glad that I could use this reason here although it was just my curiosity.
 - b. Second, some of them were illiterate and some had completed primary level of education. And asking them to write was questionable for me too. So, i used to think twice before asking them this question. Although I asked all of them.
 - c. The handwriting was also somewhat like barrier for the participant to write. One of the participants was journalist and he was educated too. But he denied to write because of his handwriting. Although he didn't do this exercise, he did the mapping and there I found that his handwriting were not good enough. Later when he asked him, he answered the same thing.
2. The benefits of writing down their dietary habits were it was easier to remember the foods that they said. It helped in comparing the two schedules [before and after]. Further it helped to probe the questions if the participant was diverted to his answers. For example; it worked like a proof and I could easily say them that you had told this thing earlier and what about the thing that you are saying now! The drawbacks were the participants started being less attentive. It was easier to bring the participant to the content when they were diverted to the next topic or issues. So, the method was better as we; the interviewer cannot be too attentive and focused to ward each of the statement that are told by the participant during the interview. We also cannot memorize each of the statement. So, the method worked as the hard disk where all the things were memorised.
3. Well, the method was very interesting although it took time. I think this method is better to do as it make the participants focused. For this, there is requirement of good skill in the field researcher. I could not make it interesting but if the field researcher is clever enough then I think this method could cover a lot of context as well as content that would have rarely been achieved if it was the traditional method of asking and answering.

Researcher 2

I said the participants that they have to participate on the exercise. But except one participant all of the participant did not wanted to write on the paper. Some said they do not have good handwriting and some wanted me to write for them. Even 2 female participant said they can only write their name and signature. So, I wrote for them.

The participant did not showed any interest on writing. They used to say, "You write for me, I will tell you everything."

Writing down of their eating habits helped a lot to probe about each food they consume.

Method 2: Using the calendar as a prompt

Researcher 1

1. The use of calendar helped a lot to remind them about the events that they had involved. If there was no calendar as a tool then it would have been difficult for the participant to remember the events as in our culture [Hindu Culture], we have many festivals, events and as for now, due to westernization, people have started mitigating different events beside their own. So, the calendar helped them a lot. In our calendar [B.S.] there is a system of marking all the events and festivals which is pictorial. And use of this calendar was the other benefits. In one of my interviews, what I had done is that I didn't use the calendar although I had it then at that time, I tried to ask the participant about the events that I could

remember. I did it so because I thought I could have remembered all of our events as it was done at the end [I had done it when I had already done many interviews] of the interviews. But unfortunately it didn't work which I identified during the transcription and translation. So, the use of calendar had made the work easier.

2. It varied according to ethnic group. Those who were Brahmin/Chhetry, for them the festivals/events were similar so for them the use of calendar was just to remind about the involvement in any ceremony/get together. The other festivals were similar for all them and showing the calendar to them in thought of getting good answers was not possible. But in case of the other ethnic group other than Brahmin/Chhetry then it was very effective. First they used to respond we didn't celebrate or took part in any events. After the calendar was disclosed then their response were like Oh yes! We did this in this month or day... So, it was helpful.
3. As I have already discussed above, it helped to memorize the things that they had participated throughout the last year. The use of calendar even helped to drag the attention of the participant. Some of them were glad to see when the calendars were used during the interview. As they used to wonder why I was carrying the calendars with me. Some of them had even responded Oh! so, here you use the calendar and were so happy to see and respond for it.
4. The drawbacks as mentioned above it was not effective among Brahmin/ Chhetry as their cultures/ festivals were similar but in case events it worked. Beside this, I didn't find drawbacks.

Researcher 2

It was really good method to make the participant remind about the events they attended. They also looked at the calendar and it was easier for them to remind of events they attended. Some participants also didn't look at the calendar. They just told what they remember. Even I tried them to look on the calendar, they told by their own remembrance. But the method was quite helpful to ask about the events they attended.

Method 3: Mapping support

Researcher 1

1. The different thing lies here. Instead of the participant, whether I [the interviewer] was able to ask the questions appropriately? As we know that the answers always depend upon the questions that are asked. But the way the questions were asked, the response is better than that. For some cases, I had to probe the question more than 2-3 times and during that probing I used to reach to the point where I was imposed to use the leading questions. Despite, the participants responded well.
2. It was the most interesting exercise for me as there were use of different colours and it was short but more informative. This was the benefit for me as I could make the participant more participatory by mapping their home, where they go, how they go. So, the benefit of it was to pull the participant to the content again by letting them know how they travel.
3. Drawback: if the questions were made simpler and more specific than it would have worked. Else, the method was too interesting and brief.

At last, all of the methods that were used in the Study i.e. participatory approach was innovative, creative and most importantly interesting methods. I would like to say why!

- a. It made the interviewer attentive and awake them after each of the section as they have to be alert and probe the question. The same thing was applied among the participants. They got involved in it even if they had done the exercise by themselves or not.
- b. Participatory approach has helped both the interviewer and interviewee to build good rapport.
- c. It had helped to find out new things/ interventions that the participants have been practicing in their daily lives.

Researcher 2

All the participant wanted me to write the map for them. Actually at first they got confused what to write in map. But when I started drawing their house then they showed the directions and told about the support they get from. It was good.

All the methods are actually helpful for the interview. It helped in probing the questions that we have. The participants did not write because I found them that they like speaking more than writing. Some of the participant do not know how to write except their name and signature but others want me to write. Only one participant write about the dietary habits.

Reflection on interviewing a couple separately – Researcher 1

This interview was a bit different than others. I was required to conduct separate interviews even though this was partner interview. It was with a young diabetic patient. Even though the participant was working her job was a bit different. This couple was in a low socio- economic status.

Points found in this interview different than in other partner interview:

1. Partner interview [together] was more communicative than separate partner interview.
2. The participant's partner was less likely to talk when he was interviewed alone but when the interview came to the end, when both of them were together, then he spoke more and gave me more information about his partner.
3. It was difficult for me as an interviewer to link up the things as they were asked after an interval of time.
4. If both of them were interviewed together then they would have corrected each other, supported each other's points adding more new things and it would have been more like a conversation rather than an interview.
5. Although it was a method of cross checking them, both the participant and her husband were very conscious while talking to me. They might have felt that they should not blame each other. Their facial expressions showed that they were afraid of saying something wrong.

