Intervening on hypertension in Zambia; development of a culturally sensitized lifestyle programme to reduce disease incidence in urban areas

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ABSTRACT

Background/purpose: Hypertension, like other non-communicable diseases, is becoming a major public health problem for Sub-Saharan Africa (SSA). Its increasing prevalence is driven by an epidemiological transition with more people leading unhealthy lifestyles, including poor diet and physical inactivity. This project aimed to explore the use of participatory methods with an urban community in Zambia in co-developing a culturally sensitized hypertension prevention intervention.

Methods: The intervention development study was divided into four phases. I scoped and synthesized existing literature on risk factors (non-modifiable and modifiable) for hypertension in SSA in Phase One. The identified risk factors and their drivers informed Phase Two community members focus group discussions and stakeholder interviews to explore the local context in the study site to clarify the problem, identify which hypertension risk factors were malleable (potential factors to target), the mechanism of change, and how to deliver this. The findings informed the development of the causal pathway, the intervention theory of change and the Phase Three co-development of the intervention core components and small-scale evaluation. Five co-development workshops (four with local residents and one with local stakeholders) iteratively informed identification of priority risk factors, the delivery format and setting, and finalization of intervention core components. The pilot intervention was then tested with volunteer participants (N=34) to assess feasibility, acceptability and potential effectiveness in Phase four.

Results: The scoping review identified the most common risk factors for hypertension in SSA. Residents FGDs and key stakeholder interviews, informed by the scoping review findings, identified a number of potentially malleable hypertension risk factors at individual and interpersonal levels, including high salt intake and other dietary factors, low physical activity, excess body weight, central obesity, high alcohol intake and smoking. From these, the workshops prioritised intervening on salt intake, other dietary factors, and physical

inactivity. Using these suggestions, an 8-week group-based intervention (CHiPI) was codeveloped. Stakeholders proposed evaluation of the CHiPI on a small scale and delivery through churches: “nearly all residents belong to a church”. Stakeholders also identified community health workers and church leaders as delivery facilitators. The intervention core components were agreed and refined in close consultation with residents. These included linguistic and cultural adaptations of SMART goal setting and self-monitoring tools, which were iteratively tested and refined to reflect the local socio-cultural context. The small-scale evaluation of the intervention showed high acceptability, feasibility and potential effectiveness in improving health literacy, adoption of healthier diets (less salt added during cooking [p=0.014], reduction in added salt to the plate at mealtimes [p=0.001], increased fruit intake [p=0.001], reduced fried meals [p = 0.001]), increased physical activity [p=0.01] and reduced sedentary lifestyle [p = 0.001]. Reductions in body weight [p = 0.002], BMI [p = 0.001], WC [p = 0.001], SBP [-3mmHg, p=0.003] and DBP [-4mmHg, p = 0.001] were also observed.

Conclusions and implications: Participatory methods succeeded in engaging local residents and stakeholders in the development of a potentially effective culturally sensitized, 8-week, group-based hypertension prevention lifestyle intervention for delivery through churches in Zambia. Having demonstrated high feasibility, acceptability and potential effectiveness, taking this intervention to a larger evaluation to obtain evidence of effectiveness can inform hypertension prevention intervention development in Zambia and other SSA countries.

Contents

List of Tables

List of Figures

Appendices

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Author's declaration

"I declare that, except where explicit reference is made to the contribution of others, that this thesis is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution."

Name: Dr. Phallon Blessing Mwaba

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Abbreviations

CBPR: - Community-Based Participatory Research

SBP: - Systolic Blood Pressure

DBP: - Diastolic Blood Pressure

ToC: - Theory of Change

SMART: - Specific, Measurable, Achievable, Realistic, Time-bound

SCT: - Social Cognitive Theory

SDT: - Self-Determination Theory

6 SQuID: - six key Steps for Quality Intervention Development

BCTs: - Behaviour Change Techniques

CBD: - Central Business District

SSA: - Sub-Saharan Africa

NCDs: - Non-Communicable Diseases

HIV: - Human Immunodeficiency Virus

AIDS: - acquired immunodeficiency syndrome

CINAHL: - Cumulative Index to Nursing and Allied Health Literature ()

CSO: - Central Statistical Office

WHO: - World Health Organisation

CDC: - Centres for Disease Control and Prevention

CVD: - Cardiovascular Disease

LMICs: - Lower- and middle-income countries

SEM: - Social Ecological Model

BCW: - Behaviour Change Wheel

COM: - Capability, Opportunity, Motivation

LDL: - Low density Lipoproteins

HDL: - High density lipoproteins

TG: - Triglycerides

CHAPTER ONE - INTRODUCTION

1.1 Background

Hypertension, like other Non-Communicable Diseases (NCDs), is a global public health challenge, with about 1.1 billion people estimated to be hypertensive globally (WHO, 2019). There is also increasing evidence that hypertension has become an important public health issue in Sub Saharan Africa (SSA) (Guwatudde et al., 2015b, Pradeepa, 2013, Seedat, 2004, Mills et al., 2020); with some studies finding an overall prevalence of as high as 57% in adults (Bosu et al., 2019). In 2013, hypertension was predicted to almost double from 74.7 to 125.5 million cases by 2025 in SSA (Ogah and Rayner, 2013).

The prevalence of hypertension varies intercontinentally, internationally and intranationally. Globally, it has been found to be about 32.3% from studies pooled up to 2015 (Sarki et al., 2015). Despite hypertension reducing in high income countries, it has been increasing in SSA, which has contributed to a global rise in the disease (Mills et al., 2016, Zhou, 2017). A systematic review and meta-analysis on the burden of hypertension in SSA (Ataklte et al., 2015), involving 33 cross sectional studies across SSA, with sample size of over 110,414, found a prevalence of 30%, though the range was from 14.7% in a young sample (mean age 38 years) to 69.9% in an older sample (mean age of 76 years).

Within-country geographical variation for hypertension also exists. Other than in the USA (Mainous et al., 2004), in Europe (Psaltopoulou et al., 2004) and a few studies in SSA (Rush et al., 2018) where the prevalence is higher especially among poor rural populations, hypertension is generally more prevalent in urban areas (Addo et al., 2007, Lamelas et al., 2019). In SSA, evidence shows a similar distribution of a higher prevalence in urban areas (Addo et al., 2007, Agyemang, 2006b, Opie and Seedat, 2005, Lemogoum et al., 2018). With the burden of hypertension being larger in urban areas, developing and implementing preventive interventions in towns and cities is required.

The problem of hypertension in Zambia has not been fully researched at a population level. Therefore, up to date evidence is inadequate (Addo et al., 2007, Oelke et al., 2015). This makes it difficult to ascertain the exact prevalence of hypertension at country level. Nevertheless, some small-scale studies indicate that hypertension is becoming an increasing public health problem in Zambia. Estimates, however, differ. Despite one recent countrywide cross-sectional survey conducted by Zambia's Ministry of Health in 2015 recording a 19.1% prevalence of hypertension among 4302 adults aged 18 to 69 years (Wilbroad et al., 2017), wider evidence shows that the prevalence has been increasing (Mulenga et al., 2013, Nnyepi et al., 2015, Oelke et al., 2015, Siziya et al., 2012, Yan et al., 2015, Rush et al., 2018). Moreover, evidence from multisite studies has shown that the prevalence of hypertension among adults above 20 years of age in Zambia was less than 20% in 2000, increasing to over 25% in recent years (Mills et al., 2016, Rush et al., 2018). With this rate of increase, Zambia risks surpassing the global mean prevalence of hypertension estimated to be approximately 26% (Mills et al., 2016, Sarki et al., 2015, WHO, 2017, Matthew et al., 2019), albeit there being no projections as to when this might happen.

The Ministry of Health's last analysis of NCDs in Zambia for 2010, 2011 and 2012 revealed that hypertension was the most common cause of health facility visits among all NCDs, accounting for 35.0%, 35.7% and 39.0% of visits respectively (MOH-Zambia, 2012). This upward trend in visits to health facilities was not seen in other NCDs during the years under review. The increase in visits may, among other possible reasons, demonstrate that there is increasing hypertension related morbidity among the Zambian population. This has the potential to impact negatively on population health, quality of life, as well as on the national health system.

Evidence from SSA shows that few people with diagnosed hypertension are undergoing treatment (Ndabarora et al., 2018, Yoruk et al., 2018) and low treatment is worse among men (Wilbroad et al., 2017). This could be due to preference for indigenous therapies such

as the herbal remedies prescribed by traditional healers (Tateyama et al., 2019), limited access to diagnostic and treatment facilities (Agbor et al., 2018), non-adherence to treatment (Sulistiyowatiningsih and Herawati, 2017), low awareness or hypertension (Ndabarora et al., 2018) or poor health seeking behaviour by patients. Moreover, among patients on antihypertensive treatment, very few have controlled blood pressure (Antignac et al., 2018, Phiri et al., 2018, Yoruk et al., 2018); a situation found to be worse among patients with a low socioeconomic status (Antignac et al., 2018). This low treatment rate and inadequate blood pressure control can not only increase morbidity due to hypertension, but also increase the incidence of complications. These complications include cardiovascular diseases, such as heart failure, ischemic heart disease, atherosclerosis and cerebrovascular accidents (Agbor et al., 2018, Pessinaba et al., 2013a). This negative impact on patients' physical health also reduces their quality of life (Trevisol et al., 2011), and may lead to reduced productivity, loss of man hours and earnings (Agbor et al., 2018), resulting in negative socioeconomic impacts. Further, more economic stress is experienced by patients due to increased health care costs for treating hypertension and its complications (Agbor et al., 2018). Being a major cause of hospital admissions (Bosu et al., 2019), increased morbidity due to hypertension leads to increased stress on health care systems in SSA that are already burdened by infectious diseases like HIV/AIDS (Osetinsky et al., 2019). With all these implications, an understanding of the major hypertension risk factors upon which interventions can be based is key.

The risk factors for hypertension in Zambia have been explored by several researchers (Goma et al., 2011, Oelke et al., 2015, Siziya et al., 2012, Rush et al., 2018, Wilbroad et al., 2017) and highlighted in policy documents (MOH-Zambia, 2013, MOH-Zambia, 2017). The increase in the problem of hypertension in Zambia, like the rest of SSA, is associated with increasing urbanization (Peer et al., 2013, Jedwab et al., 2017).

Internationally, different countries have implemented interventions targeted at reducing specific health-related risk factors such as salt intake (Campbell et al., 2011, Muthuri et al., 2016, He and MacGregor, 2009), overweight and obesity (Brown et al., 2009b), and other dietary modifications (Charlton et al., 2008). Within Zambia, however, the increase in the prevalence of hypertension has not been matched by development and implementation of preventive interventions. Researchers have only gone as far as identifying interventions as priority and proposing that policy makers and researchers engage communities more effectively to develop public health preventive interventions (Goma et al., 2011, Oelke et al., 2015, Mulenga and Siziya, 2013, Tateyama et al., 2019, Wilbroad et al., 2017).

So far, to the best of the researcher's knowledge, there is no research or project that has developed a lifestyle intervention in Zambia aimed at preventing hypertension, driven by local community members' inputs. As such, this study will address t/his gap by developing and assessing the potential effectiveness of a culturally sensitized lifestyle intervention to reduce the risk of hypertension in Zambia's urban areas using community-based participatory methods. This will be achieved through four phases, guided by the principles of the six key Steps for Quality Intervention Development (6SQuID) Model (Wight et al., 2014). It will answer the following research questions:

1. What are the most prevalent lifestyle risk factors for hypertension in SSA?
2. Which of the risk factors for hypertension in SSA are common in the study site and which ones have the greatest scope of change?
3. Can a culturally sensitized lifestyle intervention to reduce the risk of hypertension be co-developed with target end users?
4. Can a culturally sensitized lifestyle intervention co-developed with target intervention users be acceptable, feasible and effective in changing users' health behaviours?

1.2 Significance

This study will help the researcher: understand the most prevalent lifestyle factors for hypertension, including their drivers, in the study site (combining empirical evidence from published studies and indigenous knowledge); identify which of these would be easier to change, how the change can be delivered with a local context; how lifestyle hypertension prevention interventions can be co-developed with target end users; and assess the potential effectiveness of the co-developed intervention. The research, therefore, is likely to contribute evidence on how to involve communities in Zambia in co-developing public health interventions and the benefits of this approach. The knowledge generated from this process will inform future research on the development of hypertension prevention interventions in similar contexts to the current study site. Further, findings from the study will be useful to policy makers in Zambia as they strategize the development of context-sensitive public health interventions. This is critical for Zambia's current policy shift towards disease prevention and health promotion (MOH-Zambia, 2017). A recent report on the STEPs survey for NCDs in Zambia identified the risk factors and only went as far as recommending interventions (e.g. to reduce salt intake and increase physical activity) (Wilbroad et al., 2017). This study goes further by intervening on the risk factors identified and the recommendations made to develop preventive interventions. Beyond Zambia, the co-developed intervention may have potential to be applied in similar settings in SSA and contribute to regional health improvement.

1.3 Summary of thesis chapters

This thesis is presented in eight chapters. A literature review in Chapter 2 explores approaches to evidence synthesis from existing literature to inform the selection of which approach to use to explore existing evidence on risk factors for hypertension in SSA. Identified risk factors require interventions to bring about change. Approaches to

conceptualising ‘levels of intervention’ are also evaluated to inform decision making on which levels of behaviour influence to intervene on. Additionally, existing frameworks guiding the development of complex interventions are examined, leading to the selection of one for use in this study. Considering that theory-based interventions have a higher likelihood of success (Prestwich et al., 2015), theories of behaviour change used to ground the co-developed intervention in theory are also explored. In Chapter 3, the research methodology for each phase of this study is described: specifically, the evidence synthesis, exploration of the local context, and the intervention development process. Additionally, the ethical implications of the study are considered.

Chapters 4 to 7 present the results of the study. Chapter 4 lays out findings from a scoping review as part of the approach to evidence synthesis. The risk factors for hypertension in SSA and those likely to be malleable (amenable to change) are described to inform the intervention development process. Findings from the exploration of the local context are then presented in Chapter 5, including participants’ perceptions of the most common health conditions in their community and risk factors for hypertension and their drivers, as well as their suggestions for change solutions to reduce risk. Further, a causal pathway and theory of change (ToC) are presented using a synthesis of evidence from the scoping review and local context to express how interventions could reduce hypertension risk. Chapter 6 provides information on how the ToC was employed to iteratively co-develop core-intervention components with study site residents (target end-users) and key stakeholders. This process produced core intervention components, which have also been described. Chapter 7 starts with the methodology of the small-scale feasibility study of the developed intervention. The results of the evaluation of the co-developed intervention’s feasibility, acceptability and potential effectiveness are then described to inform intervention adaptations. Lastly, Chapter 8 presents a discussion of the research findings from all the

phases of the study, considers the study' strengths and limitations, and provides recommendations for future research and practice.

CHAPTER TWO - LITERATURE REVIEW

Michie et al. (2014) argue that to develop an intervention with a higher likelihood of being effective, the following inputs are required: an understanding of the problem (e.g., hypertension and its risk factors for this study) and its determinants, the different potential 'levels' of intervention, a framework for developing complex interventions, and the applicable theories of behaviour change. This chapter begins with creating an understanding of various evidence synthesis approaches, including systematic reviews, traditional literature reviews and scoping reviews to inform an approach for rapidly exploring the risk factors for hypertension in SSA for use in this study. A broad description of the risk factors for hypertension is then provided from a global perspective. Next, guided by the socioecological model (Whitehead and Dahlgren, 1991, CDC, 2015), levels at which public health interventions can be applied are then evaluated. Thereafter, an analysis of potential frameworks to guide the intervention development process is presented, culminating in the selection of a framework for use in this study. The chapter ends with an exploration of potential theories of behaviour change for use in developing an intervention to reduce the risk of hypertension that focuses on the individual and interpersonal levels of the socioecological model.

2.1.0 Approaches to evidence synthesis

Several approaches to evidence synthesis exist (Snyder, 2019, Munn et al., 2018, Xiao and Watson, 2019), as table 2.1 shows. For purposes of this evaluation, approaches have been grouped into three; including systematic, traditional/narrative, and scoping reviews (Munn et al., 2018). This section provides a brief evaluation for each approach to assess suitability for use in the current intervention development study.

Table 2. 1 Evaluation of approaches to evidence synthesis to identify which one to use to explore risk factors for hypertension in SSA

Forms of evidence synthesis	**Description**	**Strengths**	**Weaknesses in the context of the current study**
Systematic Review	The gold standard for literature review used to identify and critically analyse evidence using a structured and predefined approach, specific and narrow research questions as well as a priori prescribed quality criteria/critical appraisal for article inclusion.	Explicit and systematic methodology minimises biases and increases reliability of conclusions	Being an emerging problem in SSA, narrowing the search as in systematic reviews may not include all relevant information
Traditional/Narrative reviews	Unstructured, rapid extracting, summarising, description and analysis of existing evidence at a given time	A quick way to explore existing evidence	High risk of findings being affected by reviewer biases, thereby influencing the discussion on which risk factors to intervene on.
Scoping reviews	A rapid, semi-structured exploratory review of existing literature to map the available body of knowledge around a particular topic and identify key concepts, theories and sources of evidence related to phenomena under investigation such as identifying risk factors associated with hypertension	Quick, broad enough to provide a wider scope of information. Guided by explicit methodology to generate reliable results	Stand alone, the findings may not be useful in developing well targeted behaviour change interventions. Thus, require contextualising through engagement with local views.

2.1.1 Systematic Reviews

Systematic reviews emanated from and are widely used in the medical field and are considered a gold standard of evidence synthesis (Snyder, 2019). They are usually used to identify current evidence, assess consistency of existing literature, confirm or refute consistency of prevailing practice with existing evidence, identify new practices and inform decision making, as well as to identify gaps in knowledge to inform future research (Munn et al., 2018). Systematic reviews involve a critical review of literature guided by specific and narrow questions, and a rigorous appraisal of articles to include based on pre-set standards (Higgins et al., 2019). The rigorous methods, quality appraisals, explicit and systematic methods usually lead to more valid findings from which reliable conclusions can be drawn to inform practice, policy and future research (Pearson, 2004, Aromataris and Pearson, 2014, Liberati et al., 2009). However, systematic reviews are not useful in cases where single or precise questions may not be appropriate, such as when the concepts under investigation are broad or under-researched, or where there is a need to evaluate studies with different methodologies (Snyder, 2019). Furthermore, reviews where the interest is to identify certain characteristics or concepts in studies for purposes of mapping, reporting or discussion may not require the methodological rigor of systematic reviews (Munn et al., 2018). For this, other approaches such as traditional and scoping reviews become useful.

2.1.2 Traditional Literature Reviews

Traditional literature reviews are a form of evidence synthesis aimed at extracting, summarizing, describing, analysing and synthesising existing literature at a given time (Jesson et al., 2011, Xiao and Watson, 2019, Munn et al., 2018). Examples include academic literature reviews for introducing and contextualising a new study (Jesson et al., 2011, Li and Wang, 2018) and narrative reviews (Kastner et al., 2012, Popay et al., 2006). Narrative reviews are best suited for expert personal arguments on topical issues and may have less emphasis on the quality of the quoted evidence (Pae, 2015, Dixon-Woods et al., 2005).

Despite being useful in ways described above, this type of literature review has no a priori protocol guiding implementation, no explicit and transparent literature search strategy and lacks the protocols required by more structured evidence synthesis approaches such as systematic and scoping reviews (Munn et al., 2018). The traditional/narrative review therefore creates a heavy reliance on the reviewer's prior experience, knowledge and preferences making this approach more likely to be subjective, less comprehensive and susceptible to biases (Aromataris and Pearson, 2014). As such, traditional/narrative reviews are likely to be inadequate to generate evidence (on risk factors for hypertension) with sufficient reliability to inform intervention development. An alternative to this approach, which is less restrictive than systematic reviews but more structured than the traditional approaches, is the scoping review.

2.1.3 Scoping Reviews

Despite researchers not having a universally acceptable definition and procedure for their conduct (Levac et al., 2010), various definitions have suggested that scoping reviews are an exploratory review of existing literature to map the available body of knowledge around a particular topic and identify key concepts, theories, sources of evidence related to phenomena under investigation, such as identifying risk factors associated with hypertension. Scoping reviews can also be used to determine gaps for further research (Arksey and O'Malley, 2005, Dijkers, 2015, Khalil et al., 2016, Levac et al., 2010, Peters et al., 2015, Munn et al., 2018). The purpose of scoping reviews is not to generate critically appraised findings answering specific narrow questions, as in systematic reviews, but rather to map or scope existing evidence. As such, there is no quality assessment (such as assessment of bias) of the type of evidence included (Peters et al., 2015, Munn et al., 2018). Despite this weakness, scoping reviews retain sufficient rigor, including using a formalised way to develop research questions such as the Population, Concept and Context (PCC) approach (Peters 2016), and involve an explicit and transparent search strategy, as well as a

standardised approach to article selection (Munn et al., 2018). This increases the reliability of findings from scoping reviews while remaining broad enough to provide sufficient detail on the concepts under investigation. In the current study, a scoping review was chosen to review what has been empirically established as risk factors for hypertension in SSA so that potentially modifiable factors could be identified to inform discussions with local residents and stakeholders in the study site as a way to identify what to intervene on.

2.2.0 Risk factors for hypertension

This section highlights the broader perspective on risk factors for hypertension globally. A more detailed analysis of risk factors within the context of SSA and Zambia (the study site) will be explored through the scoping review presented in Chapter 4. Globally, risk factors for hypertension include non-modifiable and modifiable risk factors (CDC, 2010, Ibrahim and Damasceno, 2012a).

Non-modifiable risk factors include older age (Choi et al., 2017, Nyuyki et al., 2017, Siziya et al., 2012), male sex (Choi et al., 2017, Dong et al., 2012, Nyuyki et al., 2017, Twagirumukiza et al., 2011, Goma et al., 2011, Khanal et al., 2017, Siziya et al., 2012, WHO, 2017), family history of hypertension (Ranasinghe et al., 2015), foetal programming (Carolan-Olah et al., 2015, Desai et al., 2013) and black ethnicity (Murthy et al., 2013). However, these non-modifiable risk factors are not the most important factors in the causality of hypertension (Schutte et al., 2012b) and usually play a permissive role rather than an absolute causal effect. For example, genetic predisposition, age, excess body weight, and black ethnicity, increase the body's sensitivity to salt (a lifestyle factor) such that high intake leads to development of hypertension (Sanders, 2009).

Modifiable risk factors are considered to make the largest contribution to the increase in hypertension in SSA (Schutte et al., 2012b). They include behavioural factors such as: unhealthy diets – for example, increased salt intake (Subasinghe et al., 2016, Ware et al.,

2017, Mufunda et al., 1993, He and MacGregor, 2009, Radhika et al., 2007, Noppa et al., 1980, Lopez Castanon et al., 2011, Mohan and Campbell, 2009, Duric et al., 2011), high consumption of oils and/or fats (Ibrahim and Damasceno, 2012a, Zhao et al., 2011, Bruno et al., 2016) and low intake of fruit and vegetables (Pienovi et al., 2015, Borgi et al., 2016, Domingos et al., 2016, Wu et al., 2016, Yang et al., 2018); low physical activity (Cois and Ehrlich, 2014, Cois and Ehrlich, 2015, Kengne et al., 2007, Olack et al., 2015, Zack et al., 2016b, Macnair, 2000, Petermann et al., 2017, Rani et al., 2015); smoking CVDs (Benowitz, 2003, Anand and Sk, 2017, Burke et al., 2017); alcohol intake (Cois and Ehrlich, 2014, Olack et al., 2015, Rani et al., 2015); and sleep deprivation (Knutson et al 2009). Other modifiable risk factors are metabolic (obesity, diabetes/hyperglycaemia) (Goma et al., 2011, Siziya et al., 2012, Bernabé-Ortiz et al., 2017, Onyango et al., 2017) and socioeconomic factors (globalisation, urbanisation, low socioeconomic status and low level of education) (Bernabé-Ortiz et al., 2017, Ibrahim and Damasceno, 2012b, BeLue et al., 2009b, Ibrahim and Damasceno, 2012a).

Other risk factors

Other modifiable risk factors for hypertension include health conditions such as atherosclerosis (stiffening of arterial walls) (Adji et al., 2011), and systemic proinflammatory diseases (Wang et al., 2007). Medical treatment of these conditions can modify the risk of hypertension.

Understanding the range of risk factors for hypertension is key to identifying what to intervene on. This, then provides information on which levels an intervention needs to operate to produce the maximum effect on the risk factor.

2.3.0 Levels of intervention

The potentially modifiable risk factors discussed above present an opportunity for disease prevention through lifestyle interventions (Arena et al., 2015). Moreover, as highlighted in section 2.2, modifiable risk factors, such as salt intake, account for most of the rise in hypertension in developing countries (Schutte et al., 2012a), implying that controlling these factors can potentially produce significant reductions in the prevalence of the disease.

Globally, there have been calls for increased action on initiating change through modifiable lifestyle risk factors by developing and implementing healthy lifestyle initiatives as opposed to just increasing health information and awareness among communities (Arena et al., 2015). Successful lifestyle interventions targeting particular risk factors, such as reduction in salt intake, to reduce the risk of hypertension have already been developed and implemented in many high income countries (Brown et al., 2009a, Campbell et al., 2011, Charlton et al., 2008, He and MacGregor, 2009, Ma et al., 2010, Muthuri et al., 2016). Similarly, successful interventions have been implemented in some low- and medium-income countries (LMICs). For example, a systematic review of studies conducted in LMICs globally between 1977 and 2012, including 43 studies with 6779 participants reporting on the effects of lifestyle modification on hypertension reduction, revealed that lifestyle interventions significantly lowered blood pressure in LMIC populations (Baena et al., 2014). To change people's lifestyles through interventions in this way requires an understanding of what influences their health behaviours.