So, although conducting interview separately might have some benefits, conducting it together is better.

B.9 Coding framework for Study 2 data

1. Determinants of behaviour	2. System - what should be happening
Age	Healthcare provision
Attitude to Ayurvedic medicine	Economic
Awareness and knowledge	Improved referral
Culture - ethnicity, religion and identity	Manpower
Feelings about changes made to eating practices at cultural events	Recognition and Awareness raising
Reasons for changes to eating practices at cultural events	Training
Reasons for fasting or not fasting	3. System - what is actually happening
Distance to support providers	Barriers
Gender	Awareness and knowledge
Female involvement in and control over food	Economic
Joint decision making	Focus on treatment not prevention
Male involvement in and control over food	Healthworker attitudes
how food is prepared	Healthworker resources
Internal capacity for change	Political problems
Motivation for change	Private
Opportunity to acquire desired food	Community support
Opportunity to buy food from different locations	Medical professional support
Physical difficulty	Regularity of support provided
Relationship between health professional and patient	NGO support
Gender of health professional	Public
Shared eating experience	Advice giving and nutrition counselling
Social support	Community support
Family support	Evaluation of support
Friends support	Examples of effective support
Partner support	School related
Socio-economic factors	Govt instigated support
Patient differences & characteristics	Medical professional support
Stress	Provenance of support guidelines
Support for Physical Activity	Rural-Urban
Use of Medications	
Work activities	
4. System - opportunities for better provision	5. Lifestyle behaviours
Community	Alcohol

FHCWs	Change in quantities of food
Cooking classes	Controlling diet
Economic	Craved foods
Educational materials	Cultural eating and drinking practices
Future scenarios	Different foods consumed now compared with before diagnosis
Government	Drinks (non alcoholic)
PEN	Fast foods
Language used	Fruit consumption
Lunchboxes	Meal timings
Media - radio, TV, newspaper, social media	Meat and fish consumption
Monitoring of behaviour	Oil use
Nutrition education, classes or camps	Physical Activity
Physical Activity	Rice
Political changes	Same foods consumed now as consumed before diagnosis
Reminders	Snacks
Role modelling	Sweet foods
Schools and school children	Veg consumption
Social support	6. Other findings
Teachers as support providers	Background to diagnosis
Training for health professionals	Gender prevalence of diabetes and prediabetes
	Knowledge about diet before diagnosis
	Knowledge about disease before diagnosis
	Patient advice to others
	Severity of disease

B.10 Document review

Nepal Government Documentation (formation of and background to PEN)

Policy	Date	Summary
Non Communicable Diseases Risk Factors: STEPS survey Nepal 2013 ..\Data Collection\PEN package\Background&Formation of PEN docs\Nepal 2012-13 STEPSreport.pdf	2013	Extensive survey considering the prevalence of diabetes as one of several NCDs. One of the formative pieces of research which informed the development of PEN
<i>Multisectoral Action Plan for the Prevention and Control of Non Communicable Diseases (2014–2020)</i> http://www.searo.who.int/nepal/mediacentre/ncd_multisectoral_action_plan.pdf	2014	Strengthen and orient health systems to address the prevention and control of NCDs and underlying social determinants, through people-centred primary health care and universal health coverage. Early and appropriate treatments and access to services, particularly primary care, will avoid devastating, irreversible complications of diabetes.
<i>National Health Policy 2014</i> http://nhsp.org.np/national-health-policy-2014-3/	2014	NCDs, including diabetes, are reflected in the <i>National Health Policy 2014</i> . It calls for a people-centred approach to quality health services that are more effective and accountable to the citizens. Health is placed central to overall development, building partnerships and establishing multi-sectoral collaboration.
Nepal Health Sector Strategy (NHSS) III (2015-2020) http://nhsp.org.np/wp-content/uploads/2016/08/NHSS-English-Book-final-4-21-2016.pdf	2015	The basic health service package of NHSS III has incorporated diabetes screening, counselling and laboratory services at all levels of health care. The third action area of the Action Plan is on health-systems strengthening for early detection and management of NCDs and their risk factors. Actions under this area aim to strengthen health systems, particularly the primary health-care system, by implementing PEN.
NCDs and mental health: About 9 voluntary global targets http://www.who.int/nmh/ncd-tools/definition-targets/en/	2015	Include a 25% relative reduction in overall mortality from the four major NCDs.
WHO Nepal Country Profile – Diabetes	2016	2016 WHO profile showing prevalence of diabetes, change (increase over time), gender breakdown, medicines administered

PEN Specific Documentation

Document	Date	Summary
WHO Package of Essential Noncommunicable (PEN) disease interventions for primary health care in low-resource settings http://www.who.int/nmh/publications/essential_ncd_interventions_lr_settings.pdf	2010	PEN is an essential package of cost-effective interventions with high impact, including those for early detection and management of type 2 diabetes, which are feasible for application in resource-poor settings. The package will be introduced in the first two years and then expanded to other districts in the country. In this process, diagnostic services will be made available in primary health-care settings. Phased implementation and escalation of coverage of PEN in all 75 districts brings opportunities to strengthen the health workforce, diagnostics, medicines and supplies, the health information system, research and surveillance and reduce inequity in diabetes care in Nepal.
Health facility Nepal WHO PEN protocol - revised (3)	2017	Protocol for healthcare delivery in health facilities in Nepal according to PEN. Includes actions for asking, assessing, estimating risk, referral and counselling/treat if necessary
PEN Protocol Risk Chart	2017	Chart of risk predications of a CVD event by measurement of gender, age, blood pressure, blood cholesterol, smoking status or absence of diabetes
PEN Protocol BMI Chart	2017	BMI chart for underweight to obese
WHO PEN protocol_1_HP level Final	2017	Protocol for prevention of heart attacks, kidney disease through integrated management of diabetes and hypertension. Guidance for visits to Health Posts, presentation of symptoms and actions
WHO PEN protocol_2_PHCC and HP level Final	2017	Health education and counselling on healthy behaviours to be applied to all at Health Post level. Specific advice on physical activity, smoking, healthy diet, adherence to treatment. Includes flow diagram for tobacco cessation
Four images from flipbook given to health workers implementing PEN in rural areas \\ds.leeds.ac.uk\staff\staff15\libelvc\PhD\Study 2 - SSlS and Obs\Data Collection\PEN package	2017	Flipbook pages cover referral, advice to give to patients who present with early signs of NCDs
Powerpoint presentation by government to rural communities about prevention of NCDs as part of PEN	2017	To be translated

\\ds.leeds.ac.uk\staff\staff15\libelvc\PhD\Study 2 - SSIs and Obs\Data Collection\PEN package\Nepali PEN presentation for rural areas.pptx		
Comedy sketch video (1 hour) about diabetes prevention and healthier eating (media campaign)	2017	Well known Nepali comedians awareness raising about diabetes prevention healthier lifestyle
PEN SMS message sent by government	2017	States: <ol style="list-style-type: none"> 1. Consumption of alcohol and cigarettes can cause cancer, diabetes and heart disease so do not consume them. 2. Let's promote and practice physical exercise and reduce the risk of high blood sugar levels, diabetes and cancer. <p>Texted by the ministry of health.</p>
PEN Training of Trainers		
Session 1.1_Overview of major NCDs and risk factors	2016	Delivered by Dr Lonim Prasai Dixit, National Professional Officer, useful overview of risks and specific problems in Nepal
Session 1.2_Prevention & Control of PEN Program in Nepal-	2016	Delivered by Mohammad Daud, Director Primary Health Care Revitalization Division- PHCRD, Teku, KTM, Nepal. Overview of health system and their roles, drug procurement, staffing structure at different levels, NCD capacity at different levels, key drugs at hospital, PHC and HP level, objectives of PEN, type of PEN service available at both Health Post and Primary health care centre levels, integrating PEN into Health system, approach of PEN, roles and responsibilities in PEN, progress update, requirements for PEN to work.
Session 1.3_PEN at the Primary Health Care	2016 (Nov)	Prevention at primary, secondary and tertiary levels, core functions at PHC level, chronic care model for primary health care, the importance of primary health care being proactive in early detection, PEN interventions for PHC, PEN in SE Asia region (other implementation), WHO PEN implementation in Korea, what needs to change in PHC – PEN requires a health systems approach, PEN's links with NCD targets, roles in health systems to make PEN work, thai diabetes rates.
Session 1.4_Ncd care in nepal_Dr. Bhagwaan	2016	Delivered by Bhagawan Koirala, Institute of Medicine. Growth on NCD prevention looking at services and institutions – private and public.
Session 2.2_Approach to CVD risk prediction	2016	Dr Oyere Onuma MD., MSc. Medical Officer, Cardiovascular Diseases, Management of NCDs Unit, WHO HQ, Geneva. CVD prevalence and management
Session 2_Heart diseases basics	2016	Types of heart disease
Session 2.3_Diabetes management at PHC PEN Training for trainers – Diabetes Management at PHC	2016	Delivered by Dr. Pradeep Shrestha. Covers: risk factors, diagnosis, treatment, prevention, community prevention actions
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Session 2.4_ Early detection of Cancer at PHC	2016	Dr Oyere Onuma MD., MSc. Medical Officer, Cardiovascular Diseases, Management of NCDs Unit, WHO HQ, Geneva. Ways of early detection of cancer.
Session 2.5 CRD_management	2016	Useful slide (6) on the 4 different protocols for PEN implementation (tools)
Session 3.1 Basics of Counselling	2016	Health education and counselling, the 5 A's behaviour change model (slide 28-29), motivational interviewing
Session 3.2 Tobacco control at the primary health care setting	2016	Mass media campaigns, self help materials etc. related to tobacco control
Session 3.3 Addressing alcohol use at PHC (2)	2016	Dealing with alcohol use
Session 3.4 Promoting healthy diet at PHC (2)	2016	Covers food groups, food pyramid, general recommendations, plate models, scenarios for group work
PEN Training for trainers – Dietary guidance at the primary health care level		
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PEN Implementation Plan in Nepal- Service Delivery	2016	Delivered by Mohammad Daud, Director Primary Health Care Revitalization Division- PHCRD, Teku, KTM, Nepal. PEN result framework, budget estimation, strategic actions/interventions, health facilities services and diagnostics, service delivery approach and modality, government and partner

		roles, roles of HF and FCHVs, delivery mechanisms according to different facilities (e.g. health post, district hospital), action plan 2016-2018
Session 3.5 Physical activity intervention at the primary health care	2016	How to promote more PA
Session 3.6_Information_quality_improvement_nepal_2016	2016	Importance of systems for monitoring, individual health records to be opened for patients, improving quality of care,
What next_Dr. Lonim	2016	Diagnostics/tools in place, how diagnostics work at Health Post level and at PHC level

See also (Upreti et al., 2016)

Appendix C Part 3 Appendices

C.1 Document review: Documents informing intervention proposals

Document	Date	Summary
National Consensus Statement on the Management of Type 2 Diabetes Mellitus in Nepal – DEAN Nepal. Chief Editor Dr. Dina Shresha	2018	Discussion of Management of Type 2 Diabetes including lifestyle management stating individual should be referred to a professional dietician when feasible. Dietary advice including some techniques such as the Zimbabwe Hand Jive for portion sizes.
Diabetes screening form, Ministry of Health, Department of Health Service District Health / Public Health Office	2018	Screening form to be used in latest iteration of PEN which is based on the Indian Diabetes Risk Score. Form considers age, abdominal obesity, physical activity, family history but not diet. Patients are scored and provided with a final diagnosis.
Diabetes Pamphlet, Ministry of Health	2017	Summary booklet about diabetes – types, symptoms, treatment and prevention.
Food Diary template 1 used by dietician interviewed in Studies 2 and 3 in private health clinic in Kathmandu	2018	Table containing list of foods at each meal time of the day (regular meal times) food listed are grouped into different food groups and provide space for the patient to fill in what they consume at different times.
Food Diary template 2 used by dietician interviewed in Studies 2 and 3 in private health clinic in Kathmandu	2018	Table for listing of meals, including foods, times, quantity and home measurements. Food exchange listing different food groups and which foods are in each group.
Presentation given to patients with diabetes at a public hospital in Kathmandu by a dietician interviewed	2018	Summary of background to diabetes, reasons for the increase in people suffering from diabetes, the prevention of diabetes and the importance of treatment, what diabetes is, what happens in diabetes, why treatment is important, 5 main points to control diabetes, what is the appropriate diet for diabetes. Then very detailed dietary advice about different types of food and drink. Plate models and correct examples of food portions.
YouTube video with Dr Jyoti Bhattarai 1 – Avenues@health: URL accessed 14/08/18 https://www.youtube.com/watch?v=LANJT3e7ARw&feature=youtu.be Views 2899	2013	Summary of what diabetes is, what causes diabetes, the causes and consequences of diabetes
YouTube video with Dr Jyoti Bhattarai 1 – Diabetes Health and Sickness on median.com URL accessed 14/08/18 https://www.youtube.com/watch?v=T5aSjDAmAVI	2016	Summary of diabetes and lifestyle changes people can make to minimise or prevent it. Examples of foods to avoid or those it is safe to eat.