Human behaviour is a complex phenomenon which is influenced by multiple independent and interlinked factors (Schmied, 2017). These influencers of behaviour can be understood using the Socio-ecological Model (SEM) (Whitehead and Dahlgren, 1991, CDC, 2015, Schmied, 2017), summarised as operating at individual, interpersonal, community, organizational and policy levels, as shown in figure 2.2.1. The SEM emphasizes that health behaviours are determined by factors across multiple levels; for example, an interplay of

intrapersonal factors (e.g., self-efficacy) and factors in the environment where an individual lives (e.g., community and social norms) can influence one's decision to adopt a particular behaviour. Interventions can be applied at any one or more of the levels of the SEM. However, existing evidence shows that health interventions are likely to be more successful if a multi-level approach is used (Sahranavard Gargari et al., 2018, Schölmerich and Kawachi, 2016, Salmon et al., 2020). To use a multi-level approach, understanding what each level of the SEM (individual, interpersonal, community, organisational and policy levels) means is important.

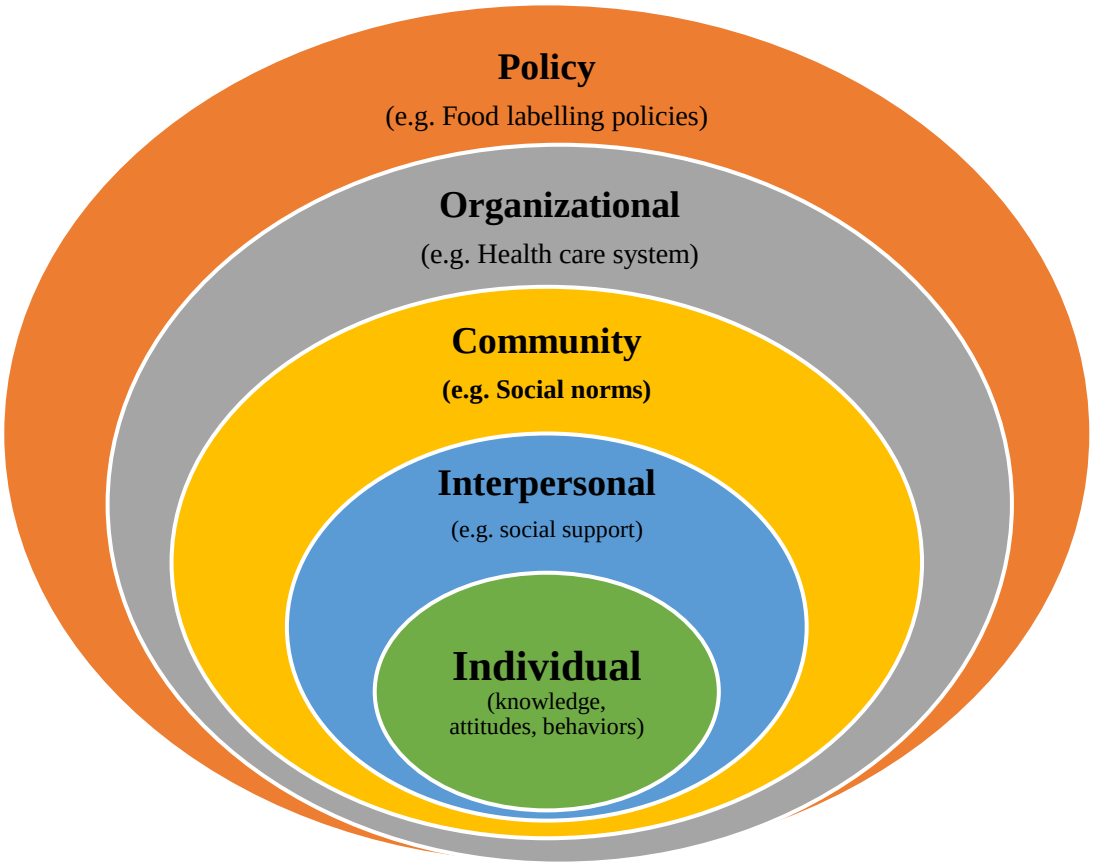


Figure 2. 1 The Social Ecological Model

(Adapted from the Centers for Disease Control and Prevention (CDC) at shttps://www.cdc.gov/violenceprevention/publichealthissue/social-ecologicalmodel.html; retrieved on 12th September 2019)

2.3.1 Individual level

The individual level is the innermost part of the SEM and refers to individual characteristics that influence health behaviour. For example, a person's attitude toward jogging can determine whether they undertake this form of exercise or not. Interventions at this level seek to bring about change by influencing individual characteristics such as attitudes, beliefs, knowledge, skills and capacity (CDC, 2015). They can, for example, be used in 'downstream' public health intervention targeting specific health risks, such as obesity, to influence adoption of healthier lifestyles by changing individual factors (Simons-Morton 2013). Downstream interventions assume that individuals have considerable autonomy to decide their actions independent of the environment they live in, such that changing individuals' capacities will lead to adoption of healthier lifestyles (Simons-Morton 2013). However, it can be argued that the change realised may be hard to maintain. For example, evidence shows that change in knowledge alone can influence attitudes and decisions, but is not sufficient to being about sustainable behaviour change (Kali Aronica, 2019). This is because people's choices may be constrained by other environmental factors (Kelly et al., 2005, Richard et al., 2011, Sahranavard Gargari et al., 2018). For example, an individual who decides to eat more fruit might fail to meet their target if fruits are not available or are too expensive. Moreover, targeting individuals alone can also result in them feeling blamed for their actions, a situation sociologists have called 'responsibilisation' (Pyysiäinen et al., 2017, Rose, 1992).

The concept of responsibilisation suggests that neo-liberal societies distract attention from social structural health issues and shift responsibility to individual agents. Conversely, structural level interventions posit those behaviours can be influenced by modifying the social, physical, economic, or political environments in which health is produced and reproduced (Blankenship et al., 2006, Brown et al., 2019). For example, changing salt content in pre-packaged foods can contribute to a reduction in salt intake even when

individuals do not decide to do so. Nonetheless, downstream interventions are likely to be less costly and quicker to implement than structural level approaches and can lead to immediate changes driven by individuals while at the same time pursuing change at the much harder to influence structural level.

2.3.2 Interpersonal level

The interpersonal level refers to the formal and informal social networks and social support systems likely to influence individual behaviours, including family ties, friends, peer influence, co-workers and religious networks (CDC, 2015). For example, the diet that a person adopts can be influenced by their family members, and obesity can be linked to their wider social networks (Christakis and Fowler, 2009, Christakis and Fowler, 2007). As such, interpersonal interventions, including group-based interventions (Hunt et al., 2014) can target social interactions to bring about desired lifestyle change (Cook et al., 2014). Commonly, participants in such interventions have similar characteristics (e.g., people with similar risk factors). They directly or indirectly encourage each other to achieve the targets set, anchored on interpersonal social support (Bunn et al., 2016, Kellou et al., 2014).

2.3.3 Community level

The community level refers to characteristics in community settings and structures that shape or modify individuals' behaviours (CDC, 2015, Kali Aronica, 2019), These characteristics include community groupings (e.g. social clubs, churches, schools, workplaces) and how these interact, the built environment, social norms, and community leadership systems in which social relationships and interactions occur. Levels of physical activity, for example, can be influenced by the availability of a conducive built environment such as play parks and walkways (Isiagi, 2019), beside changes in health knowledge. Situating public health interventions within community settings, such as community clubs, is likely to yield positive results in changing behaviours (Kali Aronica, 2019). Finally, social networks and cohesion in community settings can support behaviour change (Van den Bos et al., 2018).

2.3.4 Organisational level

The organisation level comprises organisational set up, including an organisation's regulations and policies that have an influence on an individual's behaviour (CDC, 2015). Organisational level interventions, like workplace health interventions, aim to modify factors within the organisation likely to influence adoption of healthier lifestyles (Montano et al., 2014, Kali Aronica, 2019). For example, restructuring of work tasks and workload has been shown to improve mental health for workers, thereby reducing stress levels (Giga et al., 2018). As such, embedding interventions within organisations, such as workplaces and churches (e.g., by restructuring work arrangements and programming, or through organisational policy changes or activities), can increase the likelihood of individuals adopting the desired behaviours.

2.3.5 Policy level

The policy level involves influences on behaviour arising from interpreting and implementing existing local, national or international laws and policies. For example, despite yielding minimal results in changing behaviours as occurred with the smoking ban in the United Kingdom (Jones et al., 2015), there have been positive results elsewhere. Policies to improve walkways have been shown to increase physical activity as demonstrated by a baseline survey (N = 1813) for the RESIDential Environment (RESIDE) project (in Perth, Western Australia) (McCormack et al., 2012). Despite being harder and usually taking longer to implement, interventions at this upstream level of the SEM affect a larger portion of the population than the downstream levels and are likely to produce more sustainable changes (Kali Aronica, 2019, Conner and Norman, 2017). For example, West (2017) established that increasing the cost of smoking is likely to lead to reduced smoking at a population level. West established that for every 10% increase in the cost of cigarettes, there was a corresponding 4% decrease in cigarette purchases.

Section summary and discussion

The foregoing section has provided evidence that modifiable risk factors can be targeted at different levels in health behaviour change interventions. Behaviour is a product of life course learning, present experiences, and perceptions as well as a current cognitive and physical capabilities, set in specific social and physical environments (Conner and Norman, 2017). Considering that human health behaviour is shaped by multiple factors across the five levels of the SEM (Glass & McAtee, 2006; WHO, 2012), interventions are most effective when they address factors at all or multiple levels (Kali Aronica, 2019). For example, consumption of vegetables can be influenced by self-efficacy at individual level, social support at interpersonal level, and availability of vegetables in the community, which may be determined by agricultural policies promoting growing and selling of affordable vegetables. Intervening at all levels of the SEM, however, presents challenges, such as higher cost and measurement challenges (Charns et al., 2012). As such, compromises often need to be made, and researchers advocate for multilevel interventions which combine two or more, but not necessarily all, levels of the SEM to maximise intervention effectiveness (Simons-Morton et al., 2011, Green and Kreuter, 2005a, Green and Kreuter, 2005b, Bartholomew et al., 1998, Eldredge et al., 2016).

The development process for such multi-level public health interventions requires frameworks to provide a skeleton to guide the design of core intervention components. The next section explores the process for intervention development and then presents a consideration of potentially useful intervention development frameworks for this study.

2.4.0 Intervention development

The risk factors for hypertension discussed above provide a basis for designing interventions (Simons-Morton, 2013). This intervention development study involves a careful and

systematic development of intervention components, i.e., change strategies for identified problems (risk factors) (Fraser and Galinsky, 2010). The process consists establishing “explicit practice principles, goals and activities" aimed at realising the desired change (Fraser and Galinsky, 2010 pg 1). Generally, designing interventions includes identifying malleable factors through problem analysis and then mapping these factors onto the likely effective change strategies in a theory of change (Fraser and Galinsky, 2010, O'Cathain et al., 2019) to understand how the change will come about.

A theory of change is an illustration of how a programme/intervention would work from inputs to desired outcomes (Nilsen and Hasson, 2020). It comprises interlinkages of a series of *‘if this is done, then something will change or happen.’* For example, *if* health education on hypertension is provided to intervention users, *then* their awareness about the disease will increase. The four main components of a theory of change include inputs (resources required), activities (the activities to be implemented to lead to the desired outcomes, e.g., training), intended outputs (what will be the direct effect of the activities e.g. if training is provided, then participants will develop self-management skills) and intended outcomes (what the outputs will lead to, e.g., if participants develop self-management skills, then they will be more likely to manage to adopt and sustain the desired behaviours (Thojampa and Sarnkhaowkhom, 2019, Nabi and Prestin, 2017). Theories of change in lifestyle interventions are best co-created with target intervention users and stakeholders as this is likely to build a shared understanding of the intervention and improve ownership and potential effectiveness (Abildgaard et al., 2020, Nilsen and Hasson, 2020, Wight et al., 2014). Further, the theory of change must be clear about the change mechanisms and techniques (i.e. strategies that facilitate the desired change) and ideally incorporate one or more formalised theories of behaviour change (Wight et al., 2014).

Once the theory of change is developed, intervention development is best conducted iteratively, and refinement done through repeated small-scale tests, feasibility and pilot

studies (O'Cathain et al., 2019). The effectiveness of an intervention which has demonstrated promising results during small-scale evaluations is ultimately assessed through a randomised controlled trial (RCT) to assess its ability to deliver change successfully on a larger scale (Wight et al., 2014).

According to Fraser and Galinsky (2010), interventions can be either prescriptive or flexible. In more prescriptive designs, the intervention is guided by well-specified manuals which explicitly define the objectives and content at every stage, as well as the tasks and activities to be conducted. Alternatively, intervention designs can be more flexible and guided by the results of the dialogue between those delivering the intervention and participants. Whether prescriptive or flexible, intervention development should follow a multi-step approach (Craig et al., 2008, Craig et al., 2013, Fraser and Galinsky, 2010, O'Cathain et al., 2019). This multi-step approach should include several actions, as proposed by O'Cathain et al. (2019), based on relevance to unique contexts. These actions include the following nine steps: i) planning, ii) stakeholder engagement from the beginning and throughout the development process, iii) establishment of a team-based decision-making process, iv) review and synthesis of existing evidence, v) drawing on existing theories, vi) articulating the programme theory/theory of change, vii) understanding the context in which the intervention will be implemented, viii) considering future implementation, and ix) designing and refining the intervention. However, to meet the main objective of the current intervention study, i.e. to co-develop a culturally sensitised lifestyle intervention to reduce the risk of hypertension, six key actions from O'Cathain et al.'s steps have been prioritized to include: i) planning, ii) review and synthesis of existing evidence; iii) stakeholder engagement (combined with consideration of the local context), iv) use of intervention development frameworks and formalised behaviour change theories; v) articulating of the theory of change; and the vi) iterative development and optimization of the intervention. From the steps above, planning for the study (already implemented), evidence synthesis (Chapter Four) and stakeholder

engagement (Chapter Five) have been described elsewhere. The next two sections (2.4.0 and 2.5.0) therefore examine intervention frameworks and formalised theories of behaviour change.

2.4.1 Behaviour change intervention development frameworks

To choose a suitable framework to inform the design and development of the intervention in the current study, several frameworks were evaluated based on the clarity of their guidance with regard to O'Cathain et al.'s proposed steps (O'Cathain et al., 2019).

Nine frameworks/models for development of behavioural change interventions (Michie et al., 2011c, Hardeman et al., 2005, Michie, 2008, French et al., 2012, Campbell et al., 2000a, Kok et al., 2004, Collins, 2018, Green and Kreuter, 1999, Fraser and Galinsky, 2010, Wight et al., 2014) were identified using a traditional literature review approach (see section 2.1.2). Each of these frameworks has its own strengths as presented in Table 2.2. However, they also have weaknesses, such as being too complex (Michie, S., Van Stralen, M. M., & West, R. 2011), requiring a high degree of skill (Green, L., & Kreuter, M. 1999), being more clinically oriented (Campbell, M., et al (2000), potentially taking too long to implement (Green, L., & Kreuter, M. 1999), being unclear on how intervention developers and intervention users can employ the steps in practical, real life scenarios (Collins, 2018) and being potentially costly to implement step-by step (Collins, 2018, Wight et al., 2014).

To give an example of how each of the frameworks was evaluated, Frazer et al's framework has been assessed in detail here. Fraser and Galinsky (2010) proposed a 5-step process of developing interventions including: i) developing problem and programme theories, ii) specifying intervention components and piloting them, iii) testing for efficacy and refining intervention components, iv) testing effectiveness, and v) disseminating the findings. Developing the problem theory (causal pathway) and programme theory (theory of change) hinges on literature searches to ground them in existing theory and evidence. Cultural and context orientation only occurs at the pilot stage and beyond. This, arguably, weakens the

cultural and context sensitisation due to a lack of involvement of the target end users of the intervention in the designing and development stages. As such, this framework is not in keeping with the current study's community based participatory approach (see methodology chapter). Similarly, as shown in table 2.2, other frameworks have their own weaknesses which may limit their use in the intervention development process followed in this study.

In the current study, Wight et al's six essential Steps for Quality Intervention Development (6SQuID) Model (Wight et al., 2014) was adopted to provide an overarching framework for intervention development. The 6SQuID Model is described in section 2.4.2.

Table 2. 2 Strengths and challenges of frameworks for intervention development

Framework	Framework description	Strengths	Potential challenges
Multi-phase Optimization Strategy (MOST) (Collins (2018))	Three phases: (1) The preparation phase (including selection of components and development of the conceptual model), (2) Optimization phase-intervention optimization to meet specific criteria pre-determined by the investigator, and (3) The evaluation of the optimized components using RCTs	A rigorous process for the optimization of the components	The detail for developing intervention components is not given and is done by the researcher without the involvement of the intended end-users. Not ideal for co-production
Causal modelling (Hardeman et al (2005))	Use of a causal modelling approach linking behavioural determinants, behaviour and disease outcomes in a causal pathway. This is then linked to appropriate intervention and measurement points and behaviour change techniques which are tailored to context	Grounding of the stages in evidence and theory	Behaviour change techniques decided by technical researchers (without involving target end-users) may lead to reduced acceptability. Not ideal for co-production
Steps in Intervention Research (Frazer et al 2010)	Five step process of designing and developing interventions including (a) developing problem and program theories; (b) designing program materials and measures; (c) confirming and refining program components in efficacy tests; (d) testing effectiveness in a variety of practice settings; and (e) disseminate program findings and materials.	Rigorous approach	Weak cultural sensitization as the targeted end users are only involved at the piloting stage and beyond. Cultural sensitisation of the intervention may be weak.
MRC guidance for the development and evaluation of complex interventions to improve health (Campbell et al (2000))	Involves a stepwise process including theory building, process and outcome modelling, and feasibility assessment	Defines the stages well to provide an orderly approach to the development of complex interventions	The guidance is broad, leaving the intervention developer to fill in the grey areas.

Framework	Framework description	Strengths	Potential challenges
The precede–proceed model (Green & Kreuter (1999))	A logical model for planning providing a structure for applying concepts for planning and evaluation of complex interventions. PRECEED deals with planning while PROCEED develops the intervention	Suitable for behaviour change intervention development and involves target end-users	Insufficient detail on intervention development and may require great understanding of the concepts to employ. This may not be ideal as target end-users may fail to participate fully if concepts are hard to understand.
Intervention Mapping (Kok et al (2004))	Development of theory- and evidence-based health promotion programmes. Intervention mapping seeks to map behaviours onto their theoretical causes from epidemiological principles in order to identify intervention components	Grounded in theory	Does not provide sufficiently easy to follow details to implement the protocol. This may be challenging for co-production and may take long for the researcher to understand and apply it
Behaviour Change: The principles for effective interventions. NICE Public Health Guidance (National Institute for Clinical Excellence. (2007))	Outlines principals for intervention development	Clear principles for intervention development	No details provided to further explore the outlined principles making it hard for an intervention researcher
Theoretical Domains Framework (French et al. (2012))	Four steps to developing complex interventions using 12 domains of determinants of behaviour	The 12 domains offer a range of potential intervention components	Most of the process is expert determined (inadequate involvement of target end users in designing intervention components)

Framework	Framework description	Strengths	Potential challenges
Six steps in quality intervention development (6SQuID) (Wight et al 2014)	Proposes six steps to developing complex interventions: 1. Define and understand the problem and its causes, 2. Clarify which causal or contextual factors are malleable and have greatest scope for change, 3. Identify how to bring about change: the change mechanism, 4. Identify how to deliver the change mechanism. 5, Test and refine on small scale, 6. Collect sufficient evidence of effectiveness to justify rigorous evaluation/implementation.	Clearly outlined steps. Steps 2-4 have potential for close community involvement, therefore suitable for co-production of intervention components	The cost of iteratively following all the steps rigorously may be high.

2.4.2 The Six Steps for Quality Intervention Development (6SQuID) Model

Despite having its own potential weaknesses such as the cost for implementing each step thoroughly; the 6 SQuID model appeared to present a pragmatic approach using six essential steps with a strong community (target end user) involvement. The six steps include "(1) defining and understanding the problem and its causes; (2) identifying which causal or contextual factors are modifiable: which have the greatest scope for change and who would benefit most; (3) deciding on the mechanisms of change; (4) clarifying how these will be delivered; (5) testing and adapting the intervention; and (6) collecting sufficient evidence of effectiveness to proceed to a rigorous evaluation." (Wight et al., 2014 pg 2). Each of these steps is explained in detail (answering questions on what? where? who? how?) to provide a clear framework for use by intervention designers. The steps do not follow a linear process in practice; instead, an iterative process is followed where intervention designers may return to previous steps to refine findings.

The 6 SQuID model also encourages co-identifying of malleable factors with target end users and key stakeholders to improve the likelihood of acting on factors with the largest scope of change and relevant to context. Community involvement is likely to ensure a reduction in the wastage of resources through intervening on factors with little scope for change in the context of the study site and therefore having a negligible impact on identified problems (Wight et al., 2014). Beside each step being explicitly explained to guide intervention developers, the model also allows testing and adapting of the intervention components before embarking on a costlier full-scale evaluation. One potential challenge with the 6SQuID Model is that, as indicated above, the implementation of the steps may be iterative, thereby potentially increasing the length of the intervention development process and thus increasing the cost. As such, trade-offs must be made to follow a rigorous process in developing an intervention while minimizing cost and avoiding delays. For example, steps 5 and 6 might be condensed to shorten the process and reduce costs.

When designing complex public health interventions, they must be sensitive to contexts (Craig 2008, Craig et al 2013). Interventions sensitized to contexts are more likely to be acceptable to the intended end-users due to their potential to foster community ownership achieved through community engagement at all stages of intervention development. This increases the likelihood of the intervention being effective in changing behaviours (Rowley et al., 2000). The future end users can help to identify and suggest components to be included in the intervention as they contribute at every stage. Despite the 6SQuID Model outlining a pragmatic framework for intervention development and emphasising community involvement, it lacks sufficient detail on how the community can be practically engaged. As such, additional guidance is required for this, for example, using principles of the Community Organisation Model (Glanz et al., 2008) (explained in section 2.4.2.1) which can be practically implemented using a community-based participatory approach (CBPA) (Appiah, 2020).

2.4.3 Community-based participatory approaches

A community-based participatory approach (CBPA) refers to collaborative research where researchers and communities (residents, representatives, informants, stakeholders) participate collectively and equitably in research aimed at improving the lives of the researched (Collins et al., 2018, Wallerstein et al., 2018).. It is, to date, the most recognised form of community engaged research (Wallerstein et al., 2018). Originally, CBPAs were mainly used in research to improve health and equity in minority and vulnerable or special populations (Oetzel et al., 2018). However, CBPA is also a well-recognised way of involving people who may be affected by a particular health condition in research to determine how the problem can be addressed (Bergold and Thomas, 2012, ICPHR, 2013, Tremblay et al., 2018, Wallerstein, 2020, Wallerstein et al., 2018). CBPAs have increasingly been used in biomedical, public health and nursing preventative intervention research (Collins et al.,

2018) because health is produced in the community, within social networks and contexts, rather than from within health systems (Wallerstein, 2020). Wide stakeholder and grassroots involvement across all stages of the research process is an important requirement of CBPA (Wallerstein, 2020, Wallerstein et al., 2018). CBPA is, therefore, important in order to develop community interventions with increased likelihood of high feasibility and acceptability (Wallerstein, 2020, Wallerstein et al., 2018, Appiah, 2020). If applied well, CBPAs can provide a deeper understanding of the local context resulting in the development of interventions relevant to community needs, and facilitating the translation of knowledge into community change (Oetzel et al., 2018). Furthermore, partnership during the research process can bring satisfaction to both researchers and community participants through shared responsibility, knowledge and experiences which are likely to improve potential acceptability, feasibility and effectiveness of interventions developed using CBPR (Viswanathan et al., 2004). CBPAs are used by researchers to engage the researched and target end-users of the results of the study as partners, instead of as simply research participants (Green et al., 1995, Green and Mercer, 2001, Cargo and Mercer, 2008). Using this approach in public health research can allow end-users to contribute to the generation of knowledge and solutions for the health issues affecting them. Combining the empirical knowledge of the researchers and the practical real-world experiences and knowledge of the community is key to producing context sensitive solutions (Cargo and Mercer, 2008).

Several forms of CBPA have been described, such as community based participatory research (CBPR) (Satcher, 2005), participatory rural appraisal (Chandra, 2010), empowerment evaluation (Phillips et al., 2019), participatory action research (Chevalier and Buckles, 2019), community-partnered participatory research (Jones and Wells, 2007), cooperative inquiry (Napan et al., 2018), dialectical inquiry (Williams and Hummel, 2020), appreciative inquiry (Hung et al., 2018), decolonizing methodologies (Elder and Odoyo, 2018), participatory or democratic evaluation (Podems, 2017), emancipatory research

(Humphries et al., 2020)and forms of action research embracing a participatory philosophy (Stringer and Dwyer, 2005). The choice of which CBPA to adopt in a particular study depends on various factors.

According to Cargo and Mercer (2008), when the purpose of a study is to understand the needs of policy makers for health service delivery priority setting to facilitate the translation of research evidence into practice, potentially useful participatory approaches include utilization-focused evaluation, empowerment evaluation, participatory action research, participatory research and appreciative inquiry. Participatory research aimed at engaging target end users to find solutions for their own health problems (self-determination); suitable approaches include CBPR, decolonizing methodologies, community-partnered participatory research, empowerment evaluation and participatory research (Cargo and Mercer, 2008). From all these forms of participatory research, the current study used the CBPR (selection justified in Chapter Three) to co-create a culturally sensitized public health intervention to reduce the risk of hypertension.

CBPR builds on the strengths and resources within communities (skills, networks, organisations) to find solutions for issues affecting them (Collins et al., 2018). The ideal CBPR is an equitable partnership during all research stages including defining the problem, data collection and interpretation, disseminating the findings and using the findings to address community needs (Israel et al., 2005, Israel et al., 2012). CBPR fosters co-learning among all partnerships in research, and ensures that local relevance (to end users and their immediate environment) is emphasised (Israel et al., 2012, Israel et al., 2005). Beside fostering context sensitivity, CBPR in public health research and intervention development considers that disease is caused and influenced by multiple determinants, including biomedical, social, economic, cultural, and physical environmental factors (Israel et al., 2005, Israel et al., 2012). This consideration allows for collaborative work and co-learning

between multiple disciplines and with communities to ensure the multiple influencers of health are addressed. This co-learning happens across several stages including: partnership development; assessment of community strengths, resources and dynamics; identifying local health priorities and research questions; designing and conducting etiologic, intervention, and/or policy research; determining how to implement the research design and the methods selected; disseminating and translating research findings as well as maintaining, sustaining, and evaluating the partnership (Israel et al., 2012).

The quality of the partnerships among study participants determines the success of the CBPR. As such, effort must be made to build strong and sound partnerships. Partnership building requires an entry point to the community to develop relationships upon which the research would thrive (Collins et al., 2018). This involves establishing relationships through pre-existing (or forming new) connections and networks within the community. (Israel et al., 2012). Once established, relationships must be sustained and grow as the research evolves. One of the recognised approaches to sustaining and growing partnerships with community members is through provision of incentives such as transport (to and from the study site) and food (Israel et al., 2012, Israel et al., 2017). At this stage and throughout the research, effort must be made to build trust, as this is an essential component of effective CBPR partnerships (Lucero et al., 2018).

Once partnerships are established as the entry point to CBPR, an exploration of the community strengths, resources, skills and networks/relationships likely to have an impact on the participatory research is performed. This process, which is referred to as action-oriented community diagnosis (AOCD) (Israel et al., 2012), is an important part of intervention development planning. One important method for conducting AOCD is in-depth interviewing of stakeholders who have been in the community long enough to understand the issue at hand and hold key roles such as community and institutions

leadership. Furthermore, FGDs have also been used to obtain key information from community informants such as residents (Israel et al., 2012).

The next stage following the AOCD involves identifying local health priorities, concerns and research questions. In CBPR, research priorities are identified by or in collaboration with community representatives who may be individuals or organisations. At this stage, research questions are informed by the expressed needs of the community (Collins et al., 2018). Ideally, the community suggests their needs, research questions, or desired direction to a researcher. Alternatively, researchers may suggest research questions if building on prior, collaborative projects or when attempting to deal with already known community problems (Collins et al., 2018). The latter is useful in situations where stakeholders are unable to identify and approach a researcher on their own. Further, some researchers have had to produce research proposals for funding purposes before community involvement could be established (Viswanathan et al., 2004). Even when community involvement can be established before a proposal, it is likely to be limited and a more extensive engagement is required once funding has been awarded. The co-identified priorities may be refined iteratively as more information is obtained in the study process.

Also, an understanding of a community's culturally-defined aetiology and mechanisms of change is paramount to prioritization. This helps to establish a fair balance between empirical research evidence and culturally sensitive community knowledge. This stage allows for co-identification of what the intervention should look like and how it should be delivered. Once the co-designed research is implemented, the results are shared with all partners and jointly interpreted to ensure everyone makes sense of the findings. The partners are then engaged to determine what, from the findings, and how these can be disseminated and possibly published. Finally, CBPR partners engage in agreeing on what should be done

to maintain, sustain and improve the partnerships; an action that contributes to the sustainability of study outcomes.

Previous evidence shows that the extent to which the community is involved in each of the CBPR stages described above has varied from engagement in some aspects of the research process to a comprehensive involvement in all the stages of research (Westfall et al., 2006, Spears Johnson et al., 2016). Despite being the ideal expectation for all CBPR, achieving full participation and power balance has been found to be difficult (Wallerstein, 2006). For example, the constraints associated with ethics procedures and funding application in academic research usually leads to researchers initiating research and developing research proposals before engaging the community (McIntyre, 2008). In keeping with this observation, some researchers have used systematic reviews to initiate research and develop research proposals before engaging the community (McIntyre, 2008, Salimi et al., 2012). Additionally, another review of evidence (through in-depth interviews with professional and community participants) on the levels of community involvement in 25 CBPR projects conducted in Southeast USA revealed that very few studies incorporated community views at all levels of research similarly (Spears Johnson et al., 2016). Furthermore, a systematic review of the 60 CBPR studies conducted to improve community health in Canada and the USA found that only four involved the community across all the research phases (Viswanathan et al., 2004). Another review of 46 research networks found that none reported full engagement of patients in research (Yonas et al., 2006).” This is also in line with Israel et al’s idea that participatory researchers are unlikely to incorporate CBPR stages similarly and to the same extent (Israel et al., 2005, Israel et al., 2017). Others have suggested that CBPR should not necessarily include all the stages and elements, as attempting to do this is likely to increase cost and project duration (Bogart and Uyeda, 2009). As such, for projects that have limited resources and time such as the current research, a careful selection of context sensitive CBPR stages to include may be important. Instead of focussing on

including all elements of CBPR, researchers can attempt to engage the community to agree on what is relevant for that community and the involved stakeholders upon which more emphasis can be made during the research.

2.4.3.1 The use of community-based participatory research in other health research in SSA

The use of CBPR to engage the people affected by health conditions in finding context sensitive solutions has not been fully explored and appreciated in SSA (Kamanda et al., 2013, Coughlin, 2016). However, some studies (see table 2.3 below) in SSA have used the CBPR to develop interventions to: prevent infectious diseases, such as HIV (Baron et al., 2018, Baptiste et al., 2006) and malaria (Panter-Brick et al., 2006); and address barriers to accessing treatment for tuberculosis (Phiri et al., 2021) . Furthermore, CBPR has also been used in designing interventions to improve the quality of health service delivery (Wereta et al., 2018). Some lifestyle interventions designed using participatory approaches have also been reported; such as improving health through clean cooking (Ronzi et al., 2019).

Table 2.3 Examples of studies using CBPR in SSA

AUTHOR	BRIEF DESCRIPTION OF THE STUDY	LESSONS LEARNT AND INCORPORATED INTO THE CURRENT STUDY
Mitchell, et al. (2005)	This was part of a larger study in South Africa. The choice of topic was made by the researchers and workshops used to co-develop a photovoice intervention delivered by teachers and Community Health Workers (HCWs). Teachers and CHWs were taught to use cameras, encouraged to take pictures of the challenges and potential solutions for addressing HIV/ AIDS- related issues, and later gathered to view and discuss the pictures that had been taken. The choice of photovoice was selected by researchers and taught to participants.	Co-development of the intervention components and Co-delivery of interventions.

AUTHOR	BRIEF DESCRIPTION OF THE STUDY	LESSONS LEARNT AND INCORPORATED INTO THE CURRENT STUDY
Baptiste et al., (2006),	The study aimed to develop a youth HIV/AIDS prevention intervention in South Africa and Trinidad. Researchers decided the study focus and introduced the intervention to community leaders to gain entry into the community. Community Advisory Boards were formed to oversee cultural adaptation of the intervention and implementation of phase 2 of the study (a randomized efficacy test of the intervention) and. Focus groups and interviews used to contextualise the project. Used significant community members (influential people) to pilot and deliver the intervention.	Use of significant others in the community to deliver the intervention
Panter-Brick, et al. (2006)	This was an intervention study to prevent malaria in Gambia. It comprised 3 phases including 1. understanding the local context, 2. Intervention development and 3. Evaluation. Phase 1- included in-depth interviews and focus group discussions with residents and stakeholders to obtain views of malaria, malaria transmission, local usage and relative value of bed nets, and social responsibilities for purchasing nets and maintaining them in good condition. Additionally, observation and 3 surveys on insecticide treated nets (ITN) usage were conducted. Phase 2 - intervention delivery using songs and posters was suggested by the community. Phase 3 - Evaluation of cultural effectiveness and health impact	Use of FGDs and interviews to explore local context.
Dickinson, (2011)	The study was conducted in rural South Africa. The intervention focus was developed by researchers. Researchers used peer educators to identify myths about HIV/AIDS in the community. Later, workshops were conducted to discuss the myths and develop stories to respond to these. Stories were refined iteratively. Interviews were used to supplement the data. Feedback was given to the peer educators on the findings of the study.	Co-development workshops for the intervention components
Kamanda, et al. (2013)	The study was conducted in Western Kenya to develop a public health intervention for orphaned children. To gain entry into the community, the researchers introduced the project to the District Administration and DC. The project was then introduced to the district stakeholders through meetings. Study sites were chosen by researchers purposively and based on history of receipt of the government subsidies. Community meetings were used to explain the project to the community and, in return, get their views, respond to their questions and seek their support for the project. The topic was	Entry into the community through gate keepers.

AUTHOR	BRIEF DESCRIPTION OF THE STUDY	LESSONS LEARNT AND INCORPORATED INTO THE CURRENT STUDY
	determined by the researchers and only got the community to understand and support it. Formed a Community Advisory Group to review and refine study procedures and data collection tools. CAB was also involved in reviewing and analysing study findings.	
Puffer et al. (2013)	The study conducted in Tanzania. Researchers identified the intervention priorities using existing data which showed high pregnancy rates in the study sites. The sites were not co-identified with community partners. The topic was introduced to the participants (students) who were requested to write essays about teenage pregnancies, its causes and implications. The study used 1 week long workshops to identify priority causes of teenage pregnancies and sources of information about sexuality in the community. This formed basis for scripting and development of films that were designed by participants. Not clear on who decided on the mechanism of delivery of the films.	Using existing data and research evidence to develop ideas for research focus
Wereta et al., (2018).	This study aimed to develop a community participatory quality improvement intervention. The topic was chosen by the researchers and the community was engaged to discuss priority quality improvement issues and interventions.	Prioritisation of solutions by the community
Phiri, et al. 2021	Used PR to identify barriers to men's access to TB diagnosis in Malawi. The topic was identified by researchers. In-depth interviews of men and women were used to identify possible barriers. These were then taken to co-development workshops to identify interventions. Following each workshop, debrief was held by the professional researchers to identify emerging issues and the conduct of the workshops. community not involved in data analysis. Suggestions of possible interventions from participants included: labour rights legislation; patient welfare support system; and drawing on local leadership to encourage men to seek care. No further development of intervention components beyond identifying the broad intervention categories.	Use of interviews to explore local context Co-development workshops for intervention components and debriefs every after each workshop

Each of the researchers in the studies above used different approaches to partnering with communities to develop intervention in SSA, and engaged with the stages of CBPR to different extents. Importantly, as suggested by Spears Johnson (2016), none of the studies

followed all the recommended stages; a practice that was in agreement with earlier observation that following all the stages is not easy (Wallerstein et al 2006). In most studies, the topic for the study was determined by the researchers and only taken to the community for validation and buy in. Very few studies demonstrated that they sought support from gate keepers such as community leaders (Baptiste et al., 2006), and District Administrators (Kamanda et al., 2013) as an entry point to the communities. Co-identification of community priorities to intervene on was conducted using various approaches (used in combination or alone), including: essay writing (Pfeiffer et al), workshops (Dickinson, 2011, Pfeiffer, 2013, Wereta et al., 2018), and interviews (Dickinson, 2011, Panter-Brick et al., 2006, Phiri et al., 2021). Furthermore, some of the studies involved the community in workshops to co-develop core intervention components (Mitchell et al., 2005, Panter-Brick et al., 2006, Phiri et al., 2021) and refine interventions using community advisory boards (CABs) (Baptiste et al., 2006, Kamanda et al., 2013).

Considering studies vary in the depth of engagement with CBPR stages, using strengths from several studies is likely to strengthen the depth of community involvement. As shown in table 2.3, some of the lessons learnt from these studies for possible incorporation into the current study include: identifying the research focus using existing data and empirical evidence (Pfeiffer, 2013); options for gaining entry into the community (Kamanda et al., 2013); as well as exploration of the local context using focus group discussions and interviews (Panter-Brick et al., 2006). These options can be optimised to suit the context of the current study.

The forgoing CBPR concepts can facilitate the building of community empowerment, critical consciousness and capacity in keeping with the Community Organisation Model which has been described below.

2.4.4 Community Organisation Model

The Community Organization Model is a participatory decision-making process of engaging communities to help them identify their own health problems and generate solutions for these problems (Minkler, 2004). It requires active community participation and aims to empower communities to make their own decisions and to determine their course of action. Community organisation is key to health promotion activities. Evidence shows that health promotion that begins from community contextual needs is more likely to be successful (Glanz et al., 2008). Further, community participation can play a significant role in supporting self-efficacy, sense of control and capacity to adopt healthy behaviours and coping strategies, and in turn, intervention effectiveness (Nabi and Prestin, 2017, Wehmeyer and Shogren, 2016, Nilsen and Hasson, 2020). Overarching principles of the Community Organization Model include community empowerment, critical consciousness raising, community capacity and social capital building, issues selection, as well as participation and selection relevance (Mangum and Dacanay, 2016, Minkler, 2004). These are explored below in detail.

Community empowerment is about developing a sense of ability within the community to identify their own (health) problems and work out solutions (Zimmerman and Eisman, 2017, Haldane et al., 2019, Mangum and Dacanay, 2016). In this process, communities become masters of their own actions and lives. To achieve this, communities need to be engaged in deciding the issues that are important to them (Glanz et al., 2008). This can be achieved by involving community representatives, organisations and groups throughout the process of designing and developing the intervention through participatory methods (Appiah, 2020). A well engaged community is likely to feel empowered to critically analyse their situations; a concept called Critical Consciousness (Chronister et al., 2020).

Critical consciousness raising occurs when communities intuitively and consciously analyse their own problems and decide on what should be changed (Chronister et al., 2020, Glanz et

al., 2008). This can be achieved through continuous dialogue with people, helping them to link problems to their root causes and how these are related to the desired actions that are to be undertaken. Tools such as causal pathways (Paasche-Orlow and Wolf, 2007) and theories of change (Better_Evaluation, 2018) are more likely to offer opportunities for the community to appreciate the linkages between risk factors, their drivers and how these lead to the development of the problem (e.g. hypertension). Additionally, how the risks could be reduced is also appreciated. Critically conscious communities draw on available capacities within themselves to effect the desired change (Mangum and Dacanay, 2016).

Community capacity refers to abilities such as skills, leadership, joint-working and resource mobilization within the community (van Herwerden et al., 2019). It concerns community members' capacity to jointly evaluate their problems, identify causes and respective solutions, as well as take actions like resource (financial, human or material) mobilisation to support behaviour change. By actively involving communities in problem identification, critical root cause analysis and solution development, competencies can be built for handling both current and future challenges in behaviour change as a team (Loss et al., 2007, Nickel and von dem Knesebeck, 2020).

A well-engaged and capacitated community is likely to value its social capital: specifically, networks of relationships of trust within a community (Villalonga-Olives et al., 2018). For example, trusting relationships can determine how communities approach problems, and how they address each other and the community leadership. High levels of social capital are likely to build communities where each member is valued and respected, and collaborative working is enjoyable (Dudwick et al., 2006). Such a community is more likely to be effective in dealing with problems through careful joint-selection of community needs, i.e., issues selection.

Issues selection involves agreeing achievable goals that put the community before an individual (Glanz et al., 2008). Issues selection is likely to be achieved by ensuring each

community member is engaged to ensure that everyone has an input into decision-making and thus own the decisions. To engage the community successfully, researchers can work with community representatives such as stakeholders because it is impossible to have input from each community member individually (Wight et al., 2014). For intervention development, this approach is in line with guidance that, in any attempt to deal with community problems, solutions should stem from the community themselves (Haldane et al., 2019). Each member or community representative must be given an opportunity to contribute. This ensures that communities' experiences feed into an intervention which in turn is deemed as relevant to the community involved.

Section summary

The 6SQuID Model, an intervention development framework was considered as potentially useful to inform intervention development in this study. The 6QuID Model can provide overall scaffolding for the intervention development process. Beside guiding intervention development from problem identification to obtaining sufficient evidence for effectiveness to warrant a full-scale evaluation, 6QuID emphasises the involvement of communities in developing context sensitive interventions. This can be practically implemented using principles of the Community Organisation Model implemented through a community-based participatory approach (which is elaborated on in Chapter 3) to identify context sensitive issues to intervene on and how to do this. Moreover, participation of all stakeholders to act and bring about the desired lifestyle changes is key to the development of effective behaviour change interventions (Arena et al., 2015). An example of an intervention that was conducted in South Africa using this approach, where health clubs mobilised and facilitated by local community members yielded positive weight loss results (Puoane et al., 2012), provided evidence that community ownership obtained through constant engagement has the potential to facilitate development of more effective interventions including their sustenance (Nilsen and Hasson, 2020, Abildgaard et al., 2020).

This current study selected the 6SQuID Model to provide a framework for intervention development (at individual and interpersonal levels of the SEM) which required adequate community participation. To provide understanding of what community involvement would do, concepts of the Community Organisation Model were drawn upon. To employ these models, formalised theories of behaviour change needed to be considered to provide an underpinning rationale for the intervention theory of change. The next section discusses and evaluates the theories used in this study.

2.5.0 Theories of behaviour change

Theories of behaviour change represent existing evidence on the mechanisms of action (i.e. mediators) and moderators of behaviour change, as well as assumptions about the meaning of human behaviour, including what influences it (Davis et al., 2015). Despite there being multiple approaches, theories of behaviour change use similar principles, albeit applying them differently (Conner and Norman, 2017). Intervention researchers advocate for the use of theory-based interventions because they are deemed to be more effective in delivering desired behaviour change, as they tend to be more focussed on the attainment of the desired outcome(s) through well-outlined pathways (Glanz and Bishop, 2010, Prestwich et al., 2015). Current thinking promotes the use of multiple theories of behaviour change in multilevel interventions to act synergistically at different levels of the SEM (O'Cathain et al., 2019). Furthermore, evidence shows that anchoring interventions in formalised theories of behaviour change produces well formulated change mechanisms especially if the theories have a strong explanatory power (Wight et al., 2014).

Nevertheless, despite being found to be useful (Glanz and Bishop, 2010, Haldane et al., 2019, Wight et al., 2014), some researchers have established very little to no impact by interventions anchored on formalised theories on behaviour change (Gardner et al., 2011, Roe et al., 1997, Stephenson et al., 2000, Samdal et al., 2017). Two key reasons for such failures have been proposed: poor application and inappropriate choice of a theory (Davis et

al., 2015). Poor application of theories (e.g., where a theory does not link well with behaviour change techniques or is not well linked to change mechanisms) is likely to lead to a reduction in intervention effectiveness. Moreover, if a theory does not address the main determinants of the behaviour targeted for change (inappropriateness), it is unlikely to have a positive impact.

This study sought to develop a multi-level intervention (individual and interpersonal level) to reduce the risk of hypertension in Zambia's urban areas. Taking into account the evidence that single theories are not enough (O'Cathain et al., 2019), elements of three different theories of behaviour change were preferred to synergistically elucidate behaviour change mechanisms in the theory of change at individual and interpersonal levels of the SEM. A behaviour change framework (the Behaviour Change Wheel - BCW) (Michie et al., 2014) was used to provide fundamental underpinning of what would be required to change, as well as potential activities (intervention functions) to help bring about the desired change in the theory of change. The study also drew on Self-determination theory (SDT) (Ryan and Deci, 2000) and Social Cognitive theory (SCT) (Bandura, 1997) to further elucidate how the intervention functions would produce change. These theories are further explored in the next section.

2.5.1 The Behaviour Change Wheel

The BCW, developed from a synthesis of evidence from nineteen (19) behaviour change frameworks, is a behaviour change framework providing a systematic and structured way of identifying intervention and policy functions likely to bring about change based on the established target behaviour (Michie et al., 2014).

The wheel comprises three levels including a behaviour system, COM-B (Capacity, Opportunity and Motivation - Behaviour), at the centre surrounded by change mechanism activities, called intervention functions. The outermost circle, called policy categories.

provides support for the adoption and maintenance of the desired behaviour (Michie et al., 2011c). Once a behaviour that needs to change, including the new desirable behaviour to be adopted, is identified, designing an intervention requires selection of intervention and policy functions before proceeding with the choosing of active ingredients and delivery modes (Michie et al., 2014). For the current study, the two inner layers of the BCW will be employed to decide what the intervention can target to change (i.e., capability, opportunity, motivation) in the intervention end-users as well as which activities to use to facilitate behaviour change.

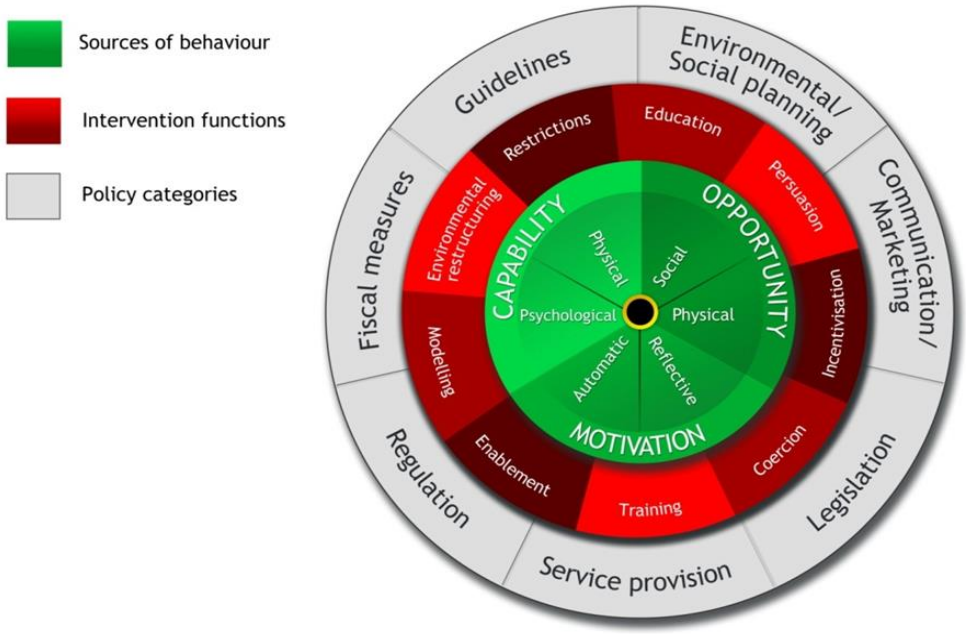


Figure 2. 2 **The Behaviour Change Wheel**
(From *www.behaviourchangewheel.com*)

The COM-B Model, at the hub of the BCW, is a behaviour model used to identify what, in terms of **C**apability, **O**pportunity and/or **M**otivation, need to change in order for intervention

users to adopt the target/desired behaviour. The COM-B Model proposes that for people to adopt a target/desired health behaviour (B), they need physical and psychological capability (C) to do so, supportive physical and social opportunities (O), and sufficient automatic or reflective motivation (M). As Figure 4.2.2 shows, the COM-B parameters interact. For example, higher motivation can increase the likelihood of an individual adopting a behaviour. A well adopted behaviour can, in turn, lead to further motivation to sustain the behaviour and attempt to make additional changes. Furthermore, both capability (C) and opportunity (O) have direct and indirect (through motivation) influence on behaviour.

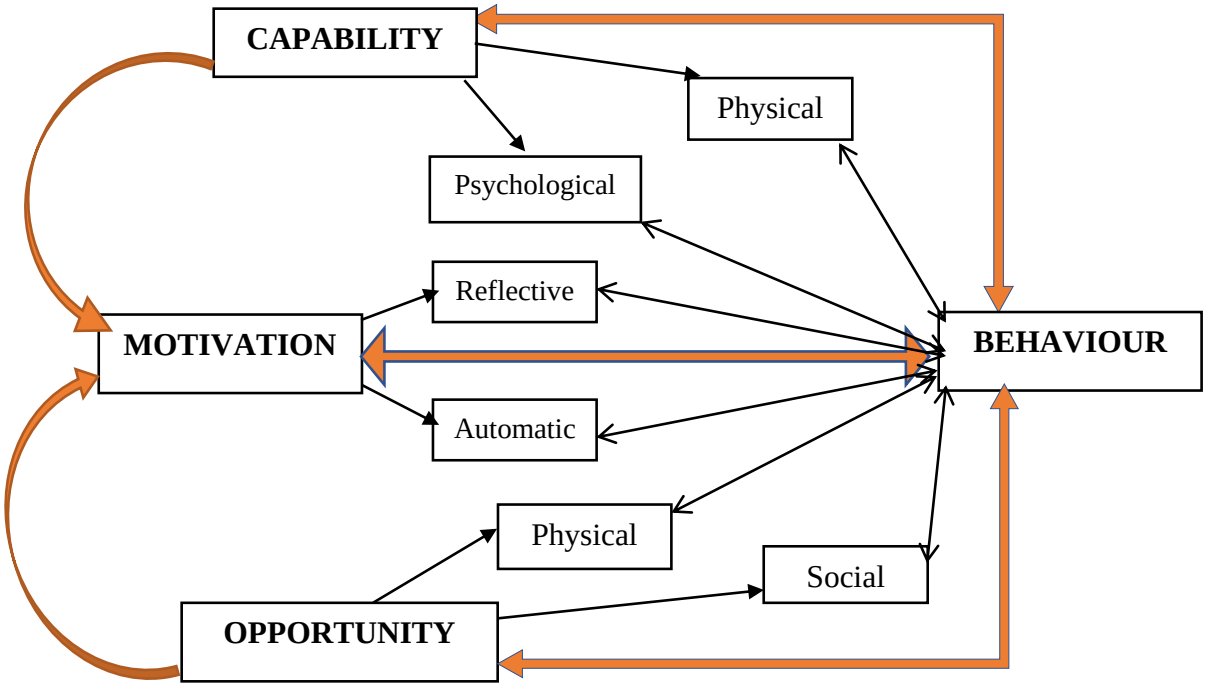


Figure 2. 3 The COM-B model

Capability refers to an intervention user's psychological and physical competency to adopt a desired target health behaviour (Michie et al., 2014). Psychological capability denotes an individual's capacity to think clearly or apply their mind effectively based on what they know (Michie et al., 2011c). As such, it can be argued that levels of knowledge play a key role in developing psychological capacity. To adopt a behaviour, a person needs to apply

their mental capacity to understand what it means, the merits of adopting it and demerits of not doing so; a concept similar to what the Community Organisation Model coined as Critical consciousness (Chronister et al., 2020). Physical capability means the bodily ability to engage in activities. Adopters of a target behaviour need to have skills and be physically capable of engaging in the activity (Michie et al., 2011c). For example, there is no benefit in engaging a wheelchair user in an intervention that aims to encourage people to walk at least 150 minutes per week. Therefore, to change such physical activity behaviour, the intervention user must be capable of adopting and sustaining the desired behaviour which must be supported by environmental opportunities.