C.2 Dietary messages tested in Study 3 workshops

Exercise 1: Content of Nutrition intervention [not for policymakers]

The following ideas focus on positive messages gathered from the interview data collected, from existing healthy eating resources and from international guidelines (NHS England, 2018, Diabetes UK, 2018, American Diabetes Association, 2018, WHO, 2015a, American Diabetes Association, 2015).

[Facilitator to read these to participants]

Some of these messages could be delivered in a variety of interactive ways where the patients and their family members can see demonstrations of how these could be done. For example, experiential learning where the patients and their family members, for example, learn by experimenting how much salt and sugar is in unhealthy foods. Demonstrations of cooking healthy foods could also be provided, including healthy foods to eat during festival time. Role plays could be delivered to demonstrate how to include all family members in learning about healthy foods for the whole household.

1. Cooking healthy foods
 - How to cook healthy meals for everyone in the household (not needing to cook for the diabetic patient separately). The foods which can be cooked for all members of the family. Cooking healthy foods can be fun! Homemade foods can be much healthier than outside foods.
 - How to cook foods in a healthy way – for example, the amount of salt and oil to use when cooking. Easy to understand quantities of foods. For example: Use about 2 or 2.5 spoon of oil per day but not more. The oil that is cooked more than once is harmful to health even though the oil is good. Use healthy oil to cook with – such as olive oil, sunflower oil, mustard oil. It is best not to use ghee or coconut oil.
 - Diabetic patients should not have more than 1 teaspoon of salt per day. (WHO)
2. Foods which can be eaten
 - Foods the diabetic patient can eat (focus on food groups – wholegrain foods, fruits and vegetables, herbal and green teas such as Tulsi and Jasmine tea, tea and coffee without sugar, fresh salads containing carrots, radish, cabbage, tomato, spinach, plain vegetable soup, yoghurt with water) – myth busting (alcohol, rice and other foods)!
 - Eat healthy fats: sunflower, soya bean oil, walnuts, sunflower seeds, olive oil, mustard oil, badam nuts and oil, cashews, almonds.
 - Healthy foods do not have to be expensive foods.
 - Showing love to your family members by providing them with the healthy foods such as those listed above.
 - Meat can be eaten but must be lean, without skin and not deep fried.
 - Foods the diabetic patient should try to avoid having a lot of. These include processed foods including bakery items such as cake, pastries, patties, cream rolls, and doughnuts. Drinks such as Horlicks, Bornvita, Boost, Viva etc. and cold drinks such as coca cola, pepsi, fanta. Sugary foods such as honey, chocolate, biscuits, jam, ice-cream, biscuits with sugar, sweets. Fried and oily foods like; *Puri, Paratha, Pakoda, Samosa, Sel, Malpuwa* [these foods are especially made up of white flour which is very oily in nature]. Deep fried meat, meat with fats and skin or very spicy meat items etc., sour pickles or pickled vegetables.
3. Healthy eating during festivals
 - Why to avoid fasting and how important this is
 - The importance of eating healthily during festival times, explaining to friends you need to eat fewer unhealthy foods
4. Including your family members – Diabetes should not be one person's burden but shared
 - How to involve all family members in learning about healthy eating
5. Frequency of eating
 - Eat foods in small amounts but regularly – five small meals per day
 - Take tiffin to work or outside the house when you can. Try to limit outside foods and eat your own foods instead.
6. Maintain a healthy lifestyle as well as eating healthily
 - The importance of combining healthy eating with a healthy lifestyle of physical activity and limited stress.
 - Taking medicines from the doctor over traditional medicines

C.3 Descriptions of interventions provided for participants in workshops, Study 3

1. Media and Technology

Text messaging (SMS messaging)

Evidence shows that text messaging (SMS) has been effective in promoting improved health behaviour. During our research, many diabetes patients and their family members have told us that they think that text messages reminding them to eat healthily in certain specific ways would be a very effective method of improving and prompting healthier eating. Others we spoke to were more sceptical about whether this method would be effective. Certainly something very important to consider is those who are unable to read text messages or who do not have access to a mobile phone. We are aware that the government have started sending general healthy lifestyle messages to people as part of PEN, however we are not able to identify who is chosen to receive these messages and if they are effective (show example above). We would like to establish if this mode of delivering an intervention would be effective, and if it would be, how frequently would it be effective to send these messages, with what content and for how long (i.e. 1 week, 1 month, 1 year). It is also important to consider who to send the text messages to. Our research has found that family members of patients are very important and we would like to consider if it would be effective to send text message reminders to family members as well as patients.

Social media messages

From our research it is clear that many people in Kathmandu use social media (such as Facebook) to communicate and receive news. Social media has been proven as an effective way to promote health messages and we want to know how effective it would be to use social media to send nutrition education messages. As with text messages, it is important to consider that not everyone will have access to social media, and some of those who do have access, may be illiterate and not be able to understand messages or conversations on social media. Another consideration with social media is the lack of regulation of what is posted which could lead to confusion of some health messages (for example if someone posts that they have had very good advice from a friend but the advice is actually not reliable). One of the important benefits of social media is the potential for a two-way interaction between the patient and other people (whether they be fellow patients, health professionals or others). Social media interactions can also be made public so that discussions between a patient and health professional (for example about how much oil to use in cooking, or which healthy foods to buy) can be seen by others. If social media could be effective in promoting healthy diet, we need to think about which medium to use (for example facebook, twitter, whatsapp) and which of these is most popular amongst certain groups of people (such as young people). Also we need to consider how regularly to post social media messages and who will manage the social media accounts.