Opportunity refers to factors outside an individual's full control that can facilitate or impede adoption of a desired behaviour, including the social and physical environments around the intended adopters of a target behaviour (Michie et al., 2014). Examples of social opportunities that influence behaviour include social networks, norms, culture and social support (Verheijden et al., 2005). Environmental opportunities include physical and built environments (Michie et al., 2011c). For example, built environments like cycle-paths can support and facilitate improvements in interventions aimed at increasing cycling (Aldred, 2019). There must be enough opportunities available to facilitate adoption of intended behaviours if the intervention is to succeed in helping users change behaviour. However, for intervention users to change behaviour in the presence of opportunities, they need motivation.

Motivation is defined as mental processes involved in the generation of behaviour such as critical analysis/appraisal, emotion and decision-making. Motivation is either reflective or automatic (Michie et al., 2014, Michie et al., 2011b). Reflective motivation refers to individuals' ability to plan and reflect on the desired behaviour change. It is similar to the principle of self-efficacy advanced by other theories (Lewis et al., 2016, WHO, 2012, Redding and Evers, 1997, Wehmeyer and Shogren, 2016, WHO, 2004). Automatic

motivation relates to habit formation from associative learning or a person's natural inclination to perform a behaviour (Michie et al., 2011b). Automatic motivation is similar to what other formalised theories, such as SDT (Ackerman, 2018), call autonomous motivation (Knittle et al., 2018), which has been explained in section 2.5.2.

The COM-B Model extends the principle of intervention mapping, which seeks to map behaviours onto their theoretical causes from epidemiological principles in order to identify intervention components (Kok et al., 2011). COM-B, however, emphasises that multiple, interlinked behaviours (and their determinants) must be considered comprehensively when deciding which behaviour(s) to intervene on. It is premised on the idea that theoretical determinants of behaviour exist in a system of interlinked factors (Michie et al., 2014); all of which must receive attention. A change in one factor/behaviour can affect or be affected by another behaviour. Intuitively, the COM-B adopts a much wider approach to behaviour change, covering determinants of behaviour within an individual as well as his/her social and physical environment.

In conclusion, the COM-B Model, a component of the BCW, can be used to guide the identification of what needs to be changed in terms of capabilities, opportunities and motivation of the targeted adopters of the desired behaviour. The BCW then guides intervention designers on correctly identifying intervention functions through which capacity, opportunity and motivation can be enhanced to facilitate behaviour change. Intervention functions (Table 2.4.1) are types of activities, e.g. health education, to produce the needed change in capability, opportunity and motivation (Michie et al., 2014). Similarly, policy functions, e.g., development of guidelines, to promote sustainable behaviour change are also mapped. The BCW culminates in the identifying of intervention and policy functions. How to produce the desired behaviour change using intervention and policy functions through behaviour change techniques (BCTs) is explored by BCT taxonomies

(Abraham and Michie, 2008). Additionally, intervention content and delivery modes are determined outside the BCW framework (Michie et al., 2014).

Existing evidence shows that development of interventions should always start from a consideration of which behaviour change models capture a considerable range of internal (e.g. psychological capability) and external (e.g. social support as part of physical opportunity) change mechanisms (Michie et al., 2011c). The combination of several models is advantageous because no single model is capable of explaining all aspects of behaviour change required due to the complexity of human behaviour (Michie et al., 2014).

Table 2. 3 Definitions of intervention functions and implementation/policy categories

Intervention Function	Definition
Education	Increasing knowledge or understanding
Persuasion	Using communication to induce positive or negative feelings or stimulate action
Incentivization	Creating an expectation of reward
Coercion	Creating an expectation of punishment or cost
Training	Imparting skills
Restriction	Using rules to reduce the opportunity to engage in the target behaviour (or to increase the target behaviour by reducing the opportunity to engage in competing behaviours)
Environmental restructuring	Changing the physical or social context
Modelling	Providing an example for people to aspire to or imitate
Enablement	Increasing means/reducing barriers to increase capability (beyond education and training) or opportunity (beyond environmental restructuring)
Policy categories	**Definition**
Communication/marketing	Using print, electronic, telephonic, or broadcast media
Guidelines	Creating documents that recommend or mandate practice. This includes all changes to service provision
Fiscal measures	Using the tax system to reduce or increase the financial cost
Regulation	Establishing rules or principles of behaviour or practice
Legislation	Making or changing laws
Environmental/social planning	Designing and/or controlling the physical or social environment
Service provision	Delivering a service

In view of the foregoing, the BCW can be used to identify ways of changing behaviour. However, it requires to interface with underpinning formalised theories (beside the COM-B which is nested within the BCW) about what drives people to change behaviour and how the change takes place. This is likely to promote the development of theory based interventions which have been found to be more effective in changing behaviours (Wight et al., 2014).

2.5.2 Self-Determination Theory

Self-determination is a psychological theory of human motivation that explains people's goal-directed behaviour change (Ryan and Deci, 2000). It involves an understanding of what

drives people to behave the way they do. According to SDT, human behaviour is influenced by three basic human needs: autonomy, competence, and relatedness.

2.5.2.1 Autonomy

Autonomy refers to individuals' level of power/authority to make their own decisions and choices (Wehmeyer and Shogren, 2016, Ryan and Deci, 2000). Behaviour change is more likely when autonomy is high, i.e., when individuals engage in a particular behaviour because they feel they have chosen to do so and not because they are externally coerced. As such, the choice of behaviour must be initiated and driven by a personal conscious intention and decision focussed on an ultimate end or goal (Wehmeyer and Shogren, 2016). For this to happen, individuals must develop an inner sense that they are in control of their own behaviour.

Healthy behaviours are not naturally easy to adopt. Individuals must value, endorse, internalise and own the target behaviours in an intervention if they are to succeed in changing behaviour. This can be achieved through motivation (external or internal) or fostering of autonomy. According to the SDT, motivation can be on a continuum (Table 2.4.1) from amotivation to intrinsic motivation i.e., non-self-determined to self-determined, respectively. Within extrinsic motivation is a continuum of regulation indicating the degree to which the behaviour has been integrated into the individual's sense of self. Progress on this continuum is characterised by progressively increasing self-determination, which is maximised with integrated regulation (Ryan and Deci 2000). Superior to these is intrinsic motivation where autonomy of actions ensures that an individual personalises, values, endorses and 'owns' behaviour change. In this way, with or without external influence, people can make their own decisions about adopting healthy behaviours.

Table 2. 4 Continuum of motivation according to Self-Determination Theory

TYPE OF MOTIVATION	REGULATION STYLE	MEANING OF THE LEVEL OF REGULATION
Amotivation	Non-Regulation	There is no perceived competence, control or intension.
Extrinsic Motivation	External regulation	Externally derived motivation driven by external influences such as rewards, praise, obedience to a set rules, fear of unpleasant outcomes/repercussions.
	Introjected regulation	Somewhat externally derived motivation is internalised and regulated by a sense of self-esteem, self-control, ego, desire for internal rewards (e.g., pride, shame avoidance etc) and punishments.
	Identified regulation	Minimally internally derived motivation which is regulated by factors such as personal importance and conscious valuing. Behaviour is clearly recognised and fully valued by an individual
	Integrated regulation	The most autonomous kind of extrinsic motivation. It is characterised by internally derived motivation that is regulated by awareness of an internally synthesised need to do something. There is integration of a behaviour into self-perception/self-image. Behaviour is completely integrated into personal values and beliefs
Intrinsic Motivation	Intrinsic regulation	Internally derived motivation regulated by personal interest, internal enjoyment and satisfaction. Behaviour is adopted because one enjoys doing it and feels satisfied.

Note: Arrow shows direction of increasing motivation to change behaviour

To build autonomy, interventions can focus on providing clear information that is useful to the users, providing a rationale for the change, avoiding external pressure, supporting desired behaviour and identifying and finding solutions to barriers to change (Wehmeyer and Shogren, 2016).

2.5.2.2 Competence

Competence is a psychological need to feel effective i.e., feeling able to adopt and execute a behaviour satisfactorily (Legault, 2017). People must have confidence in their capacity to make things happen as agents of their own change. Interventions can focus on building a sense of competence/capacity amongst intervention users to initiate action, determine how the action works (mechanism) and take every step to the ultimate end. Competence can be achieved through behaviour change techniques such as information provision (e.g. education) and tailoring tasks to individuals' situations, i.e. providing an optimal challenge (Gillison et al., 2019) An intervention user whose sense of competence is improved is more likely to engage in, achieve and maintain behaviour change.

2.5.2.3 Relatedness

Relatedness refers to a sense of shared experience, connectedness and having meaningful relationships with others, such as fellow intervention participants (Ryan and Patrick, 2009, Legault, 2017). People are more likely to be motivated to adopt behaviours that allow them to form and enjoy good relationships with other people involved in the intervention and the wider community. Furthermore, a sense of belonging to a group of people attempting to achieve similar goals is likely to create a drive to change lifestyles. For example, physical activity buddies can spur one another on to achieve their physical activity goals (Hunter et al., 2012, Shamizadeh et al., 2019). As such, relatedness becomes useful in group-based interventions.

2.5.3 Social Cognitive Theory

The SCT operates on the principle that behaviour is determined by multi-level factors: psychological factors, human capacities and environmental factors (Bandura, 1986b, Beauchamp et al., 2019, Bandura, 1989). These are now discussed in turn.

2.4.3.1 Psychological factors

Psychological factors include the building of outcome expectations, as well as individual and collective self-efficacy (Glanz et al., 2008, Thojampa and Sarnkhaowkhom, 2019). Behaviour is often driven by beliefs about the outcomes (outcome expectations) of an intended behaviour change and the value placed on it (Luszczynska and Schwarzer, 2005). The principle is that actions toward an intended behaviour are usually aimed at minimising cost while maximising benefit. People use foresight to work towards a desired expected physical outcome while foregoing immediate benefits of alternative undesirable behaviour. On the one hand, behaviour is driven by how an individual expects to feel if they do or do not behave in a particular way. On the other hand, anticipated social outcomes, such as approval by peers, also drive behaviour change (Luszczynska and Schwarzer, 2005). Anticipated social outcomes are about how people will judge/or evaluate a person's actions and how ready that individual is to adjust their behaviour to satisfy social norms.

Beside outcome expectations, self-efficacy also helps drive behaviour change (Bandura, 1997). This is a belief about capacity to perform the desired behaviour (Thojampa and Sarnkhaowkhom, 2019). Self-efficacy can be perceived individually or be community centred. Individual centred self-efficacy is about an internal or personal belief about one's ability to influence change. Alternatively, community-centred self-efficacy is about collective efficacy. It is about how an individual's social network believes in their collective capacity to bring about change. In the presence of a supportive environment and individual capacity to perform a behaviour, collective self-efficacy to adopt healthier lifestyles can facilitate successful behaviour change.

2. 4.3.2 Human capacities

Human capacity means that, to adopt a desired target behaviour, one must have the ability to perform the activity (Glanz et al., 2008). For example, for individuals to increase consumption of fruit, they must be capable of buying fruit and eating it. Human capacities include forethought (thinking through the action to be taken and the consequences associated with it), self-reflection (evaluating one's actions, experiences and consequences) and self-regulation (the ability to set one's behavioural goals and meet them) (Nabi and Prestin, 2017). These factors build an individual's self-management skills. According to Bandura (1997), self-management/regulation capacity can be achieved through goal setting (individuals setting their own goals and how to achieve them), self-monitoring (monitoring one's own behaviour, e.g. recording physical activity), self-feedback (such as self-reward for good behaviour), self-instruction (giving oneself instructions before performing a task) and enlistment of a social support systems like physical activity buddies (Glanz et al., 2008, Bandura, 1989, Shamizadeh et al., 2019).

2.4.3.3 Environmental determinants

For behaviour learnt and psychological factors like self-efficacy to lead to sustainable adoption of desired behaviour, one's environment must be supportive. According to SCT, environmental support includes external incentivisation (reward) of desired behaviour or facilitation (including environmental modification, social support and observational learning) (Bandura, 1986b, Glanz et al., 2008, Nabi and Prestin, 2017).

Incentivisation can be reward for desired behaviour or punishment for undesirable behaviour. To promote adoption of health behaviour, an intervention may include rewards (e.g., a gift for well executed behaviour). Punishment may become a disincentive because it can create apprehension if applied directly. Indirect negative incentivisation like increasing tax on cigarettes leading to increased cost has been found to be more effective (Chaloupka et al., 2011, Adda and Cornaglia, 2010). However, such high-level interventions are not

applicable to individual and interpersonal level intervention as is the focus for the current study.

Facilitation includes factors that are likely to support and promote adoption of a desired behaviour such as environmental adjustment to remove barriers to behaviour change (e.g. creating play parks to encourage adoption of physical activity), social support (e.g. physical activity buddies or group based programmes) and observational learning (modelling e.g. a high standing person in the community who has reduced weight demonstrating to intervention participants on how to lose weight) (Bandura, 1986b, Nabi and Prestin, 2017). Observational learning and social support can be applied to individual and interpersonal levels of interventions and have been widely used in health behaviour change interventions (Webb Girard et al., 2020). Modelled behaviour is more likely to be imitated if the model is perceived as similar to the imitators (Glanz et al., 2008). Additionally, interventions can use modelling of behaviour (Thojampa and Sarnkhaowkhom, 2019) to promote sustenance of behaviour change, e.g. using an example of a local resident who may have managed to sustain lifestyle changes. Behaviour modelling has been found to be more effective than instruction-based approaches (Glanz et al., 2008). As such, a consideration of environmental determinants is key to intervention development.

Section summary

The foregoing section explored the potential use of the COM-B Model (as presented within the BCW), the SDT and SCT in this study. The COM-B Model is useful for identifying aspects (capability, opportunity and motivation) in the intervention users that need to change to enable them to adopt the desired behaviour. Once identified, these are mapped onto intervention functions (such as health education). How the intervention functions can result in behaviour change is then clarified using the SDT and SCT.

Self-determined people employ their autonomy and sense of control to determine their own actions. They have an inner belief in their autonomy to bring about change through their own

actions, as well as to respond to challenges they may face. When faced with a challenge, a self-determined person can ascertain what they should do by analysing the discrepancy between their current position and where they need to be. They will then assess their own capacity (e.g., knowledge, skills) to take appropriate action. If capacity is deficient, there is an inner drive to acquire the missing capabilities (Wehmeyer and Shogren, 2016). Once capacities are acquired, the likelihood of an individual working on mechanisms of how to reduce the current position-target discrepancy. SDT therefore, works towards motivating users so that they take control of initiating behaviour change and sustain it over time (Ryan et al 2008). Users can take control if their psychological needs (autonomy, competence and relatedness) are met, which has been shown to be effective in producing good health behaviour outcomes such as improving physical activity, body weight control, vegetable and fruit consumption (Ryan et al 2008, Teixeira et al 2015).

Despite relatedness operating at interpersonal level, both autonomy and competence are individual level psychological needs. However, relatedness alone is inadequate to underpin all behaviour change mechanisms and techniques at the interpersonal level. For example, it does not account for observational learning at interpersonal level. An additional theory is needed to operate at the interpersonal levels. As such, SCT can be employed to cover this gap.

The SCT posits that if intervention users' psychological factors (e.g., outcome expectations and self-efficacy), human capacities (self-management skills) are built and a conducive environment (e.g., social support) provided, they are likely to succeed in changing behaviour. SCT's psychological constructs and human competencies operate at an individual level similar to autonomy and competence of the SDT. The environmental factors operate at interpersonal and community levels of the SEM.

As table 5.2 Shows, the formalised theories of behaviour change, COM-B, SDT and SCT, have been summarised to highlight the change mechanisms and how these can be developed

focussing on the individual and interpersonal levels of the SEM. A combination of three theories of behaviour change to underpin the pathways in the theory of change for a multi-level behaviour change intervention in the current study was in keeping with recommendations that interventions that use multiple theories are likely to be more effective (O'Cathain et al., 2019). As indicated above, intervention users can change behaviours if their capability, opportunity, and motivation (COM-B) are changed. How these would be changed is elucidated by the SDT (e.g., by building autonomy and competence [individual level] and relatedness [interpersonal level]) and SCT (e.g., by building human capabilities such as self-management skills [individual level] and social support [interpersonal level]). These are likely to synergistically provide a rationale for the change mechanisms of the intervention ToC at the targeted levels of the SEM.

Table 2. 5 Summary of the theories of behaviour change for inclusion in the intervention, including change mechanisms, levels of intervention in relation to and how to build them.

THEORY	CHANGE MECHANISMS	DEFINITION OF THE CHANGE MECHANISM	LEVEL OF INTERVENTION	HOW TO BUILD THE CHANGE MECHANISMS
COM-B MODEL	Capability	Psychological and physical competency to adopt a desired target health behaviour	Individual level	Build autonomy, competence and human capabilities (self-management skills)
	Opportunity	Social and physical environmental factors outside an individual's full control that can facilitate or impede adoption of a desired behaviour	Interpersonal level	Build a sense of relatedness and social support
	Motivation	Reflective or automatic mental processes involved in the generation of behaviour	Individual level	Build psychological factors (e.g., outcome expectation, self-regulation)
SELF-DETERMINATION THEORY	Autonomy	Individuals have the power/authority to independently make their own decisions and choices	Individual level	Provide clear information useful to the users
				provide rationale for the change
				Avoid external pressure
				Support desired behaviour
				Identify solutions to barriers to change
	Competence	People must have the capacity to make things happen as agents of their own change. This means that individuals must have an inner sense of power and belief in their ability to independently achieve the set targets through self-initiated and guided actions. People must understand that it is their actions, and not those of others, that will bring the change needed.	Individual level	Provide tools, skills and knowledge necessary for change
				Provide support when barriers are experienced
				Avoid over-dosing (e.g., having too many group sessions) the intervention behaviour change components.
				Help users to be masters of their own change

THEORY	CHANGE MECHANISMS	DEFINITION OF THE CHANGE MECHANISM	LEVEL OF INTERVENTION	HOW TO BUILD THE CHANGE MECHANISMS
COM-B MODEL	Capability	Psychological and physical competency to adopt a desired target health behaviour	Individual level	Build autonomy, competence and human capabilities (self-management skills)
	Opportunity	Social and physical environmental factors outside an individual's full control that can facilitate or impede adoption of a desired behaviour	Interpersonal level	Build a sense of relatedness and social support
	Motivation	Reflective or automatic mental processes involved in the generation of behaviour	Individual level	Build psychological factors (e.g., outcome expectation, self-regulation)
	Relatedness	Foster a sense of relationship between users and professionals, fellow intervention users and wider social networks. This relatedness is likely to add motivation for users to adopt and internalise behaviours.	Interpersonal	Show respect and understanding for the user's situations, feelings, views and opinions
				Demonstrate care
SOCIAL COGNITIVE THEORY	Psychological factors	These include building of outcome expectations as well as individual and collective self-efficacy. Behaviour is often driven by beliefs about the outcomes of an intended behaviour change and the value placed on this change	Individual level	Induce a sense of positive outcome expectation around the target health behaviour
				Create a sense of self-efficacy through e.g., goal setting and persuasion
	Human capacities	This entails that adopters of behaviour should have the ability to perform the target behaviour. This includes Self-management skills	Individual level	Build skills for self-monitoring
				Build goal setting skills
				Create abilities to enable individuals to reward themselves for healthy behaviours adopted
				Impart skills for self-instruction

THEORY	CHANGE MECHANISMS	DEFINITION OF THE CHANGE MECHANISM	LEVEL OF INTERVENTION	HOW TO BUILD THE CHANGE MECHANISMS
COM-B MODEL	Capability	Psychological and physical competency to adopt a desired target health behaviour	Individual level	Build autonomy, competence and human capabilities (self-management skills)
	Opportunity	Social and physical environmental factors outside an individual's full control that can facilitate or impede adoption of a desired behaviour	Interpersonal level	Build a sense of relatedness and social support
	Motivation	Reflective or automatic mental processes involved in the generation of behaviour	Individual level	Build psychological factors (e.g., outcome expectation, self-regulation)
				Develop skills for self-enlistment of social support systems (to support intended behaviours)
	Supportive environments	Creating an environment that supports the desired behaviour (e.g., physical activity grounds or enlisting social support to support physical activity).	Interpersonal level	- Modify and redesign the built environments - Incentivisation of desired behaviour - Provide social support

2.6.0 Behaviour change techniques

Behaviour change technics (BCTs) comprise behavioural interventions' active ingredients that enable intervention users to change behaviour (Michie et al., 2011c). Michie et al. (2013 pg 82) define BCTs as "observable, replicable, and irreducible components of an intervention designed to alter or redirect causal processes that regulate behaviour." BCTs, therefore, provide an understanding of how behavioural interventions work and allow for a standardised way to identify and apply them in interventions (Michie 2008). Additionally, standardised and well described BCTs allow for accumulation of knowledge and replication of studies in other settings beyond the initial implementation site (Michie et al., 2013). Furthermore, BCTs facilitate a universally acceptable way to evaluate behavioural change interventions (Johnson et al., 2014). As such, researchers recommend that interventions be well described in terms of their components and ingredients (BCTs) because if poorly specified, described and implemented, effect size is usually compromised (Taylor et al 2012). BCTs are described in different behaviour change taxonomies.

BCTs taxonomies refer to hierarchical classification or categorization of BCTs (Michie 2008). Over the years, BCT taxonomies have evolved from an initial 26 targeting physical activity and dietary behaviour change (Abraham and Michie, 2008) to a more refined 40 item Coventry, Aberdeen and London-Refined [CALO_RE] taxonomy generated from a synthesis of 221 interventions (Michie et al., 2011a) and focused on the same behaviour domains (physical activity and diet) as Michie's 2008 taxonomy. These earlier behaviour specific taxonomies of BCTs have undergone iterative reviews and improvements to produce a more organised, clustered, hierarchical 93 item Behavioural Change Taxonomy categorised into 16 groups (Michie et al., 2015, Michie et al., 2013, Abraham et al., 2015) of BCTs, which is applicable to multiple behaviours (Abraham and Michie, 2008, Michie et al., 2008). The latter taxonomy provides a comprehensive and widely accepted list of possible BCTs for behaviour change intervention designers to use during development,

implementation, reporting and evaluation (Michie, 2012, 2013). Despite the clustered cross-behaviour BCTs taxonomy being available, intervention designers can also draw on existing behaviour specific taxonomies to develop intervention specific for target behaviours, as described in the next paragraph.

Researchers have established that despite taxonomies of BCTs being potentially applicable universally, some have been found to be more effective in changing certain health behaviours than others (Michie et al., 2013). For example, there are taxonomies that have been found to be effective specifically for smoking cessation (Michie et al., 2009c), cardiovascular disease prevention (Suls et al., 2020) and reduction of excessive alcohol intake (Michie et al., 2012). Similarly, BCT taxonomies such as the CALO-RE, have been developed for interventions aimed at increasing physical activity and healthy eating (Michie et al., 2009a). These behaviour specific taxonomies provide a more specific list of potential BCTs for intervention designers to choose from when intervening on specific behaviours including diet and physical activity behaviours.

Researchers have explored various combinations of BCTs used in diet and physical activity interventions (Michie et al., 2009a, Samdal et al., 2017, Cradock et al., 2017). A systematic review of 101 papers that synthesised 122 evaluations (N=44 747) of diet and physical activity interventions established that interventions that combined self-monitoring (e.g., using a monitoring activity log) with at least one or more of the self-regulation techniques (intention formation for behaviour change, feedback on behaviour [e.g. praising participants for achieving set milestones] (Samdal et al., 2017), goal setting for behaviour change and review of behaviour goals) showed greater effectiveness (Michie et al., 2009a, Michie et al., 2009b). Samdal et al. (2017) evaluated 48 interventions (N=11, 183) and found that goal setting – behaviour and self-monitoring were more effective in changing diet and physical activity behaviour in both the short and long term. Sustaining of newly adopted behaviours was found to require adding feedback, graded tasks (e.g., gradual increment of physical

activity levels) (Samdal et al., 2017) and environmental manipulation (e.g. creation of cycle paths to promote cycling) (da Silva et al., 2017) to goal setting and self-monitoring. Similar findings (i.e., effectiveness of BCTs above in changing physical activity and dietary behaviours) have been reported in other studies (Cradock 2017). These commonly used, and effective, specific BCTs for diet and physical activity behaviour change provide a checklist from which intervention designers can select.

BCTs can be used alone or in combination. However, existing evidence shows that behavioural interventions are more efficacious when they use multiple BCTs, on average six (Michie et al., 2009a, Dombrowski et al., 2012). The multiple use of BCTs should however be carefully navigated, as employing too many in one intervention may compromise intervention effectiveness (Michie et al., 2009d).

To understand the possible mechanisms of how BCTs bring about the desired change, they need to be linked with formalised theories of behaviour change (Michie and Johnston, 2012, Araújo-Soares et al., 2009). Evidence shows that BCTs used without theoretical basis or linkage to mechanisms of change usually have reduced efficacy (Araújo-Soares et al., 2009). Despite this evidence, very few interventions have linked BCTs to theorised mechanisms of change (Michie et al., 2017). And a few researchers have found no association between theory-based interventions and effectiveness in changing behaviour (Samdal et al., 2017). This may possibly be because Samdal and colleagues did not asses how theories were applied to BCTs considering evidence suggests that poorly applied theories are less effectiveness (Davis et al., 2015).

2.7 Chapter summary

Chapter Two began by evaluating approaches to evidence synthesis and made the case for using scoping review methodology to understand hypertension risk factors in SSA. A broad account of the modifiable risk factors for hypertension on which interventions can

potentially be employed to reduce hypertension risk was given (including unhealthy diets, low physical activity, excess body weight, hyperglycaemia, diabetes mellitus, smoking, excess alcohol intake, sleep deprivation/stress and low socioeconomic status), drawing on global literature relating to hypertension risk. The chapter then turned to exploring the 'levels' at which interventions can be applied using the SEM as a structuring model. It was noted that researchers recommend multi-level interventions to increase potential effectiveness. Having established that a multi-level intervention is preferable, frameworks and models were explored to inform the process for developing interventions. Nine existing frameworks were evaluated and the 6SQuID Model identified as suitable for the current study. The argument was then made that 6SQuID should be supplemented by the Community Organisation Model, to provide explicit guidance on the processes of engaging communities in co-development of interventions. Finally, after identifying the BCW (with COM-B in it) as a behaviour change framework, a review of other formalised theories of behaviour change was conducted and two identified to underpin mechanisms of change in this study, including the SDT and SCT. These theories must be appropriately applied to combination of BCTs to bring about the desired change. The next chapter will explore the methodological choices made in order to operationalise the intervention development approach described and justified in this chapter.

CHAPTER THREE: METHODOLOGY

The challenge of this project was to combine peer-reviewed biomedical evidence and the views, understandings and practices of those living in the community where this work was based, to develop a lifestyle intervention to reduce hypertension risks. The problem was identified from locally generated health information that showed a rise in hypertension. This was then taken to the District Health Office (DHO) (a community representative organisation) where a representative validated the problem and the need for interventions to reduce the risk. After this engagement, a protocol was then quickly developed by the researcher (due to the limited demands of the academic calendar) and submitted to the Ethics Review Board for approval.

Existing evidence on risk factors for hypertension in SSA was explored via a scoping review and the findings used to guide the exploration of understandings, beliefs, attitudes, needs and lived situations of the target end-users of the intervention, using focus groups and interviews. The scoping review and qualitative findings were then synthesised to generate a causal pathway and a theory of change, as well as inform the co-development of core intervention components that were likely to be acceptable, feasible and salient to the community. This required participatory methods (ICPHR, 2013, Bergold and Thomas, 2012). The pilot intervention was tested on a small group using qualitative methods to provide insights into its acceptability and feasibility and quantitative methods to measure potential effectiveness. To develop and test the intervention, the study was divided into four main phases guided by the steps of the 6SQuID Model (Wight et al., 2014) as follows:

Phase One: A scoping review and evidence synthesis to define the problem of hypertension and its causes, and describe which factors were likely to be malleable (6SQuID Step One). The Phase One findings then informed the Phase Two topic guides.

Phase Two: Focus groups with residents (target end-users) and interviews with key stakeholders (e.g., community leaders and health workers) to clarify the problem and its

causes (part of 6SQuID Step One), and identify malleable factors, change mechanisms and possible change delivery channels (6SQuID Steps Two and Three).

Phase Three: Intervention components development – Co-development workshops (6 SQuID Step Four) and how these would be delivered.

Phase Four: Testing of intervention components (materials and tools), assessment of feasibility, acceptability, and potential effectiveness (6 SQuID Steps Five and Six).

This chapter presents the methodology for the first three phases, including data analysis for each phase. However, methodology for the small-scale feasibility study (Phase Four) will be presented in chapter seven.

3.1.0 Evidence synthesis

The scoping review (Phase One of the study and step one of the 6SQuID Model) was conducted to define, understand and synthesise the causes of hypertension in SSA, and describe which factors were likely to be malleable. It involved extracting existing knowledge about the risk factors for hypertension in SSA and identifying the likely malleable factors which would be subjected to community confirmation to suit the study site's context in Phase Two. As discussed in section 2.1, the choice of scoping, against systematic and traditional narrative reviews was made to enable the rapid mapping of a breadth of studies and of a variety of designs, without being restricted to a narrow question, specific study designs or by the need to assess the quality of the included studies (Arksey and O'Malley, 2005).

The scoping review followed the framework developed by Arksey and O'Malley (2005), including 1) identifying the research questions; 2) identifying relevant studies; 3) study selection; 4) charting and 5) collating, summarizing, and reporting the results.

3.1.1 Identifying the research question.

As a first step to the rapid exploration of existing literature, a research question to guide the focus of the review was developed. Considering this study was about developing an intervention to reduce the risk of hypertension, there was a need to identify the risk factors likely to be responsible for the increase in the disease. From these risk factors, the researcher sought to identify which ones were likely to be malleable and hence guide the exploration of malleability in the local context (Phase Two). Furthermore, the intervention was targeting Zambia's urban areas; Zambia is a Sub-Sahara African country. As such, the scoping review included studies from SSA.

The PCC (Population, Concept and Context) acronym was used to guide development of the research question (Peters, 2016), which focussed on risk factors for hypertension (Concept) among adults (Population) in SSA (Context). The researcher drafted the specific text of the research question, which was refined iteratively through feedback from the first and second supervisors.

SSA was chosen for two reasons. Firstly, most SSA countries fall in broadly similar economic brackets: SSA countries are all developing countries at different levels of development and were jointly projected to continue advancing at a GDP growth rate of 3.2% and 3.5% in 2018 and 2019, respectively (World Bank, 2018). The socioeconomic status of a country affects people's lifestyles. As such, certain lifestyle dynamics due to economic development are likely to be influenced in similar ways.

Secondly, there are historical and cultural linkages among most SSA tribes. The majority of SSA is occupied by ethnic groupings that originated from the Bantu expansion, providing a particular gene pool among most SSA countries (Bostoen, 2018, Montinaro and Capelli, 2018). The Bantu are believed to have migrated from the area between current Cameroon and Nigeria to Southern, Central and East African regions about 5000 to 1500 years ago (Bostoen, 2018). At sub-regional level later in the early 19th Century, the Ngoni (a Bantu

tribe) from current South Africa invaded Zimbabwe, Mozambique, Zambia, Malawi and Tanzania (Newitt, 2018). The gene pool from such a common historical background might have an effect on the responses of individuals to certain lifestyle factors. A review of the entire SSA, therefore, had the potential to generate knowledge about risk factors of hypertension in Zambia.

The review sought to answer the research question on w*hat is known about the factors contributing to the increase in the prevalence of hypertension in SSA, and which of these factors are amenable to change?*

3.1.2 Identifying relevant studies.

Following the identification of the research question, the next step was to conduct an exploratory article search from Google Scholar to isolate 10 key papers addressing the risk factors for hypertension in sub–Saharan Africa. These 10 key papers were later searched for individually in nine databases (EBSCOhost, PubMed, Medline, Web of Science, ASSIA, PsycInfor, ProQuest, Cumulative Index to Nursing and Allied Health Literature (CINAHL) and EMBASE). Databases that yielded at least four of the 10 key articles were included among those to be used during a detailed search; these included PubMed, Medline, Web of Science, CINAHL and Embase. The initial search was conducted on 15th January 2018 and updated on 27th June 2018. The search terms are provided in Table 3.1 Additionally, hand searches of the Medical Journal of Zambia, African Journals Online and the Journal of Hypertension were conducted to obtain additional relevant records as they were not indexed in the databases searched. Reference lists of any retrieved reviews were also consulted to obtain additional studies.

Table 3. 1 Summary of the search terms used in the searches of the databases and journals

DATABASES	SEARCH TERMS
PubMed, MEDLINE and EMBASE, CINAHL, WEB OF SCIENCE	"hypertension"/"high blood pressure"/"elevated blood pressure"/"blood pressure high" **AND** "Sub Saharan Africa" /"Sub Saharan Africa countries"/ "developing countries"/"Zambia"/"Angola"/"Namibia"/"Botswana"/"Mozambique"/"South Africa"/"Zimbabwe"/"Malawi "/"Tanzania"/ "Democratic Republic of Congo" **AND** "risk"/"risk factors"/"risk factors/correlates"/"risk factors correlates"/"risk factors for hypertension"/"lifestyle risk factors"/"lifestyle risks"/"lifestyle"/ "lifestyle, behaviour"/"lifestyle, risk"/"lifestyle, risk factor"/"lifestyle, risk factors"/"associated factors"/"associated/correlated"/"associated/risk factors"/"correlates"/"vulnerability"/"vulnerability/risk"/"vulnerability factors"/"behaviour"/ "practices"
MEDICAL JOURNAL OF ZAMBIA	hypertension OR high blood pressure OR blood pressure high OR elevated blood pressure
AFRICAN JOURNALS ONLINE	hypertension OR high blood pressure OR blood pressure high OR elevated blood pressure

3.1.3 Study Selection

Retreived records were subjected to title, abstract and full-text screening. To be included, studies needed to be i) empirical studies investigating the risk factors for hypertension and conducted in SSA, ii) multinational studies with at least one country from SSA, iii) studies on humans reported in English, and iv) studies on adults ≥18 years old. Contrasted to systematic reviews, there was no rigorous assessment of the quality of the studies in line with scoping review methodology (Arksey and O'Malley, 2005, Ehrich et al., 2002, Khalil et al., 2016, Levac et al., 2010, Peters et al., 2015). Literature reviews, meta-analyses and scoping reviews were also included. Studies were excluded if they were i) conducted only in non-SSA countries, ii) pregnancy-related studies and iii) studies on children and/or adolescents < 18 years old.

The researcher reviewed all the records at every stage of screening i.e., title, abstract and full article screening. For quality control and reliability of findings, supervisors made independent decisions on a randomly selected sample of 10% of the records at every stage. In case of disagreement, consensus was arrived at through discussions.

3.1.4 Charting

The resulting set of records were subjected to more rigorous reading to extract the following: year of publication, author(s), sample characteristics, study location, aims and objectives, methodology, key findings and study conclusions. The first and second supervisors each extracted data from 5% (total 10%) of randomly selected records and compared their findings with the researcher's. Any disagreements were again resolved through discussion among the three reviewers.

3.1.5 Collation, Summarization, and Reporting

A mixed-methods approach was used to collate and summarise the data (Arksey and O'Malley, 2005). An analysis of the study characteristics listed in section 3.1.4 and risk factors for hypertension identified in each study was conducted. The number of studies in

which each risk factor was explored was used to generate frequencies. Initially, risk factors were classified as non-modifiable (e.g. age) or modifiable using the widely used biomedical model (Ibrahim and Damasceno, 2012a). Considering this study's focus on developing a behavioural change intervention, modifiable risk factors were prioritised for analysis. Modifiable risk factors were summarised according to the Socioecological Model (SEM) (Golden and Earp, 2012, Whitehead and Dahlgren, 1991) to identify those that were more likely to be changeable (potentially malleable) through individual and interpersonal level interventions. Other factors that would depend more on structural and policy than individual and interpersonal level interventions to change were classified as unmalleable. This classification helped to identify malleable factors where lifestyle (downstream) interventions could be applied immediately without waiting for more complex higher-level (upstream) changes which would take longer to implement.

Section summary

The scoping review was used to synthesise existing knowledge on risk factors for hypertension in SSA. This formed Step one of the 6SQuID Model (phase one of this study). Findings from this review informed topic guides for the subsequent step (the local context in the next section) in the intervention development process. This was in keeping with intervention development practice of using existing evidence to seek clarification from local study contexts through residents and stakeholders (Wight et al., 2014).

3.2.0 Exploration of the local context

The exploration of the local context was conducted to obtain indigenous views about hypertension and its risk factors, As indicated in the introduction to this chapter, exploration of the local context (Phase Two) covered Steps One to Three of the 6SQuID model. An understanding of the local context concerning the risk factors identified from the scoping review was required to develop an intervention with a high potential for acceptability, feasibility and effectiveness (Appiah, 2020). A community-based participatory approach

(CBPA), a form of participatory research (Wallerstein and Duran, 2017, Appiah, 2020) was followed to incorporate the local people's views of the prevalent lifestyle risk factors for hypertension into the intervention design. This approach also enabled the researcher to understand which factors the community perceived as being changeable, and how this change could be achieved. As will be demonstrated in this chapter, the choice of CBPA from the several other participatory approaches highlighted in Chapter Two hinged on the fact that this study involved the community in several stages of the study (including co-defining the problem, identifying the study location, determining how to bring about change, developing and testing a programme to prevent hypertension) and was conducted from within the community.

This CBPA methodology aligns well with, and can be operationalised through, elements of the of the Community Organisation Model: community empowerment and critical consciousness (Mangum and Dacanay, 2016, Minkler, 2004, Minkler et al., 2008), as described in section 2.4.0.

Despite all the positives of the CBPA, it may be hard to practically implement. The complexity of communities and multi-level interventions may make it hard to determine with certainty the end points of satisfactory community involvement (Minkler et al., 2003). This, on the one hand, increases the risk of inadequately involving the community. This may lead to inadequate cultural sensitization, hence compromised acceptability, feasibility and potential effectiveness of the interventions (Appiah, 2020). On the other hand, it may result in the over-engagement of the community resulting in interventions that are detached from scientific evidence because communities may not know everything to be wholly relied upon. Another challenge with CBPA is that the multiple engagements with the community may lead to increased financial cost (e.g., for snacks/meals, and transport refunds) (Minkler et al., 2003). As such, there was a need, in this study, to ensure a balance between existing

evidence, community inputs and the researcher's clinical expertise to develop a well-balanced intervention.

In line with the CBPA, the first step in Phase Two, guided by the scoping review (6SQuID step one) findings, investigated beliefs, attitudes, priority needs and situations of the target intervention end-users to co-identify what was needed to change in the community to reduce hypertension risk. This step also explored the extent to which these were changeable and potential intervention components which were likely to be necessary, feasible and salient to them. As evidence shows, the community engagement that was sustained throughout the intervention development process using CBPA (Appiah, 2020) helped identify the community's own health problems and solutions; an action necessary for building community empowerment (Zimmerman and Eisman, 2017, Glanz et al., 2008) and community critical consciousness (Chronister et al., 2020).

In summary, this qualitative research component of the current study aimed to develop contextual understandings through focus groups and interviews with local residents and key stakeholders, respectively, through a CBPA. Through this, information was obtained to inform the co-development of intervention components that would be in the best interest of the target end-users and with the potential to be effective (Arena et al., 2015, Oelke et al., 2015).

3.2.1 Study Location

The study was conducted in Maramba, a community within Livingstone, a major city and tourist capital of the Zambia. Livingstone is located in Zambia's Southern Province and has a projected population of 179,665 and a 3.2% annual GDP growth rate (CSO, 2010) according to the 2010 Census (the last official census in Zambia). Maramba has a projected population of 33,218 (CSO, 2010), accounting for 18.5% of the Livingstone City population.

The study site was selected together with the Livingstone District Health Office (LDHO); the office that manages primary and public health services in Livingstone. The researcher visited the LDHO to get permission to conduct a study in the district as well as to seek guidance on the possible study locations. From the possible locations, the LDHO proposed Maramba area on account that the area was cosmopolitan, had a good mix of people with varying socioeconomic statuses, and a diverse combination of occupation ranging from non employed, self-employed (e.g. business owners, marketeers) and those in formal employment. This provided an opportunity for the current intervention development study to design an intervention likely to address a wide range of local cultural context parameters. The area is served by one Health Clinic, while the Central Hospital (University Teaching Hospital) is within a 15km radius. The range of socioeconomic activities in the area include formal or informal employment, business (including cross border trading between Zambia and Zimbabwe) and tourism activities, and small-scale farming. Being an urban/peri-urban area, the study site has been affected by the rising prevalence of hypertension as in other SSA countries (Addo et al., 2007, Agyemang, 2006b, Opie and Seedat, 2005, Lemogoum et al., 2018).

3.2.2 Study design

This qualitative, community-based participatory research was conducted to allow Maramba residents to provide their views about the common risk factors for hypertension in the area, why these were prevalent, which ones could be changed, the possible ways to bring about the change and the potential players in bringing about the desired change. The broad aim of Phase Two was to develop a deeper understanding of community views concerning possible ways of preventing hypertension and how to go about implementing the suggested prevention measures which would be acceptable and supported by communities instead of prescribing for them (Ayala and Elder, 2011). This approach is in keeping with existing

practice in the development of culturally and context sensitive interventions (Rowley et al., 2000).

A qualitative interpretivist approach was used because the focus was on understanding the phenomena under study from the respondents' point of view (Robert and Gephart, 2018) instead of gathering perspectives using researcher-defined categories obtained in a survey/questionnaire. Additionally, the value the residents place on the lifestyle risk factors for hypertension and how these can be changed may not have been the same as in other places because they are influenced by local circumstances such as culture and economic status, and the researcher did not want to 'import' assumptions by using predetermined parameters from elsewhere. It was envisaged that community involvement would help develop community empowerment and critical consciousness (explained in section 2.4) which are key to the identification of the community's own problems and solutions (Chronister et al., 2020). Findings from community involvement helped form ideas to use to develop possible intervention components in Phase Three of this study. Intervention designers can use various methods to engage communities, such as FGDs (Heaton et al., 2014, Rapport et al., 2008), community informants (Kennedy, 2010), interviews (King et al., 2011, Rutter et al., 2004) or a combination of any of the above (Basu Roy et al., 2014, Gibbons et al., 2016). In this study, FGDs and interviews were chosen, as justified below.

FGDs can be used to gather individual-level views by gathering perspectives of many participants at one time, hence serving the purpose of rapidly canvassing a range of individual views (Barrett and Twycross, 2018, Cyr, 2016, Kitzinger, 1994, Morgan, 1993, Munday, 2006). In this way, each FGD participant has an opportunity to give personal views. Another benefit of FGDs is that they allow perceptions to be discussed between participants, clarification of issues to be made and recall of information as each participant hears contributions from others. Differences in views are discussed in detail to either understand possible causes of the differences or possibly finding common ground (Ritchie and Lewis,

2003). The ability to allow for a rapid canvasing individuals' views (for wider input) and exploring these views in-depth (for a deeper understanding of the local context) made FGDs best suited for this study.

Besides, minimising potential biases (through researcher reflexivity as explained in 3.2.6, below) and negative influences (e.g., controlling dominance by one participant), group influence in FGDs provides an opportunity to build confidence in individuals to be more expressive, thereby generating more detailed information (Farnsworth and Boon, 2010). FGDs, therefore, can provide for the identification of the broad themes on e.g., risk factors, facilitators of unhealthy behaviours and ways to bring about change. Furthermore, FGDs can help to identify how community members may discuss and influence each other to bring about changes in lifestyle.

The disadvantage of FGDs is that they can produce a bandwagon effect where dominant participants may influence others' thinking and views (Hollander, 2004). Further, there are potential unobservable effects of group work/discussions, such as someone not liking another participant. This can influence the direction and outcome of discussions (Farnsworth and Boon, 2010, Queirós et al., 2017). These potential pitfalls of FGDs need to be prevented to improve the quality of the findings. To do this, the discussion can be semi-structured; with the researcher retaining some control over the proceedings to ensure no one participant dominates the discussion. The researcher also can attempt to stimulate equal participation by probing and emphasising that each participant has their own right of opinion which should be respected by other people.

Stakeholder semi-structured interviews were used to triangulate the findings from the FGDs to discuss in detail the views of community leaders on how and where to deliver the intervention (Longhurst, 2003, Eppich et al., 2019). Despite consuming a lot of time and facing challenges of statistical generalisability (Queirós et al., 2017) (which qualitative research is not concerned about as it is focussed on theoretical generalisability (Smith,

2018)), interviews provide an opportunity to explore key stakeholders' viewpoints in depth (Adams, 2015, Longhurst, 2003). The information obtained provides a basis for generation of detailed descriptions of the problem of hypertension and its causes in the study site, possible changeable risk factors and how these could be changed. This, coupled with triangulation between FGDs and interviews, is likely to improve the study results' validity or credibility (Queirós et al., 2017, Barrett and Twycross, 2018).

Analysis of FGD data can follow an "Individualistic Social Perspective" (ISP) or Social Constructivist Perspective (SCP) (Belzile and Öberg, 2012, Eagly and Chaiken, 2007, Marková et al., 2007, Ryan et al., 2014, pages 331-2). ISP focuses on individual opinions expressed through FGDs. This differentiates it from the SCP which focuses on how opinions are socially constructed or modified through social interactions (Belzile and Öberg, 2012, Farnsworth and Boon, 2010, Marková et al., 2007, Ryan et al., 2014). The aim of the SCP is to understand personal views and experiences while leveraging on the benefits of interpersonal interactions in FGDs. As will be expressed in the results section, the current study used both the ISP (expressing what individuals' views were) and SCP (to ascertain whether FGs were speaking the same voice on key themes).

3.2.3 Participant recrutement

3.2.3.1 Focus group discussion participants

Participants were recruited in various ways. First, an advert was placed in public places in Maramba asking for volunteers to take part in FGDs. Interested residents were asked to contact the researcher by phone, WhatsApp or email, or indicate willingness by physically visiting the local health clinic. Second, a snowball approach was also used with those recruited through the community adverts asked to let other people know about the study (Naderifar et al., 2017). To be included, participants needed to be: i) residents in Maramba, and ii) aged ≥18 years. Health workers, local leaders, managers in other organisations such as NGOs were excluded as they were reserved for stakeholder interviews.

The researcher met those who showed interest in participating face-to-face at least one week before the FGDs and shared the participant information sheet (appendix 4) to give them time to read through and understand the study. Informed consent for participating was obtained on the day of the FGD, using a form administered by the researcher.

3.2.3.2 Stakeholder interview participants

Key stakeholders included community leaders (e.g., the Health Centre Advisory Committee (HAC) chairperson, church leaders, an Area Councillor), local institutional/organisation heads (e.g., Head Teachers) and health care workers (HCWs). These participants were recruited by the researcher. The HAC chairperson was contacted directly by the researcher using contact details available at Maramba Clinic to introduce the study and request his participation. The researcher visited the Area councillor and heads of institutions (schools, colleges, NGOs, HCWs and other government departments) personally to explain the research and deliver letters requesting their participation. During these visits, potential interview respondents were given time to read through participant information sheets (appendix 4). Where people showed interest in taking part in the study, an appointment for an interview was made. Again, informed consent was obtained by the researcher on the day of the interview.

For both FGDs and interviews, the participants were drawn from the community where the discussions and interviews were held, hence did not require to travel. As such, no payments were made.

3.2.4 Data Collection methods

Views on risk factors for hypertension, why they exist, what could be done to bring about change and how the changes could be affected were obtained through focus group discussions (FGDs). The possible solutions proposed, change delivery channels (where the intervention would be delivered), delivery setting and who would deliver the intervention components were discussed further with key stakeholders through semi-structured in-depth

interviews to determine the feasibility of implementing the suggested solutions and what the role of each stakeholder would be. Both FGDs and interviews were conducted in English because all the participants could express themselves well. A few local language expressions, however, were used occasionally.

3.2.4.1 Focus group discussions with residents

Four FGDs were conducted in a board room at Maramba Urban Clinic; with each comprising eight Maramba community residents and lasting between 50 to 60 minutes (55 minutes on average).

During the FGDs, participants and the researcher sat in a circle to eliminate the stage versus audience setting, thereby avoiding the facilitator being viewed as a teacher, but rather as an equal participant (Appiah, 2020). Topic guides (informed by the findings of the scoping review) were used to direct the discussions. This helped the researcher keep the discussions on track, while maintaining flexibility to explore emerging issues further. The discussion was allowed to flow naturally: however, participants who did not participate actively were gently asked for opinions to ensure equal participation by all discussants.

Discussions were recorded digitally. The researcher listened to these recordings, taking structured notes to construct important themes from these discussions. This rapid analysis informed the stakeholder interview topic guides. Full record transcription and analysis of this data was conducted at the end of Phase Two.

3.2.4.2 Semi-Structured stakeholder interviews

In-depth semi-structured interviews were conducted with 13 key stakeholders in Maramba: each lasting 45-60 minutes (53 minutes on average). The interviews explored all the possible change and delivery mechanisms in the study site to facilitate lifestyle changes in the risk factors identified through FGDs. Some additional themes from the FGDs were further

examined to confirm or challenge findings on common diseases and prevalent risk factors for hypertension.