Videos with important messages

- i. **Videos with health promotion messages in clinics**
- ii. **Videos on online platforms using celebrities to promote healthy lifestyles (e.g. on youtube)**

We discovered that educational videos had been used effectively in some private hospitals in Kathmandu to show patients and their family members' key health messages about eating healthily before they had a consultation with a doctor about their diabetes diagnosis. Alternatively, videos featuring celebrities can also be viewed on the internet, on social media, sent via message apps such as whatsapp and viber, and can be seen on television. Videos however, need a means to visually watch them (unlike radio needs only to be heard). If videos are an effective medium to show nutrition education messages, we need to consider how effective videos could be in promoting health education, how long they should be, and very importantly where they should be delivered to patients and their family members. For example, should videos be shown in hospitals before patients see doctors, and if so, how could this work in a public hospital setting? Or, should videos only be delivered to patients and their family members on personal devices such as mobile phones, or on television? What these videos would contain is also important to consider. Would it be best to include real people talking about their experiences of successfully improving their diets? Or would it best to include health professionals giving advice on what lifestyle changes would improve dietary behaviour?

2. Printed Nutrition education: Posters, pamphlets and leaflet materials

Our data suggests that presenting key nutrition messages on posters and pamphlets could be an effect way of providing instructions for how to live a healthy life as well as providing general information about a topic. Posters would carry key messages (show some government key messages – here on the slides), including both images and text to advise on healthy messages. We are aware that the government are already using some posters (as seen), and some are being used as part of PEN. However we want to find out what kind of posters would be effective, where they would be most effective and when they should be provided for people. Leaflets have also been used successfully to transmit health messages (show example of government leaflet). Again we are aware of some government leaflets and want to know how we could improve on the information in these and how we can tailor them to different health

settings (clinics, hospitals), and when and where these would be effective. We want to ask questions such as; should posters and leaflets transmit the same messages? And also, what sort of photos and messages are important to include on such materials, for example are real photos of people best, or are cartoon images preferred? We need to think about whether leaflets and posters would be the most effective method to transmit nutrition education messages to people. In many health settings we visited may health workers told us how they needed publicity materials to hand to patients and that it was important to provide such information to patients and their families. Are posters and leaflets an effective way to provide information?

3. Community based interventions

a. Community camps/events

Community events (often called community camps) have been used by several health facilities in Kathmandu to reach out to communities and show how diets can be improved through posters and face to face advice from health professionals. These camps have been proven to be successful in encouraging people to improve their lifestyle and awareness of healthy eating when considering diabetes. Many people attended the camps and had free blood glucose tests. In some camps posters promoting healthy eating alone have not been very effective, while free blood glucose testing and discussion with health professionals have been more effective. We need to consider if community events would be an effective way of educating people about healthier lifestyles. What sort of people would attend community events? What would encourage people to attend these events? Would diabetic patients bring their family members with them to these events? When and where would it be best to hold these events? Also important to consider is what would happen at these events. As well as the opportunity to talk to health professionals, would there be the opportunity of talking to diabetic patients who have already successfully improved their lifestyle? How often would it be effective to hold these events?

b. Couples or families acting as role models

There has been evidence that using patients as role models for other patients can be an effective way of changing behaviours. Our research found that many patients said they would like to talk to other patients who had successfully made lifestyle changes to improve their diet. Some patients also gave advice to others in the interviews we conducted. Therefore asking patients and their family members who have been diagnosed for some time and had time to make positive lifestyle changes to talk to newly diagnosed patients about how they can improve their eating behaviours could be effective. We need to establish how volunteer role models could be recruited, and how willing people would be to give their time to talk to others. If people would be reluctant to be role models, are there any ways that they could be encouraged? Also important to consider would be what sort of messages role models would provide to patients and their families. Once role models form a relationship with a new patient and their family, how can these contact be maintained and encouraged? Is an informal arrangement sufficient enough or do guidelines need to be introduced to ensure such a programme would work? Also important to consider is how patients may be matched to role models, would this depend on similar socio-economic group or age? We also need to consider where this role modelling would be most effective? Would families role model for each other in clinical settings e.g. the diabetes clinic? How could this be delivered?

c. Peer Education

Research has shown in low income country settings, including in Nepal, that peer education programmes can be effective in spreading nutrition education. For example a project in Kathmandu has gathered peer educator mothers to learn nutrition education including cooking skills, and then to act as peer educators to other women in their communities, where they teach their nutrition knowledge to other members of the community. We need to consider, if we choose this option, who would be recruited as peer educators (would these be current diabetic patients, young people etc.)? We would also need to consider how long the training would last and who the peer educators would target to educate (socio-economic group, gender, age, those from the same community). Also important to consider is how long the peer educators would work with their peers – one month, one year or more, and how often would they have contact with the patients and families of patients to make the intervention successful. Another consideration is where the peer educators would educate their peers (in community health centres, hospital settings, or the homes of those they are educating).

d. Community gardens/kitchen gardens where produce is shared to encourage communities to come together and grow healthy foods to consume

In some of our interviews we heard how some families had grown their own fruit and vegetables in gardens in rural areas and when they moved to Kathmandu lost the ability to do this. One opportunity in Kathmandu would be to introduce community-run gardens to grow healthy fruit and vegetables which the members of the community could then eat for free, not needing to pay for these healthy foods. Community gardens have been used effectively in other contexts to increase healthy dietary behaviour, and in schools in Nepal. Or as an alternative to community gardens, kitchen gardens/terrace could be encouraged and the produce of these shared. This could work when several families in a building share a terrace and then the produce from it. We need to consider if this would be a viable option, where land for these gardens would come from, whether crops grown in the gardens would be safe from theft, and also where the tools and labour

4. Improved training

a. Training FCHVs or community mobilisers to deliver effective health messages to diabetes/prediabetes patients