The interviews were conducted in public places that were convenient and safe for both the interviewee and the researcher. An interview topic guide was used to provide direction. If a participant mentioned something not originally on the topic guide but relevant to the study, this was explored further to fully understand the problems, as well as the complex human experiences, values, views and beliefs around hypertension (Brink et al., 2006, Polit-O'Hara and Beck, 2006). This flexibility also helped explore and understand the topic from the stakeholders' perspectives (Robert and Gephart, 2018), and consequently provided an opportunity to obtain a deeper understanding of the lifestyle factors that impact on the prevalence of hypertension in Maramba, the extent to which (and how) they can be changed through lifestyle interventions. as well as potential change and delivery mechanisms.

3.2.5 Data handling and analysis for the local context

Both the focus group discussions and interviews were digitally recorded, with participants' consent. Original audio recordings were kept in a place accessible only to the researcher (a lockable safe in the researcher's study room at home). Computer-based research data files were protected by a password (on the researcher's laptop), which was changed regularly and only known by the researcher.

Elements of Braun and Clarke's thematic analysis (Clarke and Braun, 2017, Gareth Terry, 2017) were used to guide data analysis: i) researcher familiarisation with the data, ii) creation of codes, iii) development of themes, iv) reviewing of the initial themes, v) defining the themes, and vi) writing up the findings. For the current study, all six steps were followed, albeit with a modification of steps two and three (see below).

To familiarise themself with the data, the researcher listened to the recordings twice. Recordings were, thereafter, transcribed verbatim using a University of Glasgow approved transcriber. To verify the accuracy of transcription, the researcher listened to the recording

a further time and edited the transcript as necessary. Transcripts were cleaned (e.g., typos corrected) and imported into Nvivo software (version 12) for analysis. Steps two and three were combined to generate themes which were framed around the topic guides for the FGDs and stakeholder interviews instead of being deduced from the set of codes as other researchers do (Gareth Terry, 2017). This was because topic guides for the FGD were informed by synthesised findings from the scoping review, which in turn informed themes for stakeholder interviews. To do this, the researcher and first supervisor coded/generated themes for three transcripts independently and met to compare their findings and reach consensus on themes. The researcher then drafted the codebook with themes in their definitions. This was taken back to the supervisory team to review and refine the themes and definitions. The researcher then applied the codebook to all transcripts and went on to write up the findings.

Whereas analysis of the common health conditions and risk factors followed a thematic approach (Maguire and Delahunt, 2017, Gareth Terry, 2017), to understand the details of the drivers of the risk factors for hypertension, data coded to this theme were used to generate two typologies: i) barriers to reducing risk; and ii) perceptions that drive unhealthy behaviour. Additionally, exploration of the change solutions was achieved by mapping participant's views of potential change solutions onto the SEM.

As the foregoing section highlights, the scoping review (Phase One, 6SQuID Step One) findings informed the topic guides for FGDs to clarify existing research evidence on hypertension, its risk factors and drivers of these with the local residents as a first step to intervention development (Wight et al., 2014). Findings from FGDs were used to inform topic guides for key stakeholder interviews (Phase Two) to construct a causal pathway (part of 6SQuID Step One) as well as identify change and delivery mechanism (6SQuID Steps Two and Three). Phase Three used this data to develop the theory of change to guide

intervention development (6SQuID Model step four, (6 SQuID Step Four)) as described in the next section.

3.2.6 Development of the causal pathway

Causal pathways are processes that link one and/or several factors (e.g. risk factors for a disease) to an outcome(s) (e.g. disease occurrence) (Ross, 2018). Development of the causal pathway helped to identify all the contextual risk factors contributing to the increase in hypertension at individual, interpersonal, community, organisational and cultural levels of the SEM. The causal pathway also provided a visual summary of the potential levels of intervention to change the identified risk factors.

Using Phase One and Two findings, the researcher developed an initial version of the causal pathway. It was presented to the supervisory team for review, and refinement was iteratively done through brainstorming. As will be explained later in this section, the second version of the causal pathway was reviewed by the intervention co-development workshop participants (Phase Three) for further refinement as part of the participatory approach.

The causal pathway included all the most prevalent risk factors for hypertension in the study site informed by findings from the scoping review, the FGDs and interviews. As such, it included both malleable and non-malleable risk factors. However, to develop a behavioural change intervention with potential to be effective at individual and interpersonal levels, as was the focus of this project, there was a need to identify what would be relatively easier to change by the target intervention users (Wight et al., 2014). Risk factors from the causal pathway with a higher possibility or likelihood of change (malleable) as suggested by FGDs and interview participants were therefore agreed upon through discussions with the supervisory team.

3.2.7 Development of the theory of change

Having identified the malleable risk factors for hypertension in the causal pathway, the researcher used the information to develop a theory of change (ToC). A ToC explains how

and why an intervention is expected to work to bring about the desired change (De Silva et al., 2014). As such, the ToC was developed before designing the intervention components to provide insight into the pathways from inputs to the desired outcome and was reviewed by residents in Phase Three.

Having reviewed the literature, engaged with the community (through FGDs and stakeholder interviews), identified malleable risk factors/unhealthy behaviours requiring change; the researcher then engaged with relevant psychological theories of behaviour change to build a rationale for the linkages in the ToC (Better_Evaluation, 2018, De Silva et al., 2014). As explained in Chapter Two, the psychological models/theories of behaviour change used in this study included the BCW (with the COM-B Model) as a behaviour change framework (Michie et al., 2014), SDT (Ryan and Deci 2000) and SCT (Bandura, 1986b, Beauchamp et al., 2019).

Guided by the COM-B Model, findings from FGDs identified what, in terms of capability, opportunity and motivation, must change in target intervention users to facilitate behaviour change. In addition, using the findings from the FGDs and stakeholder interviews, the components of COM-B that needed to change were mapped onto actual activities (intervention functions) (e.g. health education) that would bring about the changes required (Michie et al., 2014). SDT and SCT were employed to underpin the mechanisms by which capacity, opportunity, and motivation would be developed through the identified activities (intervention functions) to translate into adoption of desired healthier behaviours. The researcher developed the first draft of the ToC, which was iteratively refined through discussions with the supervisory team. As with the causal pathway, the resulting ToC was taken to the co-development workshop participants for further refinement in Phase Three. The final draft of the ToC then informed the development of core intervention components, as described below.

3.3.0 Co-development of intervention components

Core intervention components were developed in Phase Three (step four of the 6SQuID Model) of this study. The development of core intervention components was focussed on the malleable lifestyle risk factors for hypertension identified in the causal pathway and was finalised in co-development workshops, including the adoption of healthier diets and increased physical activity. The core intervention components, programme content, as well as delivery mode (e.g., group-based) and channels (e.g., through schools) were co-identified with Maramba residents and stakeholders using participatory methods (Sandlund et al., 2019) in five workshops. This increased the likelihood of the intervention being tailored (sensitive) to individual needs, the local socio-cultural context and the physical/local community setting (Rimer and Kreuter, 2006, Vandenbroek et al., 2019).

3.3.1 Workshop participant recruitment

An advert was placed in public areas of Maramba to recruit participants to four co-development workshops. Interested participants sent a text message to the researcher on a research mobile phone number provided on the adverts. The researcher then contacted those who texted to arrange face-to-face delivery of participant information sheets, as well as to discuss possible dates for the first workshop. As existing evidence recommends 10 to 12 participants per group in the co-development of tailored public health interventions (Sandlund et al., 2019), 12 participants were recruited comprising a mix of both sexes (5 females) across a range of ages. This ensured representativeness of the diversity of the population. The researcher requested all 12 participants to attend all four resident co-development workshops.

Participants for the stakeholder workshop were determined during the resident workshops, which identified that the intervention should be delivered through religious organisations. Thus, the stakeholder workshop participants were drawn from religious groupings and health workers. For these, letters were written to all local Churches and Mosques. Additionally,

another letter was written to the local clinic to request a health care worker to take part in the workshops. Stakeholders responded to these letters by texting the researcher to indicate their willingness to participate. Those who did not respond within one week were visited by the researcher to follow up the response.

3.3.2 Conduct of the co-development workshops

As described in the introductory section of this chapter, a CBPA was used to iteratively co-develop core intervention components through five workshops (table 3.2): four with residents and one with key stakeholders.

Before commencing the co-development workshops, the researcher drafted outlines and facilitator guides for each workshop, which were refined through feedback and discussion with the supervisory team. Details of the content of each workshop are described below.

Table 3. 2 Summary of the co-development workshops

Workshop	Participants	Workshop content	Duration (hrs/min)
1	Residents	- Presentation and refining of the Causal pathway and Theory of Change and discussion of possible aspects of these needed to be changed. - Verifying the potential risk factors to intervene on and how to deliver the change - Clarification of the change delivery channels - Training in goal setting and self-monitoring to help participants understand what these are - Co-creation of what goal-setting and self-monitoring would look like in the study site	4 hours
2	Residents	- Refining the priority risk factors to intervene on and the top three change delivery channels. - Refining the meaning of SMART goals sensitive to the context of the study site - Drafting initial ideas for the intervention components and the name of the intervention	4 hours 20 minutes
3	Residents	- Refine the meaning of SMART goals further using a local language to be selected by the participants (Refining the Cs of goal setting using concepts from the MaFANs) - Prioritization of one change delivery channel from the top three identified in workshop 2. - Initial refining of the drafted intervention/programme from workshop 2 - Refining the name of the intervention/programme	4 hours
4	Key stakeholders	- Summarising the project to the stakeholders - Presenting the proposed programme (refined from workshop 3) - Agreeing on practical aspects of the programme implementation (the setting, when to start, programme facilitators, selection of a church to conduct the small-scale evaluation from)	4 hours 30 minutes
5	Residents	- Discussion of output from the stakeholder workshop - Final refining of the intervention/programme	3 hours 30 minutes

3.3.2.1 Workshop One (residents)

As shown in Table 3.2, Workshop One involved the presentation of the causal pathway and ToC developed in Phase Two and the proposed change delivery channels from the stakeholder interviews, to explain what had been identified as potentially malleable risk factors for hypertension and how these could be changed. Objectives included: to discuss the causal pathway; identify factors that promote unhealthy living among residents in Maramba; identify what, among the several risk factors, the current study could intervene on; and discuss and refine the ToC. Additionally, the delivery channels for the ToC were clarified with the residents. Workshop One also sought to provide initial training (to help participants understand what goal-setting and self-monitoring are), and co-creation of ideas on how to set SMART Goals and monitor one's own progress toward meeting set targets in the Zambian context.

Firstly, an interactive PowerPoint presentation of the causal pathway was delivered which highlighted how various risk factors were potentially contributing to the rise in the prevalence of hypertension in Maramba. Participants then gave feedback on the presentation highlighting their appreciation of the problem of hypertension and its risk factors. The researcher then asked participants to identify which of the risk factors in the causal pathway would be more important and feasible to change (malleable) from their perspective. This was done to prioritize three factors to intervene on because it was not possible to target all the risk factors identified in Phases One and Two and develop a coherent programme.

Secondly, the researcher presented the ToC to the residents to highlight the potential process through which the identified risk factors could be changed. Participants were asked to provide feedback on what aspects of the ToC needed to be modified. They were then taken through the list of potential change delivery channels for the ToC as proposed by the stakeholder interviews in Phase Two to discuss possible refinement. They were asked to

prioritize three change delivery channels and give reasons for their choices. Submissions from participants and fieldnotes from Workshop One were written up and discussed with the supervisory team to refine the causal pathway, ToC and change delivery channels.

Participants were then introduced to SMART goal setting and self-monitoring (Michie et al., 2013) by asking them to say what they understood by these BCTs. Thereafter, the researcher explained, in simple language, what these terms meant and allowed an open discussion, where the researcher and residents worked together to co-create possible ways to explain SMART goal setting to the target intervention users. Participants were asked to suggest what SMART goals would look like in the context of the study site, including the language to use to explain these to the community. Afterwards, an example of a SMART goal from the MaFANs material (see below) was given to the participants to consolidate their understanding of the concept.

a) The MaFANs intervention

The MaFANs was a 12 weeklong lifestyle hypertension prevention and salt reduction intervention for at risk football fans in Malawi delivered by football coaches (Bunn et al., 2019). It was co-developed with target end-users and key stakeholders, and incorporated information provision, goal-setting and self-monitoring. Week One explored information about high blood pressure, its risk factors and its complications. The second week focussed on providing information on salt, its different types and hidden salts. Week Three engaged the participants in discussing the benefits of increasing physical activity and taking stock of how physically active they were. To help participants improve diversity of their food intake, Week Four considered the value of the different food groups and the value they have to a human body and concluded with each participant auditing what foods constituted a major part of their diet. Week Five then discussed energy food, including the disadvantages of taking too much high energy foods. Week Six required participants to reflect on the progress they had made in changing lifestyles up to this point. Weeks seven

and eight focussed on the benefits of drinking enough water and of a high fibre diet respectively. Weeks nine to eleven were designed to promote behaviour change maintenance by taking stock of potential challenges likely to cause regression of behaviour change progress (Week Nine), enlisting social support for behaviour change (Week Ten) and reflection on the gains made up to this point, as well as planning for life beyond the intervention (Week Eleven). The final week (week 12) comprised celebratory social games, as chosen by the participants. Each weekly session also included sporting activities to improve physical activity, as well as setting and monitoring progress on salt reduction goals.

In MaFANs, SMART goal setting was described in the local Malawian language, Chichewa, using a translation (5Cs goal setting) developed by Malawian researchers – Chimodzi, Choyezeka, Chotheka, Chofunikira, and Chochitika munthawi yake. MaFANs was piloted with 30 men to test feasibility and likely effectiveness.

In preliminary findings, MaFANs was feasibly for delivery and effective in reducing participants' body weight and waist circumference (Bunn et al., 2019), and the materials were therefore considered suitable for adaption to the local context for the current study. For example, the 5Cs goals in MaFANs provided a starting point for the description of targets in the current study. Workshop One participants discussed and agreed on the language to use in defining SMART goals. The languages considered during the discussion included Tonga (the local language in the Southern Province of Zambia), English (commonly used official language) and Nyanja (originally from the Eastern Province of Zambia but universally acceptable and used in Maramba; a cosmopolitan residence).

To assess how other local residents would understand the concept of SMART goals, workshop participants were asked to come up with personal goals for: increasing physical activity, reducing salt intake, eating more fruits and vegetables, and reducing oily foods

consumption. The researcher then obtained feedback from participants on the ease of doing this, including possible ways to improve on the definition of SMART goals. Additionally, participants were asked to devise ways of monitoring progress towards their goals. This was done with the view that if these community representatives managed to set SMART goals using the definitions proposed by themselves and also monitor progress, then most likely this would be the case in the community.

During the workshop, the researcher took fieldnotes of the discussions (priority risk factors, description of SMART goals), which were summarised electronically after the workshop. These were discussed with the supervisory team to inform the content of Workshop Two.

3.3.2.2 Workshop Two (residents)

The objectives for Workshop Two included: i) to refine the target risk factors to intervene on. ii) to consolidate the idea of setting goals in a culturally acceptable manner in the context of Maramba and iii) to design intervention components around the priority risk factors and delivery mechanisms identified.

A summary of what was agreed upon in Workshop One relating to the priority risk factors to intervene on and goal setting was presented by the researcher. Thereafter, the researcher engaged the participants to brainstorm and agree on a locally acceptable way to describe a SMART goal to the community in a manner that would be easily understood.

The participants were then divided into three groups. Each group was allocated one risk factor and asked to design a step-by-step process of how to implement the intervention using a change delivery mechanism of their choice from the three agreed upon in Workshop One. The groups were advised to give as much detail of the intervention as possible, including goal setting and self-monitoring, as well as other BCTs, such as provision of (health) information. Each group was then asked to write their suggestions on flip charts and present

their proposed programmes to the rest of the participants for feedback. The researcher also engaged the participants in a discussion to co-develop the name of the intervention. Participants were asked to make suggestions and brainstorm until they agreed on what the intervention would be called. Finally, to encourage participants to think about the next workshop in advance, they were informed that they would be refining the rough ideas they had put together during the current workshop in Workshop Three.

Following Workshop Two, notes on the feedback obtained, observations made by the researcher and suggestions from the residents were written up electronically. These findings were discussed with the supervisors to refine the initial ideas from Workshop Two to present back to the residents in Workshop Three. In addition, the researcher integrated the MaFANs participants' manual (specifically, inform the structure and flow of the sessions) and the residents suggested intervention components from Workshop Two, to prepare an initial rough draft of a full intervention adapted to the Maramba context.

3.3.2.3 Workshop Three (residents)

The objectives of Workshop Three included i) to consolidate the knowledge for setting culturally acceptable goals in the Maramba context, ii) to identify one delivery channel from those identified in Workshop Two, and iii) to refine intervention components around the priority risk factors.

After a recap of Workshop Two, participants were asked to indicate if they had anything that needed clarification on goal setting. The researcher then engaged participants to discuss how goal setting could be described to the community in a culturally sensitive manner or in a way that the community would easily understand. Using the 5Cs example from the MaFANs material, participants made suggestions of culturally sensitive ways to explain SMART goals and how to go about setting one. Participants were also asked to prioritise one intervention delivery channel from the three suggested in the second workshop. Rationale was given for the choice (churches) made.

To begin refining the initial thoughts on intervention, the researcher provided paper copies of the initial draft of the programme developed following Workshop Two and summarised it in a presentation. Working in three small groups, the participants were asked to go through the draft document and make observations in terms of, suitability of the structure and suggestions about the duration of the intervention, the wording/names used, what should be adjusted, removed or added and whether the programme should be entirely changed to something else. Following these discussions, each group presented their responses to the workshop using flip charts. Further refining of the programme was discussed and the final ideas incorporated to inform further adaptations of the intervention components in Workshop Four. The name of the intervention proposed in Workshop Two was discussed and optimised.

Submissions from the participants were noted by the researcher, including description of SMART goals, priority change delivery systems and suggestions on changes to the draft programme and the name of the programme,. These were discussed with the supervisory team after the workshop to refine the ideas. The draft programme was the re-edited in preparation for the stakeholder workshop (Workshop Four).

3.3.2.4 Workshop Four (Stakeholders)

Workshop Four included eleven (11) participants. The majority of participants were religious leaders because the residents in Workshop Three had agreed that the intervention should be delivered through churches. The objectives of this workshop were to i) discuss and refine (if necessary) the proposed intervention components, ii) agree on the detail of how, where and when the intervention would be delivered; including who would deliver it.

After summarizing the steps, the project had taken to this point, the refined draft intervention from Workshop Three was presented to key stakeholders. Guided by the researcher, the delivery setting was confirmed, and participant recruitment, intervention facilitators and mode of delivery were discussed. To provide an objective way of selecting a church for the

Phase Three feasibility study, stakeholders suggested a checklist should be developed to support a fair selection process and ensure the chosen church was ready to host the intervention. The researcher engaged the stakeholders in a discussion of what should be included on the checklist. In consideration of the proposed delivery setting for the intervention, the name of the intervention was also discussed and proposals for refinement suggested to suit the delivery channel suggested in Workshop Three.

3.3.2.5 Workshop Five (residents)

The objective of this last workshop was to bring back feedback and suggestions from the stakeholders to the residents and allow final refining of the intervention components. The outputs from the stakeholder workshop were summarised and presented to the participants by the researcher. Residents discussed the stakeholder suggestions, including participant recruitment methods, choice of facilitators, as well as the use of the delivery setting check list.

Section summary and discussion

The pilot intervention was iteratively co-developed with the target end users and stakeholders through five workshops. The engagement of the residents and key stakeholders to co-develop the intervention in a participatory approach had the potential to build community empowerment (from the Community Organisation Model), an important ingredient for behaviour change (Glanz et al., 2008), as well as to ensure the intervention's sensitivity to the local context to improve the acceptability and potential effectiveness of the intervention (Appiah, 2020, Craig et al., 2013). Additionally, active community involvement aimed to increase the likelihood of intervening on what was priority for the community (Craig et al., 2008, Craig et al., 2013).

Using the co-developed intervention components, the researcher drafted the final intervention sessions, which were refined through discussions with the supervisory team to add a different expert viewpoint (Hawkins et al., 2017). The final output from Phase Three

was the pilot intervention and associated materials, including intervention facilitator guides and participant manuals, ready for testing on a small-scale.

3.4.0 Addressing potential power dynamics in the research

As with most CBPR, the involvement of stakeholders and residents as partners in the current study is likely to raise issues around power dynamics (Wallerstein et al., 2019, Israel et al., 2012). For example, what the leaders would say was likely to be considered as more valid than the views of the residents themselves. To minimise this, the researcher considered and treated all players as equal partners (Wallerstein et al., 2020, Lazarus et al., 2015). Furthermore, as clear delineation of roles among partners in CBPR has been demonstrated to improve group dynamics (Lazarus et al., 2015), the roles of the residents and stakeholders in the current study were carefully defined. During the exploration of the local context, stakeholders focussed on discussion of the change delivery channels and the practical aspects of implementing the prototype intervention components that had been proposed by the residents.

The power to determine the direction of the research is likely to have been with the researcher who may have been considered as an expert. To minimise this, efforts were made to agree on the agenda for the subsequent co-development workshops at the end of each workshop. The researcher then summarised and prepared the agenda for the next workshop to ensure partners felt they were involved in deciding what should be discussed. At the start of each workshop, the researcher also recapped the outputs from the previous workshop to allow participants to validate and suggest any changes to them. This process helped build trust and confidence among the residents and stakeholders' that their views were being heard and noted (Cargo and Mercer, 2008).

3.5.0 Researcher's position and reflexivity

Being a health worker (Medical Doctor) gave the researcher a deeper understanding of the topic around which the study was framed i.e., hypertension. Additionally, being a medical doctor inevitably gave the researcher an expert position in the study and a risk of introducing personal experiences and a biomedical focus. Taking a reflexive approach (Finlay, 2002), the researcher attempted to put aside his biomedical knowledge and personal experiences as a clinician when interacting with community participants. The use of the topic guides was particularly helpful in this regard, providing a structure to the qualitative work that was focussed on eliciting participants' perspectives, and not 'educating' them. Topic guides also limited the extent to which the researcher was drawn into the role of the 'expert', as a medical doctor.

During the intervention co-development workshops, the researcher ensured he was always aware of his position as a Medical Doctor. To avoid imposing his views on workshop participants, the researcher regulated his contributions and only guided the discussion. Similarly, during the delivery of the intervention in Phase Four (see Chapter Seven), the researcher sat passively at the back of the room and only spoke when asked to do so by the facilitators. However, in spite of these attempts to remain a non-participatory observer during the Phase Four intervention delivery, participants and facilitators always considered the researcher as an expert in the subject matter, and he was drawn in regularly to respond to some questions.

Another factor likely to have impacted on the research was the fact that being a man, as a researcher, may have affected the participants' and the researcher's own participation (Collins 2018). With the societal norms which provide more power to men (Shoola, 2014), a male researcher may have limited participation by female study participants. Furthermore, occupying an advantaged position in terms of knowledge and resources (Wallerstein et al., 2019) may have made his voice louder and influenced the direction of the study. To minimise

the impact of these power imbalance, during the exploration of the local context, the researcher remained conscious of this community norm and made took some deliberate actions. Focus groups were designed to have two single gender groups and two mixed gender groups to identify any gender driven patterns in the study findings. Furthermore, during these discussions, equal partnership between the researcher and the participants was emphasised.

During data analysis, the researcher continuously considered his own understandings and standpoints as a medical doctor and made stringent efforts to prevent these from dominating the interpretation of participants' statements. This was achieved by focussing closely on the words and conceptualisations used by participants and avoiding the imposition of medical terminology during coding, analysis and reporting.

3.6.0 Ethical Consideration

This section provides the ethical consideration for Phases One to Three, as well as overarching issues. Ethical issues specific to the methodology for the Phase Four feasibility study are described in Chapter Seven.

Phase One of this study did not require ethical clearance as it involved a review of existing literature. For Phases Two and Three, ethical approval was obtained from the University of Glasgow's College of Social Sciences Ethics Committee (No. 400170161 and 400180248 respectively) and the Excellence in Research Ethics and Science Ethics Board in Zambia (Approval no. 2018-July-006 for both phases). Further authority was obtained from the National Health Research Authority of Zambia for the conduct of the research.

The interview transcripts in Phase Two were fully anonymised. Extracts to support the results are presented using "male/female participant 1, 2, …" or by their job title e.g., Male Health Care Worker 1 (Male HCW 1) to represent each participant. All electronic data with personal information was uploaded and stored in password secured folders on a University of Glasgow server. Computer-based research data files were protected by a password which

was changed regularly and only known by the researcher. Paper-based study documents were locked away in the researcher's room at home which was only accessible to him. This ensured no unauthorised access to the documents. Completely anonymized data will be stored securely on the University of Glasgow servers for 10 years according to the General Data Protection Regulation. Only the researcher and the supervisory team have access to this information. It could potentially be useful if requested by other researchers or for developing journal articles and conference papers. Considering that participants have given their consent for data sharing, the researcher would consider requests for data by other researchers on a case-by-case basis.

3.7.0 Chapter summary

Chapter Three has described how Phases One, Two and Three of this research was undertaken guided by the 6SQuID Model. As figure 3.1 shows, the study was broadly divided into: Phase One, evidence synthesis - Scoping review (6SQuID step one); Phase Two, exploration of the local context (with development of the causal pathway and ToC) (6SQuID steps two to three); Phase Three, co-development of the intervention components (6SQuID step four); and Phase Four, the feasibility study to assess acceptability, feasibility and likely effectiveness (6SQuID steps five and six) whose methodology is described in detail in Chapter Seven.