Both FCHV's and community mobilisers were found in our research to be effective in delivering health messages and gathering communities together in order to receive health education. We are aware that FCHVs have a lot of demands on their time and are asked by the government to take part in many health promotion campaigns, therefore getting access to their time may be difficult but not impossible. We need to consider how volunteers, and mobilisers can be best engaged to deliver nutrition education messages. Often training programmes don't lead to direct action from the newly trained volunteers. We need to establish what will enable volunteers to put training into action, perhaps mentoring schemes? We encountered some communities which used community mobilisers to encourage people to attend community health education events. We need to find out how many communities actively use community mobilisers and whether these could be used effectively to give out education messages. We need to consider that if we use FCHV's and community mobilisers, which messages would they be effective in delivering? Also, how often should these messages be delivered to communities and how should these messages be delivered (for example in community camps, in homes?)

b. Improved training: Improved training for medical professionals

Our research found the need for better training to be provided to medical professionals during their initial training, but also after they have qualified. For example there was a need for medical students to receive better training on nutrition education and dietary care for those patients with NCDs, specifically diabetes. Whilst there are dieticians who doctors refer patients to in some health settings, in other settings dieticians are not present and available to advise patients and therefore doctors must be aware of the dietary advice to provide to patients. Can we conduct an intervention to promote and value dieticians more? If so, how would this work?

Often training is given to health professionals, but they do not put into practice their training to improve practice due to a range of factors (culture in the health system, resource limitations etc.). How can we create an intervention which will enable health workers to put into practice their training on improving dietary advice? Can a mentor structure be put in place or a personal development scheme which monitors practice of key implementation points (e.g. use of referral to dieticians)?

5. Engaging religious leaders to be vocal in health promotion. Encourage leaders to deliver messages about alternatives to fasting and eating healthy foods as part of religious rituals

It was clear from our interviews with diabetes patients that religious rituals are important and influence a lot of eating behaviours. This intervention would involve educating religious leaders so that they might be able to deliver health promotion messages. This messages would involve reassuring diabetes patients that they don't need to fast because it is harmful to them, and that they can healthily participate in rituals and still be religious and faithful. Things to consider with this intervention are whether religious leaders would be influential if they delivered health promotion messages, if they would, who would they effectively influence. Also to consider is which religious leaders would be best to include in the intervention and where they would deliver their religious messages. Also, would this intervention exclude those people who are not religious? We need to think tangibly about exactly how this intervention would look. Should we target particular religious festivals? If so, which ones, and how? Should we target particular religious leaders, if so, which ones? Who should the religious leaders be speaking to? Just diabetes patients or their families and friends as well?

C.4 Example workshop guide used in Study 3

Guide to leading a Focus Group Meeting to prioritise possible interventions to improve dietary behaviour support amongst diabetes patients and those with high blood glucose levels

Purpose of the Focus Group Meeting:

To gain the views of patients/health workers/policymakers and researcher on the feasibility of various different intervention proposals for an intervention to improve dietary behaviour amongst the target population group. To consider:

1. The appropriateness of the proposed dietary advice for the content of an intervention
2. The feasibility of nine proposed interventions to improve dietary behaviour

Who should participate?

- Policymakers or researchers with experience in diabetes/NCDs
- Health workers who care for patients with NCDs including diabetes patients
- Patients with diabetes or high blood glucose levels

A group of between 5 and 8 participants will be sufficient. Try to restrict it to a maximum of 8 or else the group will become very challenging to facilitate.

Preparation

Before the meeting you will need

1. One list of the potential interventions (9 in total) to place on the table in front of participants.
2. Beads/counters etc. – these are for the participants to vote with. You will need 4 for each participant, so if there are 8 participants you will need 24 beads/counters.

Proposals for discussion

Read out first the dietary advice, then the short descriptions of each intervention proposal as stated in the facilitation guide. This information will work as a basis for the discussion afterwards.

The discussion

Allow 2-3 hours for the discussion, it may not take this long, but may do, particularly if you have more people. Introduce yourself and explain about the Study. Explain that the Study includes adapting a behaviour support package to help people improve their dietary behaviour to reduce the impact of diabetes or prevent those with high blood glucose levels from contracting diabetes.

Exercise 1: What do you think about the appropriateness of the proposed dietary advice? [Not for policymakers]

Also ask the following questions:

- a. What would you like to add to the list of dietary advice? Why?
- b. What would you like to take away from the list of dietary advice? Why?
- c. Is some of the advice here more important than other aspects? Why/why not?

Exercise 2: What do you think of the proposed interventions? (see questions for each workshop below)

PATIENT WORKSHOP PLAN

Focus: How effective would the interventions be and for which groups?

Questions for patients

1. Which of these interventions would be most effective in improving dietary behaviour? Why? [patients and health workers to vote on their preferred interventions with counters] Which interventions would be ineffective? Why?
2. Which of the interventions do you think would be most practical to implement? Why?
3. Will the interventions be accessible/interesting/appropriate [how can interventions be adapted for these groups?]:
 - a. for both men and women (gender)
 - b. for different population subgroups – rich/poor, Hindu/Buddhist/other, high caste/low caste, literate/illiterate, well-educated/less well educated ...? (Equity)
 - c. for people who are particularly disadvantaged/vulnerable because they fall within multiple groups (poor women, low caste children...? (Intersectionality)
4. At what point in a patient's illness would it be best to implement these interventions? (Before diagnosis, at point of diagnosis, after diagnosis – if so, when?)
5. How long should these interventions be implemented for?
6. Which intervention would work for the most people?
7. Would any of the proposed interventions work together? How effective would it be if some were combined?
8. Which aspects of the cultural religious intervention would be most effective and useful? [targeting a particular festival, a particular preacher, targeting diabetes patients during fasting etc.]