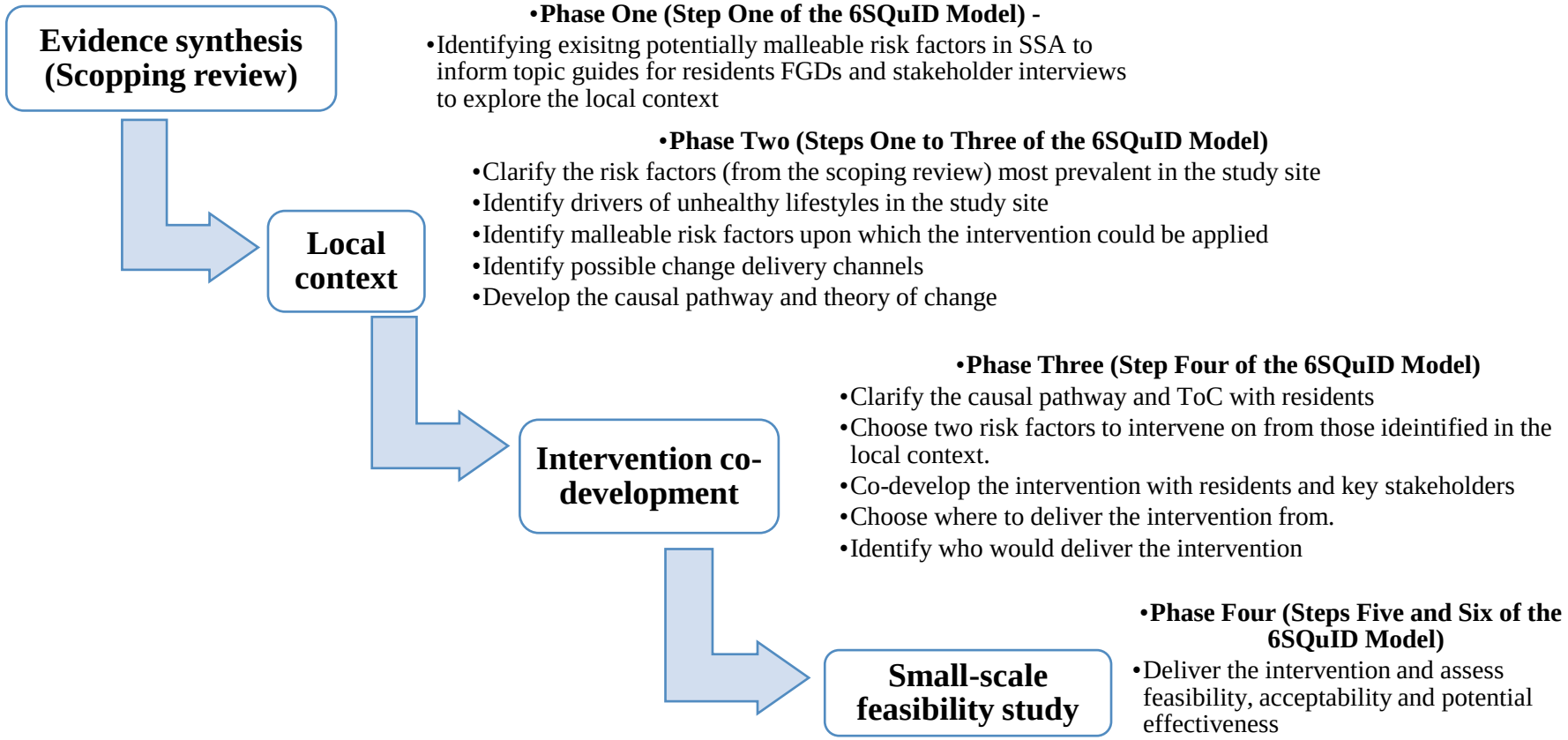


Figure 3. 1 Outline of the intervention development process

The CBPA was used to understand the problem in the local context (through FGDs and stakeholder interviews) while being guided by existing research evidence established through the scoping review. Combining the empirical evidence and the findings from the local context ensured a well-balanced basis for the current intervention development that would, not only be culturally sensitised, but also in keeping with existing empirical research evidence. The findings from the exploration of the local context were used to develop the causal pathway and the intervention ToC to inform core intervention components development.

The core intervention components were co-developed iteratively with Maramba residents and stakeholders through the five workshops. The output of these five workshops was a pilot intervention (targeting health knowledge, dietary habits – salt intake, reduction in consumption of oily foods, increasing consumption of fruits and vegetables; and physical activity) ready for testing for acceptability, feasibility and potential effectiveness in a small-scale feasibility study. The next chapters describe the results of the scoping review (Chapter Four), exploration of the local context (Chapter Five), and intervention co-development (Chapter Six) before going on to the feasibility study (Chapter Seven).

CHAPTER FOUR: EVIDENCE SYNTHESIS (SCOPING REVIEW)

In line with the first step of the 6SQuID Model (defined in Chapter Two), an exploration of the hypertension risk factor profile in SSA was obtained in a scoping review (Arksey and O'Malley, 2005, Dijkers, 2015, Khalil et al., 2016, Levac et al., 2010, Peters et al., 2015) to inform the subsequent steps in the design and development of a lifestyle hypertension prevention intervention. The scoping review mapped empirical evidence on modifiable risk factors for hypertension to identify which ones would be amenable to change (malleable) at the individual and interpersonal levels of the Socioecological Model (Golden and Earp, 2012). Other factors that would involve interventions at a higher level (described in Chapter Two) to initiate change were classified as unmalleable. This classification helped to identify factors where lifestyle interventions could intervene on relatively quickly without waiting for more complex higher and structural-level changes (Frieden, 2010, Wight et al., 2014).

The methodology for the scoping review is described in Chapter Three. This chapter presents results, including article selection, study characteristics and risk factors for hypertension.

4.1.0 Article selection

As Figure 4.1 shows, 7,884 papers were obtained after deduplication. Thereafter, title and abstract sifting were conducted to eliminate obviously irrelevant papers (n = 7,316 and n = 201 respectively). Full article reading of 314 articles was carried out and 224 excluded. Reasons for excluding papers have been provided in Figure 4.1. Full details of the 90 papers included in the study are provided in appendix 2.

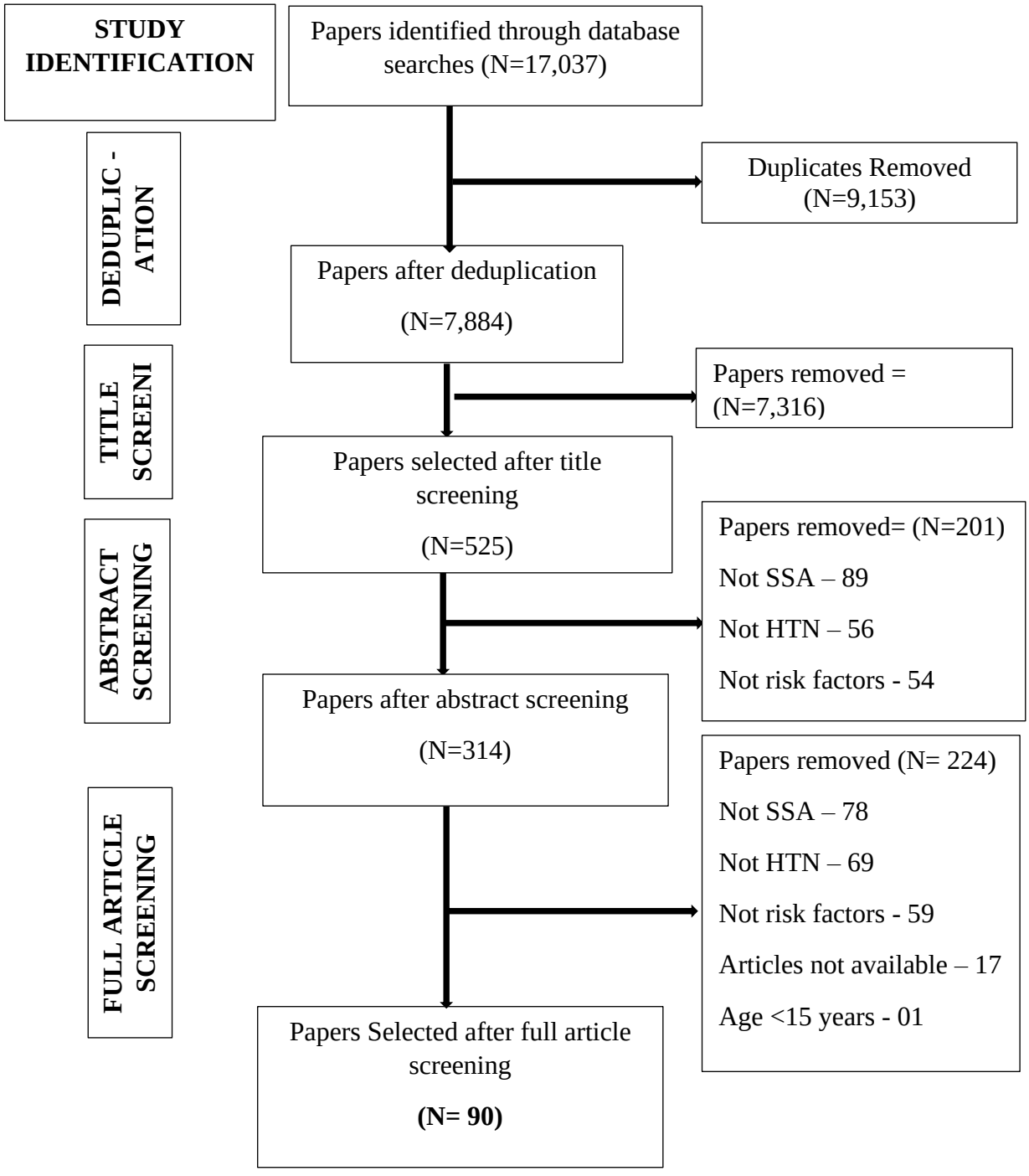


Figure 4. 1 Scoping review PRISMA diagram (SSA = Sub-Sahara Africa, HTN = Hypertension)

4.2.0 Study characteristics

As figure 4.1 shows, most of the included studies (n=76/90, 84.4%) were conducted between 2010 and 2018 (search was conducted on 15th January 2018 and updated on 27th June 2018), suggesting an increased research interest into risk factors for hypertension in SSA in recent years: intuitively proposing increased recognition that hypertension is a major public health problem in the region (Mills et al., 2020). Study sizes varied, with sample sizes ranging from 40 (Azinge et al., 2011) to 77,605 (Arku et al., 2018). 13.3% (n=12/90) of the studies were multi-national (either fully comprising SSA countries or at least one of the participating countries from SSA). Of studies conducted in a single SSA country, 46.2% (n=36/78) were conducted in the region's largest economies and most highly populated countries: specifically, South Africa 21.1% (n=19/90) and Nigeria 18.9% (n=17/90). Other countries included Tanzania 7.8% (n=7/90), Ethiopia 7.8% (n=7/90), Ghana 6.7% (n=6/90), Uganda 3.3% (n=3/90), Cameroon 3.3% (n=3/90), Togo 2.2% (n=2/90), Senegal 2.2% (n=2/90), Angola 2.2% (n=2/90), Rwanda 2.2% (n=2/90), Zimbabwe 1.1% (n=1/90), Gambia 1.1% (n=1/90), Kenya 1.1% (n=1/90) and Sudan 1.1% (n=1/90). Zambia only accounted for a small percentage (4.4%, 4/90) of the studies included.

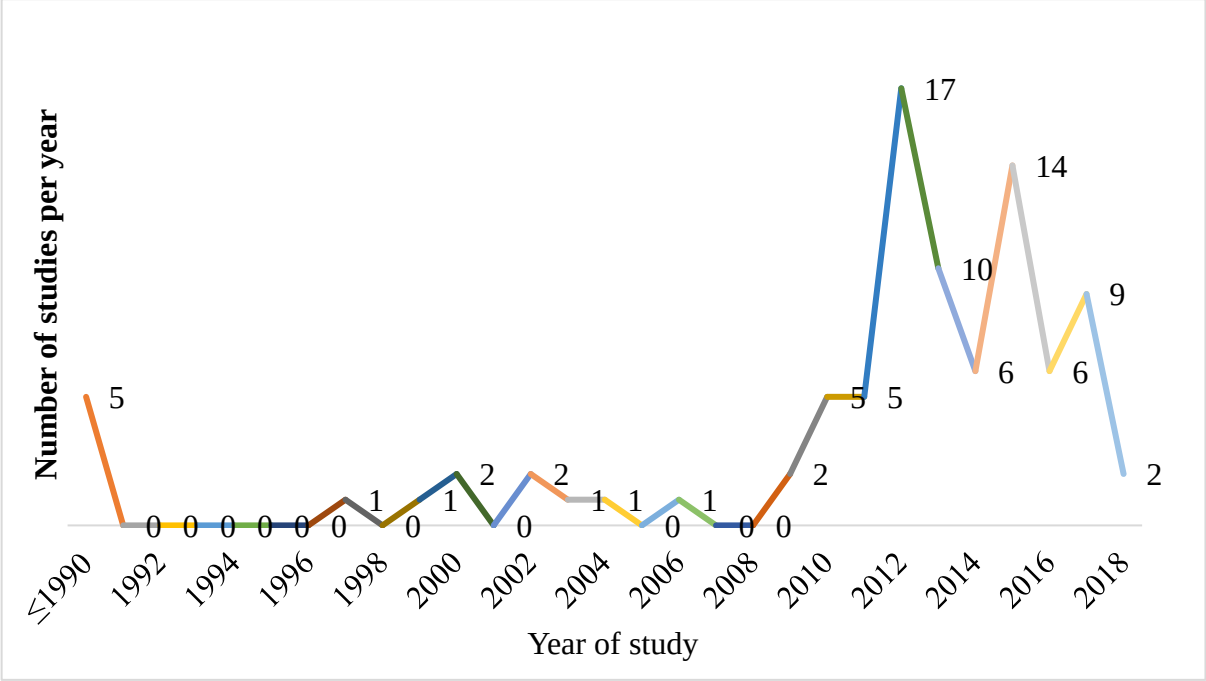


Figure 4. 2 Distribution of included studies by year of publication

Over half ,60.0% (n= 54/90), of all studies were conducted in urban areas, while the rest were conducted in both rural and urban areas 22.2% (n=20/90), rural areas only 2.2% (n=2/90) or at a national level 15.6% (n=14/90). Most of the studies 81.1% (n=73/90) were cross-sectional. The rest were systematic reviews 4.4% (n=4/90), case studies 2.2% (n=2/90), longitudinal studies 3.3% (n=3/90) and cohort studies 2.2% (n=2/90). Retrospective, comparison, observational, ecological and ethnographic designs comprised 1.1% (or one study) each.

4.3.0 Risk factors for hypertension

To appreciate which factors would offer the greatest opportunity for intervention at individual and interpersonal levels, the risk factors were grouped into non-modifiable and modifiable factors (Ibrahim and Damasceno, 2012a). Modifiable factors (Tables 4.2 and 4.3) were then sub-divided into potentially non-malleable and malleable factors.

4.3.1 Non-modifiable risk factors

This review identified five non-modifiable risk factors for hypertension in SSA. As shown in Table 4.1, these were age, family history, sex, ethnicity, and foetal programming.

4.3.1.1 Age

Three-quarters of the studies (n=68/90) reported older age as a risk factor for hypertension. Nearly all of these (n=62/68) found increasing age to be positively associated with hypertension. One study found an eight-fold increase in the prevalence of hypertension in people aged 60 to 79 compared to those under 40 years (Arrey et al., 2016). A few studies showed a positive but non-significant (n=4/68) (Akintunde, 2010, Albert and Effiong, 2015, Asresahegn et al., 2017, Yayehd et al., 2013) or no association (n=2/68) (Mkhonto et al., 2012, Pisa et al., 2010) between hypertension and age. Overall, therefore, the evidence suggests that the risk of hypertension increases with age in SSA.

4.3.1.2 Family history of hypertension

Family history of hypertension was reported in 10/90 of the studies. The majority (n=8/10) found a positive association between family history and hypertension (Albert and Effiong, 2015, Asresahegn et al., 2017, Awoke et al., 2012, Bushara et al., 2016, Helelo et al., 2014, Ibrahim and Damasceno, 2012a, Lambert et al., 1999, Oelke et al., 2015) suggesting a genetic predisposition. Two studies reported positive but insignificant associations (Akintunde, 2010, Sande et al., 2000). As such, evidence in SSA suggests that having a blood relation with hypertension increases risk developing the disease.

4.3.1.3 Sex

Over half of the studies that reported sex (n = 17/33) found that being male was associated with an increased risk of hypertension (Alemayehu and Haftu, 2012, Amira et al., 2012, Asresahegn et al., 2017, Babalola et al., 2011, Bosu, 2010, Bushara et al., 2016, Cois and Ehrlich, 2014, Fikadu and Lemma, 2016, Gebreselassie and Padyab, 2015, Goma et al., 2011, Hult et al., 2010, Kayima et al., 2015, Kingue et al., 2015, Lategan et al., 2014, Mosha

et al., 2017, Owolabi et al., 2017, Seftel et al., 1980, Zack et al., 2016a). However, a fifth reported a higher risk of hypertension for women (Abegunde and Owoaje, 2013, Ajayi et al., 2017, Akintunde, 2010, Kandala et al., 2012, Murthy et al., 2013, Scotch, 1963, Seedat et al., 1982) and nearly a quarter found statistically insignificant positive associations between male sex and hypertension (Agyemang, 2006a, Guwatudde et al., 2015a, Kramer et al., 2012, Njelekela et al., 2003, Sande et al., 2000, Sharaye et al., 2014, Zhou et al., 2012). In view of the evidence above, the association between sex and hypertension is inconclusive.

Table 4. 1 Frequencies of non-modifiable risk factors for hypertension

Risk Factors (n = n/N)	Risk factor's association with hypertension		Frequency
Age (n=68/90)			75.6%
	Older age positively associated with HTN (n=62/68)	91.2%	
	Non-significant positive association (n=4/68)	5.8%	
Family history of hypertension (n=10/90)			11.1%
	Family history positively associated with HTN (n=8/10)	80.0%	
	Non-significant positive association (n=2/10)	20.0%	
Sex (n=33/90)			36.7%
	Male sex positively associated with HTN (n=17/33)	51.5%	
	Female sex positively associated with HTN (n=7/33)	21.2%	
	Non-significant positive association (n=8/33)	24.0%	
Ethnicity (n=5/90)			5.6%
	Black ethnicity positively associated with HTN	100.0%	
Foetal programming (n=2/90)			2.2%
	Foetal programming positively associated with HTN	100.0%	

4.3.1.4 Ethnicity

Five studies (n=5/90) reported ethnicity to be associated with hypertension. All of these (Bushara et al., 2016, Guwatudde et al., 2015a, Ibrahim and Damasceno, 2012a, Murthy et al., 2013, Tigbe et al., 2014) found that black ethnicity was associated with increased risk of hypertension in SSA.

4.3.1.5 Foetal programming

Two studies in the current review reported foetal programming as positively associated with hypertension for adults in SSA (Bovet et al., 2002, Hult et al., 2010). Foetal programming refers to the concept of epigenetics, which proposes that early life exposures (intra-uterine and early childhood) can increase the risk of chronic diseases, such as cardiovascular disease, hypertension, obesity and diabetes, in adulthood (Carolan-Olah et al., 2015). This exposure can cause certain genes to be switched on or programmed in a particular way (Desai et al., 2013). For example, evidence shows that intrauterine or early childhood exposure to either over or undernutrition, programmes the body in a way that increases the risk for metabolic syndrome as well as other chronic and cardiovascular diseases (Desai et al., 2013, Plagemann, 2011). For example, Hales and Barker (2001) established that early exposure to undernutrition programmes the body in a way that less able to cope with increased nutrition in later life

Section summary

The scoping review has shown that non-modifiable risk factors for hypertension in SSA include older age, male sex, family history of hypertension, black ethnicity and foetal programming. With increasing life expectancy at birth in SSA (WHO, 2018b), the older population is also increasing, hence more people are becoming hypertensive. The current review shows that the role of sex as a risk factor for hypertension is inconclusive. Despite most studies in SSA showing that being a man increases the risk for hypertension than being female, a considerable number of studies reported the reverse. More research is required to

clarify these inconsistencies. Regarding family history, the current evidence synthesis suggests that a positive family history of hypertension increases the risk of developing the disease. Although this could be due to genetic predisposition (Zilbermint et al., 2019), it is also possible that a shared lifestyle in early and later life (Cui et al., 2002) could play a key role in this relationship between family history and hypertension. If this is the case, lifestyle interventions at family level might provide the best opportunity of reducing hypertension risk. Foetal programming was another key finding associated with risk of hypertension in SSA. An important consideration is that once programmed, it is impossible to de-programme the genes in the light of current evidence. Therefore, SSA countries would benefit from preventing exposures to factors that increase the risk of foetal programming. More investment and intervention research must be put into maternal and child health programmes that minimise harmful exposures.

4.3.2 Modifiable Factors

Several modifiable risk factors were identified in the studies, and these were sub-divided into potentially malleable and non-malleable factors. Malleability was determined based on the ease with which a risk factor could be changed (including the potential costs of doing so) at individual and interpersonal levels of the Socioecological Model (Whitehead and Dahlgren, 1991, CDC, 2015, Schmied, 2017). In this study, factors that would not be costly, would not require a long time to change and would not need policy changes (which are likely to be harder and take long to change (Wight et al., 2014)) were considered to be malleable.

4.3.2.1 Non-malleable factors

Table 4.3 provides a summary of the seven modifiable risk factors considered to be non-malleable grouped into physiological (N=2) and socio-demographic (N=5) factors.

Table 4. 2 Frequencies of non-malleable risk factors for hypertension

BROAD CATEGORY	RISK FACTORS	RISK FACTORS' ASSOCIATION WITH HTN		FREQUENCY
Physiological factors	1. Serum lipids (n=18/90)			20.0%
		Higher serum lipids positively associated with HTN (n=16/18)	88.9%	
		No significant association (n=2/18)	11.1%	
	2. DM/Hyperglycaemia(n=23/90)			25.6%
		DM or Hyperglycaemia positively associated with HTN (n=21/23)	91.3%	
		Non-significant positive association (n=2/23)	8.7%	
Socio-demographic factors	1. Marital Status (n = 9/90)			10.0%
		Being married positively associated with HTN (n=3/9)	33.3%	
		Being divorced/widowed positively associated with HTN (n=2/9)	22.2%	
		No significant association (n=4/9)	44.4%	
	2. Level of Education (n=29/90)			32.2%
		Primary/lower-level education positively associated with HTN (n=20/29)	69.0%	
		Secondary/higher-level education positively associated with HTN (n=1/29)	3.4%	
		Non-significant negative association (n=9/29)	31.0%	
	3. Level of Income (n=21/90)			23.3%
		Decreasing/lower income positively associated with HTN(n=10/21)	47.6%	
		Increasing/higher income positively associated with HTN(n=6/21)	28.6%	
		Non-significant association (n=5/21)	23.8%	
	4. Area of Residence (n=22/90)			24.4%
		Urban residence/urbanisation positively associated with HTN (n=19/22)	86.4%	

BROAD CATEGORY	RISK FACTORS	RISK FACTORS' ASSOCIATION WITH HTN	FREQUENCY
		Rural residence positively associated with HTN(n=2/22)	9.1%
		Semi-urban residence associated with HTN (n=4/22)	18.2%

HTN=hypertension; DM=diabetes mellitus

a) Physiological factors

i) Hyperglycaemia and Diabetes Mellitus

Just over a quarter of the studies (n=23/90) explored associations between raised fasting blood sugar, either below or above the diabetic threshold, and hypertension. Nearly all of these (n=21/23) found a significant positive correlation (Abebe et al., 2015, Akintunde, 2010, Awoke et al., 2012, Bushara et al., 2016, Chin et al., 2017, Egbi et al., 2015, Goma et al., 2011, Guwatudde et al., 2015a, Kandala et al., 2012, Kayima et al., 2015, Kingue et al., 2015, Kramer et al., 2012, Mosha et al., 2017, Nahimana et al., 2017, Owolabi et al., 2017, Pessinaba et al., 2013b, Phillips and Banyangiriki, 2015, Sande et al., 2000, Solomon Mekonnen et al., 2015, Tigbe et al., 2014); and two others reported non-significant positive correlations (Albert and Effiong, 2015, Asresahegn et al., 2017). As such, higher blood sugar levels, including those above the diabetic threshold, appear to increase risk of hypertension in SSA.

ii) Serum Lipids

Associations between serum lipids and hypertension were explored in 18/90 studies. The majority of these (n=16/18) found significant positive associations (Akintunde, 2010, Baldo et al., 2017, Baragou et al., 2012, Grace and Semple, 2012, Hendriks et al., 2012, Ibrahim and Damasceno, 2012a, Kramer et al., 2012, Nahimana et al., 2017, Njelekela et al., 2003, Owusu et al., 2015, Pessinaba et al., 2013b, Pisa et al., 2010, Pisa et al., 2018, Schutte et al., 2012a, Tibazarwa et al., 2009, Tigbe et al., 2014), while the rest (n=2/18) found statistically non-significant positive correlations (Goma et al., 2011, Sande et al., 2000). These findings suggest that increased serum lipid levels are likely to increase the risk of hypertension in SSA.