Timing (mins.)	Agenda item	Goal(s)	Structure	Equipment/materials	Role/responsibility
5	1. Arrival and consent forms	Greet participants Signing of consent forms	People arrive and have access to water/juice/coffee, while being greeted by the team. Participants are invited to read the information sheets (ask any questions they might have), sign the consent forms and write their names on a name badge.	Information sheets Consent forms Pens Name badges Drinks	Researchers greet people and hands them the materials for the day
10	2. Introductions and plan for the session	Introductions (of the research/NGO team as well as the participants) Briefly describe the purpose of the workshop and the plan for the session	Introduction of the research team, housekeeping announcements and description of the plan for the day. Round of participants [30 sec. each] – their names, whatever they want to say about themselves and motivations for coming.	Audio recorder	Researcher to make the introductions and announcements Research assistant start the audio recorder
30	3. Introduction of project and proposal ideas	Introduce the project and the work so far. Introduce the dietary advice and the intervention proposals with a brief explanation to ensure participants understand the options available	[5mins] Introduce the project so far and its aims to improve dietary behaviour [10 mins] Introduce the proposed dietary advice [15mins] Introduce each of intervention proposals with a brief explanation of each and a visual representation of each	Visual aid presentation Flip-chart Flip-chart pens Table of interventions and visual representations of each	Researcher to present information Research assistant takes notes of the discussion
10	4. Exercise 1: Discussion of dietary advice	Understand which interventions are preferred by participants and why	Discuss which the proposed dietary advice and whether anything is missing or should be added.	Flip-chart Flip-chart pens	Researcher facilitates the discussion and prompts where required.
60	5. Exercise 2: Discussion of proposed intervention ideas	Understand which interventions would be most effective and why	Distribute counters to participants Ask participants to put counters on the interventions they like the most, add up the total number of counters on each idea. Discuss which interventions are preferred and why and for which groups (see questions above)	Flip-chart Flip-chart pens Table of interventions and visual representations of each Counters distributed to each participant	Researcher facilitates the discussion and prompts where required to investigate why participants prefer one intervention over another Research assistant takes notes of the discussion
5	6. Close	Close workshop and acknowledgements	Thank participants for their time, offer materials to patients if they want to get more nutrition education knowledge, offer contact details and willingness to keep in touch, and invite them for lunch.		Researcher to close

C.5 Example Interview guide for health worker used in Study 3

PEN and government priorities in Kathmandu

Have you heard any more about PEN?

The government seems to be focusing its resources around PEN in rural districts, one government official we spoke to this week stated that because people in Kathmandu have access to tertiary care they need less support for NCDs. With the government not making NCDs in Kathmandu their priority, how do you think we can best tackle NCD support in both public and private settings?

Intervention exploration

Following the work we did last year, we have proposed several possible interventions, some of which could work together to deliver improved diabetes support. We have grouped them into Media and communications, Community based, traditional printed materials, health worker training and cultural) [run through interventions]

What do you think about the feasibility of the other suggestions?

Which intervention would reach the most people? Which is scalable to other areas (rural/urban)?

Which is sustainable (long term)?

Would different interventions work for different socio-economic groups? Genders? (TV seen as more of a female intervention)

Which would integrate well into the system?

Would any of the proposed interventions work together? How effective would it be if some were combined?

The most popular interventions from workshops so far are text messages, community camps (advice and blood glucose testing) peer support and videos giving health promotion messages. Would any of these work well together?

What's popular?

A popular proposal is merging the cultural elements (religious settings/leaders) and combining with community camps, videos (specifically diabetes prevention). This intervention could be proposed to be adopted by district ward committees and taken to be adapted by the ward (dependent on their needs/cultural nuances). This fills the gaps which the government are not filling.

What is being supplied?

The government is looking at text messages (needs large infrastructure), posters/pamphlets (not very effective), training (incorporated within PEN, but also dependent on the hospital/organisation/sector and resources available, perhaps beyond the scope of this intervention).

What is in demand?

There are gaps around community support, there is a demand for community camps and dietary support as well as BG testing. There are also gaps around cultural engagement with the population, e.g. considering religion as an aspect of dietary behaviour. There are gaps around using modern methods of message dissemination, e.g. text messages, videos etc. If these could be combined into a community run, local based, contextually adaptable intervention package, many gaps left by the government could be filled.

Can you think of ways to incorporate a video similar to your pre-consultation video into a community based intervention?

NSI (Nick Simon's Institute) also send groups of health professionals into health settings to take a team approach. Without government resources, can you think of a way this could work? Can we work more closely with community health systems centres or ward committees?

What can be done in the community before patients reach hospital?

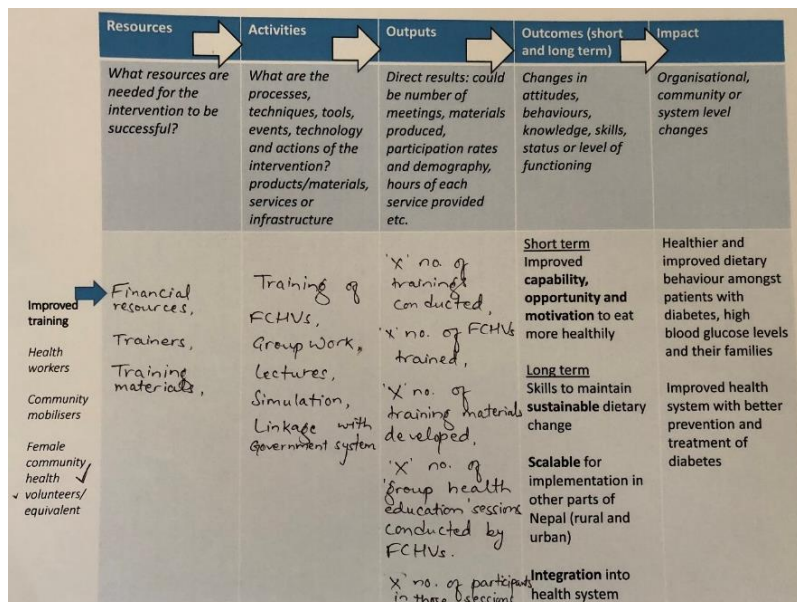
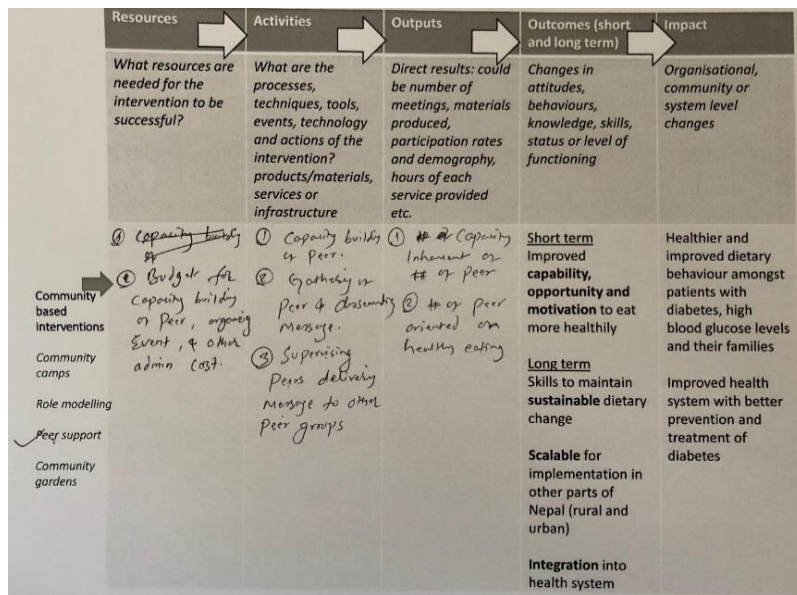
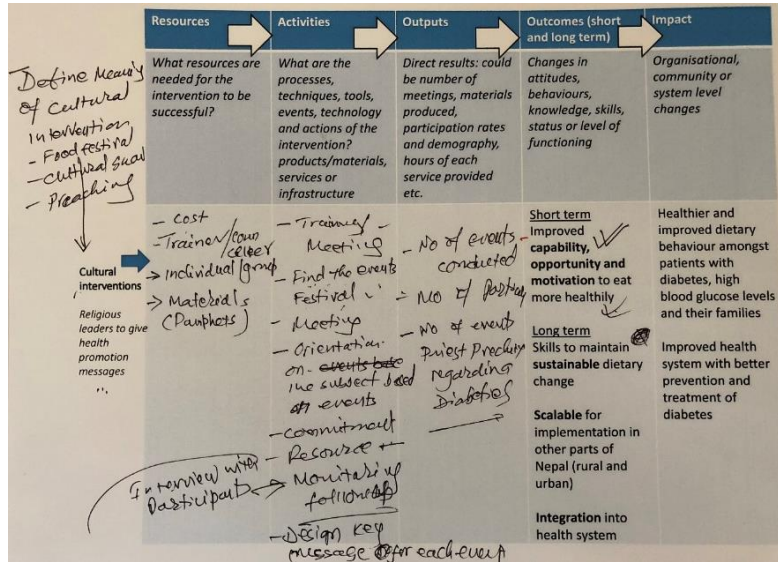
Would community based interventions work in the Kathmandu?

Media and technology interventions	Written materials	Community based interventions	Improved training	Cultural interventions
Text Messages	Pamphlets and posters	Community camps/events	For community health workers/mobilisers	Engaging religious leaders in health promotion messages
Social Media (including Facebook)		Couples acting as role models	For health workers	
Videos (pre-consultation)		Peer education		
Videos (YouTube)		Kitchen gardens		

C.6 Coding framework for analysis of Study 3 data

Code	Sub-category
1. Intervention characteristics	
	a) Mode
	b) Combining interventions together
	c) Content of intervention
	d) Location and target population
	e) Scalability of intervention
	f) Sustainability of intervention
	g) Organisational feasibility
	h) Political/gender/cultural feasibility
	i) Promotion of intervention
2. Govt policy-what is being done what is being supplied	
3. Govt policy-where there is demand but no supply of services	

C.7 Completed logic models



Resources	Activities	Outputs	Outcomes (short and long term)	Impact
What resources are needed for the intervention to be successful?	What are the processes, techniques, tools, events, technology and actions of the intervention? products/materials, services or infrastructure	Direct results: could be number of meetings, materials produced, participation rates and demography, hours of each service provided etc.	Changes in attitudes, behaviours, knowledge, skills, status or level of functioning	Organisational, community or system level changes
<p>Printed nutrition materials</p> <p>1. finance</p> <p>2. design & develop localized message.</p> <p>3. Timely supply of materials to diabetic pts.</p>	<p>1. design & develop localized message.</p> <p>2. Printing materials</p> <p>3. Supply</p>	<p>1. Materials designed</p> <p>2. Materials printed</p> <p>3. Materials reached to # or pts.</p>	<p>Short term</p> <p>Improved capability, opportunity and motivation to eat more healthily</p> <p>Long term</p> <p>Skills to maintain sustainable dietary change</p> <p>Scalable for implementation in other parts of Nepal (rural and urban)</p> <p>Integration into health system</p>	<p>Healthier and improved dietary behaviour amongst patients with diabetes, high blood glucose levels and their families</p> <p>Improved health system with better prevention and treatment of diabetes</p>

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What resources are needed for the intervention to be successful?	What are the processes, techniques, tools, events, technology and actions of the intervention? products/materials, services or infrastructure	Direct results: could be number of meetings, materials produced, participation rates and demography, hours of each service provided etc.	Changes in attitudes, behaviours, knowledge, skills, status or level of functioning	Organisational, community or system level changes
<p>Media and technology</p> <p>Text message reminders</p> <p>Facebook groups and reminders</p> <p>Videos pre-consultation</p> <p>Videos on Youtube/social media using celebrities</p> <p>① Money</p> <p>② Technical persons</p> <p>③ Clinical IT + Graphic To generate app & content (msg)</p>	<p>Government owned</p> <p>① Stakeholder consultation</p> <p>② Agreement with mobile services providers</p> <p>③ Sending text messages:</p> <p>↳ Frequency (could be weekly)</p> <p>↳ Variety of msg every week</p> <p>↳ about healthy eating</p> <p>↳ diet & diet</p> <p>↳ danger signs</p>	<p>① # population covered</p> <p>② Frequency of diff. messages sent.</p>	<p>Short term</p> <p>Improved capability, opportunity and motivation to eat more healthily</p> <p>Long term</p> <p>Skills to maintain sustainable dietary change</p> <p>Scalable for implementation in other parts of Nepal (rural and urban)</p> <p>Integration into health system</p>	<p>Healthier and improved dietary behaviour amongst patients with diabetes, high blood glucose levels and their families</p> <p>Improved health system with better prevention and treatment of diabetes</p>