b) Socio-demographic factors

i) Marital status

A few studies (n=9/90) examined the association between marital status and hypertension. The findings were inconsistent. A third (n=3/9) found a higher risk of hypertension among married people (Arrey et al., 2016, Aryeetey and Ansong, 2011, Owolabi et al., 2017). One-fifth (n=2/9) of the studies found widowed/divorced status (Mosha et al., 2017, Scotch, 1963) to be positively associated with hypertension. However, almost half (n=4/9), found that marital status had no influence on the risk of hypertension. Majority of the studies, therefore, suggest that there is no association between marital status and hypertension.

ii) Level of Education

Nearly one third (n=29/90) of the studies explored the relationship between education and hypertension. Of these, slightly over two-thirds (n=20/29) found a higher risk of hypertension to be associated with being educated only to primary school level compared to secondary or higher (n=1/29) level (Agaba et al., 2017, Alemayehu and Haftu, 2012, Arrey et al., 2016, Asresahegn et al., 2017, Babalola et al., 2011, Baragou et al., 2012, Basu and Millett, 2013, Bosu, 2010, Bushara et al., 2016, Cois and Ehrlich, 2014, Gebreselassie and Padyab, 2015, Goma et al., 2011, Guwatudde et al., 2015b, Murthy et al., 2013, Owolabi et al., 2012, Pessinaba et al., 2013b, Pires et al., 2013, Siziya et al., 2012, Zack et al., 2016a). Almost a third (n=8/29) found non-significant negative associations between level of education and hypertension (Ajayi et al., 2017, Awoke et al., 2012, Bovet et al., 2002, De Ramirez et al., 2010, Egbi et al., 2015, Guwatudde et al., 2015a, Mosha et al., 2017, Zhou et al., 2012). Taken as a whole, therefore, the available evidence suggests that in SSA, having a lower level of education increases the risk of hypertension.

iii) Level of income

A fifth of studies (n=21/90) explored relationships between income and hypertension. Nearly half (n=10/21) found that a lower income level was associated with hypertension (Abegunde

and Owoaje, 2013, Baldo et al., 2017, De Ramirez et al., 2010, Hendriks et al., 2012, Kramer et al., 2012, Murthy et al., 2013, Owolabi et al., 2017, Scotch, 1963, Seedat et al., 1982, Wu et al., 2015). However, about one-third of the studies (n=6/21) reported positive associations between higher income and hypertension (Agaba et al., 2017, Asresahegn et al., 2017, Babalola et al., 2011, Cois and Ehrlich, 2014, Fikadu and Lemma, 2016, Gebreselassie and Padyab, 2015, Wu et al., 2015), while the rest (n=5/21) found positive but non-significant associations between level of income and hypertension (Basu and Millett, 2013, Bovet et al., 2002, Kayima et al., 2015, Zack et al., 2016a, Zhou et al., 2012). These findings suggest that in most of SSA, more evidence shows that higher income increase the risk of hypertension than does lower income levels.

iv) Area of Residence

Nearly a quarter of the studies (n=22/90) found place of residence to be associated with a risk of hypertension. Of these, almost all (n=19/22) reported urban living to be positively correlated with hypertension (Abebe et al., 2015, Babalola et al., 2011, BeLue et al., 2009a, Bosu, 2010, Gebreselassie and Padyab, 2015, Ibrahim and Damasceno, 2012a, Murthy et al., 2013, Oelke et al., 2015, Sande et al., 2000, Scotch, 1963, Seedat et al., 1982, Sever et al., 1980, Siervo et al., 2014, Sobngwi et al., 2004, Solomon Mekonnen et al., 2015, Steyn et al., 1997, Tigbe et al., 2014, Wu et al., 2015). In addition, nearly a fifth of the studies (n=4/22) found an increased risk of hypertension in semi-urban, relative to rural, areas (Guwatudde et al., 2015b, Mosha et al., 2017, Nahimana et al., 2017, Seftel et al., 1980). Only two studies showed a higher risk in rural than urban areas (Agyemang, 2006a, Njelekela et al., 2003). Overall, relative to rural and semi-urban areas, living in urban areas appears to present a higher risk of hypertension in SSA.

c) Malleable Factors

Table 4.3 summarises the six modifiable factors that were classified as malleable at the individual and interpersonal levels of the SEM. These were sub-divided into behavioural (diet, physical activity, smoking and alcohol intake) and physical (body weight) factors.

Table 4. 3 Frequencies of studies reporting malleable risk factors for hypertension.

BROAD CATEGORY	RISK	RISK FACTORS' ASSOCIATION WITH HTN		FREQUENCY
Behavioural factors	Diet (n=11/90)			12.2%
		High Salt intake (n=10/11)	90.9%	
		Associated with HTN (n=8/10)	80.0%	
		Non-significantly associated with HTN (n=2/10)	20.0%	
		High fatty foods and red meat consumption (n=4/11)	36.4%	
		Associated with HTN (n=3/4)	75.0%	
		Non-significantly associated with HTN (n=1/4)	25.0%	
		Low fruit/vegetable (n=8/11)	72.7%	
		Associated with HTN (n=6/8)	75.0%	
		Non-significantly associated with HTN (n=2/8)	25.0%	
		High calorie/over-refined foods intake (n=3/11)	27.3%	
		Positively associated with HTN (n=3/3)	100.0%	
	Physical activity (n=33/90)			36.7%
		PA negatively associated with HTN (n=23/33)	69.7%	
		Non-significant negative association with HTN (n=10/33)	30.3%	
	Smoking (n=37/90)			41.1%
		Smoking positively association with HTN (n=18/37)	48.6%	
		Non-significant positive association with HTN (n=19/37)	51.4%	
	Alcohol intake (n=34/90)			37.8%
		Alcohol intake positively associated with HTN (n=20/34)	58.8%	
		Non-significant positive association with HTN (n=13/34)	38.2%	
		Alcohol negatively associated with HTN (n=1/34)	2.9%	

BROAD CATEGORY	RISK	RISK FACTORS' ASSOCIATION WITH HTN		FREQUENCY
Physical characteristics	Body weight (n= 84/90)			93.3%
		Increasing BMI positively associated with HTN (n=52/84)	61.9%	
		Overweight positively associated with HTN (n=49/84)	58.3%	
		Obesity positively associated with HTN (n=60/84)	71.4%	
		Non-significant positive association with HTN (n=5/84)	6.0%	
	Central Obesity (33/90)			36.7%
		WC positively associated with HTN (n=22/33)	66.7%	
		WHR positively associated with HTN (n=14/33)	42.4%	
		WHtR positively associated with HTN (n=1/33)	3.0%	
		AO positively associated with HTN***** (n=4/33)	12.1%	
		Non-significant positive association with either WC, WHR or WHtR (n=3/33)	9.1%	

HTN=hypertension; DM=Diabetes mellitus; AO=abdominal obesity; WC=Waist circumference; WHR=Waist-Hip Ratio; WHtR=Waist-to-height ratio, PA=Physical activity. *AO reported without indicating what parameters were used to measure it.

i) Behavioural factors

Diet

A small number of studies (n=11/90) explored dietary risk factors for hypertension in SSA. Nearly all of these (n=10/11) explored the association of salt with hypertension. The majority (n=8/10) found a significant positive correlation (Albert and Effiong, 2015, Azinge et al., 2011, Helelo et al., 2014, Mtabaji et al., 1990, Mufunda et al., 2000, Njelekela et al., 2003, Oelke et al., 2015, Yayehd et al., 2013) and two found a positive but insignificant relationship (Guwatudde et al., 2015a, Mulenga and Siziya, 2013).

All eleven studies explored relationships between hypertension and consumption of fatty foods (n=4/11), red meat (n=4/11), high calorie foods (n=3/11), as well as fruit and vegetable (n=8/11). Positive relationships were found between hypertension and consumption of fatty foods, red meat consumption (De Ramirez et al., 2010, Ibrahim and Damasceno, 2012a, Mundan et al., 2013), high calorie diets (Ibrahim and Damasceno, 2012a, Oelke et al., 2015, Siervo et al., 2014), low consumption of fruit and vegetables (Alemayehu and Haftu, 2012, Basu and Millett, 2013, De Ramirez et al., 2010, Gebreselassie and Padyab, 2015, Helelo et al., 2014, Mundan et al., 2013) and low potassium and vitamin D intakes (Afoakwah and Owusu, 2011, Ibrahim and Damasceno, 2012a, Mtabaji et al., 1990, Mufunda et al., 2000, Njelekela et al., 2003, Sande et al., 2000).

Overall, the dietary hypertension risk factors prevalent in SSA included high salt intake, consumption of fatty foods, red meat and high calorie foods, and low consumption of fruits and vegetables, potassium and vitamin D.

Physical Activity

Over a third of the studies (n=33/90) reported on the relationship between physical activity and hypertension. Of these, over two-thirds found significant positive correlations between low levels of physical activity and hypertension (Abebe et al., 2015, Awoke et al., 2012,

Babalola et al., 2011, Chin et al., 2017, Cois and Ehrlich, 2014, De Ramirez et al., 2010, Gebreselassie and Padyab, 2015, Goma et al., 2011, Helelo et al., 2014, Ibrahim and Damasceno, 2012a, Lambert et al., 1999, Mundan et al., 2013, Nahimana et al., 2017, Oelke et al., 2015, Owolabi et al., 2017, Oyeyemi and Adeyemi, 2013, Pessinaba et al., 2013b, Phillips and Banyangiriki, 2015, Sande et al., 2000, Seedat et al., 1982, Siervo et al., 2014, Zack et al., 2016a), while a further third found a non-significant positive correlation between physical activity and hypertension (Afrifa-Anane et al., 2015, Ajayi et al., 2017, Alemayehu and Haftu, 2012, Asresahegn et al., 2017, Baldo et al., 2017, Fikadu and Lemma, 2016, Guwatudde et al., 2015a, Mkhonto et al., 2012, Mulenga and Siziya, 2013, Siziya et al., 2012). Overall, therefore, low levels of physical activity appear to increase risk of hypertension in SSA.

Alcohol consumption

Over a third of the studies (n=34/90) explored the association between alcohol intake and hypertension. Almost two thirds of these (n=20/34) reported significant positive correlations (Abebe et al., 2015, Ajayi et al., 2017, Alemayehu and Haftu, 2012, Aryeetey and Ansong, 2011, Cois and Ehrlich, 2014, Goma et al., 2011, Ibrahim and Damasceno, 2012a, Kandala et al., 2012, Mundan et al., 2013, Nahimana et al., 2017, Owusu et al., 2015, Phillips and Banyangiriki, 2015, Pires et al., 2013, Pisa et al., 2010, Schutte et al., 2012a, Seedat et al., 1982, Solomon Mekonnen et al., 2015, Tigbe et al., 2014, Zack et al., 2016a). One study used a biochemical rationale, that alcohol increases levels of the liver enzymes, serum carbohydrate-deficient transferrin (CDT) and gamma-glutamyl transferase (GGT), to determine the relationship between alcohol intake and hypertension. Higher levels of these liver enzymes were directly correlated to hypertension (Pisa et al., 2010). Only one study reported a negative correlation between alcohol intake and hypertension (Owolabi et al.,

2017). Current evidence therefore suggests that high alcohol intake increases the risk of hypertension in SSA.

Smoking

Over one third (n=37/90) of studies investigated the association between smoking and hypertension. Current or past history of smoking was positively correlated with hypertension in nearly half of these studies (Agyemang, 2006a, Ajayi et al., 2017, Baragou et al., 2012, Cois and Ehrlich, 2014, Gebreselassie and Padyab, 2015, Guwatudde et al., 2015b, Ibrahim and Damasceno, 2012a, Kandala et al., 2012, Mosha et al., 2017, Mundan et al., 2013, Nahimana et al., 2017, Owusu et al., 2015, Pessinaba et al., 2013b, Phillips and Banyangiriki, 2015, Pires et al., 2013, Schutte et al., 2012a, Seedat et al., 1982, Tigbe et al., 2014). The increase in risk ranged from 12% to 37% among participants with a current or past history of smoking compared to non-smokers (Mosha et al., 2017). Just over half of the studies (n=19/37) found statistically non-significant positive correlations (Abebe et al., 2015, Albert and Effiong, 2015, Alemayehu and Haftu, 2012, Arrey et al., 2016, Awoke et al., 2012, Baldo et al., 2017, Basu and Millett, 2013, De Ramirez et al., 2010, Fikadu and Lemma, 2016, Goma et al., 2011, Guwatudde et al., 2015a, Hendriks et al., 2012, Hult et al., 2010, Kayima et al., 2015, Kramer et al., 2012, Mufunda et al., 2000, Mulenga and Siziya, 2013, Sande et al., 2000, Siziya et al., 2012). Overall, the evidence suggests that smoking is associated with an increased risk of hypertension in SSA.

b) Physical Characteristics

In this review, body weight was the only physical characteristic reported to be associated with hypertension. Studies explored body weight using various parameters including BMI and measures of central obesity.

As shown in Table 4.3, the majority (n=84/90) examined associations between body weight in terms of BMI, being overweight or obese and hypertension. Of these, nearly two-thirds

(n=52/84) reported an overall positive correlation between increased BMI and hypertension (i.e. every unit increase in BMI was associated with an increase in risk for hypertension) (Abebe et al., 2015, Abegunde and Owoaje, 2013, Achie et al., 2012, Afrifa-Anane et al., 2015, Agyemang, 2006a, Akintunde, 2010, Amira et al., 2012, Baldo et al., 2017, Basu and Millett, 2013, Bello et al., 2016, Bosu, 2010, Bovet et al., 2002, Cois and Ehrlich, 2014, De Ramirez et al., 2010, Doll et al., 2002, Egbi et al., 2015, Gebreselassie and Padyab, 2015, Goma et al., 2011, Grace and Semple, 2012, Griffiths et al., 2012, Gueye et al., 2017, Guwatudde et al., 2015a, Guwatudde et al., 2015b, Hendriks et al., 2012, Hult et al., 2010, Kayima et al., 2015, Kramer et al., 2012, Lategan et al., 2014, Mkhonto et al., 2012, Mosha et al., 2017, Mtabaji et al., 1990, Mufunda et al., 2000, Murthy et al., 2013, Njelekela et al., 2003, Ogah et al., 2013, Owolabi et al., 2017, Owusu et al., 2015, Oyeyemi and Adeyemi, 2013, Pires et al., 2013, Schutte et al., 2012a, Seftel et al., 1980, Sharaye et al., 2014, Siziya et al., 2012, Tibazarwa et al., 2009, Tigbe et al., 2014, Yayehd et al., 2013) Moreover, over half of the studies (n=49/84) found being overweight (BMI = 25-29.9kg/m^2) to be positively correlated with hypertension (Afoakwah and Owusu, 2011, Agyemang, 2006a, Ajayi et al., 2017, Amira et al., 2012, Aryeetey and Ansong, 2011, Asresahegn et al., 2017, Baldo et al., 2017, Bosu, 2010, Bushara et al., 2016, Chin et al., 2017, Cois and Ehrlich, 2014, Egbi et al., 2015, Gebreselassie and Padyab, 2015, Grace and Semple, 2012, Griffiths et al., 2012, Gueye et al., 2017, Guwatudde et al., 2015a, Guwatudde et al., 2015b, Helelo et al., 2014, Hendriks et al., 2012, Hult et al., 2010, Ibrahim and Damasceno, 2012a, Kayima et al., 2015, Kingue et al., 2015, Lategan et al., 2014, Mosha et al., 2017, Mtabaji et al., 1990, Mufunda et al., 2000, Mundan et al., 2013, Murthy et al., 2013, Nahimana et al., 2017, Njelekela et al., 2003, Ogah et al., 2013, Owusu et al., 2015, Phillips and Banyangiriki, 2015, Pires et al., 2013, Rodriguez-Arboli et al., 2016, Seftel et al., 1980, Sever et al., 1980, Siervo et al., 2014, Siziya et al., 2012, Sobngwi et al., 2004, Tibazarwa et al., 2009, Tigbe et al., 2014, Yayehd et al., 2013, Zack et al., 2016a); with a few of these studies (n=2/84) showing risk as

increasing with each unit increase in BMI above 25 (Asresahegn et al., 2017, Chin et al., 2017). Additionally, two-thirds of the studies (n=60/84) found a positive correlation between obesity and hypertension (Abebe et al., 2015, Adeboye et al., 2012, Afoakwah and Owusu, 2011, Agyemang, 2006a, Ajayi et al., 2017, Amira et al., 2012, Arrey et al., 2016, Asresahegn et al., 2017, Awoke et al., 2012, Baldo et al., 2017, Baragou et al., 2012, Basu and Millett, 2013, Bello et al., 2016, Bosu, 2010, Bushara et al., 2016, Chin et al., 2017, Cois and Ehrlich, 2014, De Ramirez et al., 2010, Doll et al., 2002, Egbi et al., 2015, Gebreselassie and Padyab, 2015, Grace and Semple, 2012, Griffiths et al., 2012, Gueye et al., 2017, Guwatudde et al., 2015a, Guwatudde et al., 2015b, Helelo et al., 2014, Hendriks et al., 2012, Hult et al., 2010, Ibrahim and Damasceno, 2012a, Kandala et al., 2012, Kayima et al., 2015, Kingue et al., 2015, Lategan et al., 2014, Mosha et al., 2017, Mtabaji et al., 1990, Mufunda et al., 2000, Mundan et al., 2013, Murthy et al., 2013, Nahimana et al., 2017, Njelekela et al., 2003, Owolabi et al., 2017, Owusu et al., 2015, Phillips and Banyangiriki, 2015, Pires et al., 2013, Rodriguez-Arboli et al., 2016, Scotch, 1963, Seedat et al., 1982, Seftel et al., 1980, Siervo et al., 2014, Solomon Mekonnen et al., 2015, Steyn et al., 1997, Tibazarwa et al., 2009, Tigbe et al., 2014, Yayehd et al., 2013, Zack et al., 2016a).

A significant number of studies (n=33/90) specifically measured central fat deposition (Waist-to-Hip Ratio (WHR), Waist Circumference (WC); Waist-to-Height Ratio (WHtR)). Of these, two-thirds (n=22/33) found a positive correlation between increased WC and hypertension (Akintunde, 2010, Asresahegn et al., 2017, Baldo et al., 2017, Basu and Millett, 2013, Doll et al., 2002, Egbi et al., 2015, Kramer et al., 2012, Lambert et al., 1999, Lategan et al., 2014, Mkhonto et al., 2012, Mosha et al., 2017, Mufunda et al., 2000, Mundan et al., 2013, Oelke et al., 2015, Ogah et al., 2013, Owusu et al., 2015, Pessinaba et al., 2013b, Pisa et al., 2018, Sande et al., 2000, Schutte et al., 2012a, Sharaye et al., 2014, Solomon Mekonnen et al., 2015). The rest, (n=14/33) and (n=1/33), found a positive correlation

between hypertension and WHR (Afoakwah and Owusu, 2011, Akintunde, 2010, Aryeetey and Ansong, 2011, Egbi et al., 2015, Goma et al., 2011, Grace and Semple, 2012, Hendriks et al., 2012, Mkhonto et al., 2012, Mufunda et al., 2000, Ogah et al., 2013, Owusu et al., 2015, Pessinaba et al., 2013b, Sande et al., 2000) and WHtR (Lategan et al., 2014), respectively.

A few studies (n=4/33) explored abdominal obesity (Ibrahim and Damasceno, 2012a, Owolabi et al., 2017, Pires et al., 2013, Pisa et al., 2018) and found a positive correlation with hypertension. A further three studies reported a non-significant positive association between obesity and hypertension (Albert and Effiong, 2015, Chin et al., 2017, Oyeyemi and Adeyemi, 2013). Taken together therefore, the findings clearly suggest that being overweight or obese (including central obesity) increases risk of hypertension in SSA.

4.4.0 Chapter summary and discussion

The purpose of this scoping review was to explore existing knowledge about the risk factors for hypertension in SSA. These were grouped into non-modifiable and modifiable risk factors. Considering this was a starting point for the development of a lifestyle intervention, this discussion has been limited to the modifiable risk factors: the category with factors having a higher scope of change.

This review revealed several factors considered to be potentially changeable (modifiable) including those with the lowest (non-malleable) as well as highest (malleable) scope for change at individual and interpersonal level. Non-malleable risk factors included high serum lipids, serum sugar, socioeconomic factors (e.g., education) and area of residence. Higher serum lipids levels were found to increase the risk of hypertension. Serum lipids include total cholesterol, high density lipoproteins cholesterol (HDL-C), low density lipoprotein-cholesterol (LDL-C) and Triglycerides (Araújo et al., 2017). Evidence from the current scoping review found a positive correlation between serum lipids and hypertension,

particularly low HDL-C, triglycerides and high LDL. Existing evidence from elsewhere supports these findings. Dyslipidaemia, (usually hypertriglyceridemia, high LDL-C and low HDL-C), is predictive of hypertension (Laaksonen et al., 2008, Memon et al., 2017, Sesso et al., 2005). Other studies have shown that a high triglycerides (TG)/HDL-C ratio is positively associated with hypertension (Cicero et al., 2014, Salazar et al., 2014, Tohidi et al., 2012). Sources of serum lipids include endogenous synthesis and dietary supply which are closely related with obesity (Grundy, 2016, Silva Afonso et al., 2018). To achieve lipid control, interventions need to target dietary sources as well as reducing obesity, in which case serum lipids can be considered as indirectly malleable. The potential benefits of controlling serum lipids include hypertension treatment and prevention (Spannella et al., 2019).

Like studies from countries outside SSA, this review found a positive correlation between raised blood sugar and hypertension in SSA. For example, Kingue et al. (2015) found that hyperglycaemia increased the risk of hypertension by 2.83 times compared to normal glycaemia. However, recent evidence from a 7-year longitudinal study has shown that DM and hypertension are predictors of each other independent of confounders like age, sex, BMI and family history (Tsimihodimos et al., 2018); suggesting a bi-directional causality. Regardless, as the current scoping review has shown, existing evidence in SSA supports the finding that high blood sugar level increases the risk of hypertension.

Socioeconomic factors, such as marital status, education and income were also found to be associated with hypertension. Findings On the association between marital status and hypertension were inconsistent; with some studies finding a higher risk of hypertension among the married, others finding widowed/divorced status to be positively associated with hypertension and yet some more studies finding no association. This mixed picture, which also exist in studies conducted in high income countries (Schwandt et al., 2010,

Ramezankhani et al., 2019), requires further investigation. Another factor found to be associated with risk of hypertension in SSA was level of education; with lower education being associated with an increased risk of hypertension. The causative role of education is, however, contested as some papers the scoping review found lower education to increase the risk of hypertension while others found the reverse to be true. Some evidence has suggested that education is only a contributing and not a direct risk factor for hypertension (Bushara et al., 2016). This means that education may act through other mediating factors like employment and level of income and may also increase comprehension of health education messages, including the rationale behind suggested behaviour changes. Despite lower income being associated with increased risk of hypertension, a significant number of studies also showed that higher income in the context of SSA is likely to increase the risk. This likely reflects the fact that the transition from low to high income in SSA increases adoption of unhealthy diets and sedentary lifestyles. For example, a study in Ghana established that adults with increasing levels of education and wealth adopted unhealthier lifestyles which only changed after introducing a lifestyle intervention (Tagoe and Dake, 2011). This is potentially because increased income is likely to increase access to fast foods from takeaways and also reduce dependence on physical activity for livelihood. The final non-malleable risk factor identified was urban residence. However, the fact that most of the studies in this study were conducted in urban areas could have introduced a bias for urban areas.

Beside the non-malleable risk factors, this review revealed several factors considered to be potentially changeable (malleable) at individual and interpersonal levels. These malleable factors included diet, physical activity, smoking, alcohol intake and body weight. An increase in unhealthy diets (high salt intake, fatty/oily foods, low fruit and vegetable consumption), low physical activity, smoking and excess body weight (including central

obesity) were found to be associated with an increase in the risk of hypertension. These findings were in keeping with existing evidence globally (Mills et al., 2020). However, for alcohol intake, one study found a negative correlation between alcohol intake and the risk of hypertension. A possible reason behind this inconsistent finding could be the type of alcohol that the study participants were exposed to as well as the quantities and frequency of intake. The research question in the study was whether a participant had ever taken alcohol. This could have been once or more exposures to alcohol. Thus, the protective effect of alcohol may not be guaranteed. However, according to Mundan et al. (2013), despite alcohol intake increasing the risk for hypertension overall; intake of red wine reduced the risk by 3.13 times compared to non-drinkers. This would suggest that the type of alcohol taken can determine the level of risk. Furthermore, some studies elsewhere have found that light to moderate consumption of alcohol has a protective effect against coronary heart diseases, ischaemic stroke, and peripheral arterial disease, while heavy drinking is associated with increased risk for hypertension, cardiomyopathy, dysrhythmias, and haemorrhagic strokes (Briasoulis et al., 2012, Klatsky, 2010, Rehm and Roerecke, 2017).

With the rising prevalence of hypertension in SSA, more preventive interventions are required. While appreciating the value of upstream interventions (e.g., to improve sociodemographic factors), this scoping review suggests that interventions targeting malleable factors such as excess body weight (overweight/obesity), unhealthy diet (high salt intake, low fruit and vegetable consumption, high fatty foods consumption) and physical inactivity may reduce the risk of hypertension. These are likely to offer the greatest scope of change at individual and interpersonal levels of the SEM where the current study aims to intervene.

These factors (unhealthy diet, excess body weight, physical inactivity alcohol and smoking) were investigated through focus groups (FGs) and stakeholder interviews, in Phase Two of

this study, to explore their relevance to the local context of Maramba. The next chapter (Chapter Five) presents findings from this exploration of the local context.

CHAPTER FIVE: LOCAL CONTEXT AND DEVELOPMENT OF THE INTERVENTION THEORY OF CHANGE

The evidence synthesis (Chapter Four) identified a range of risk factors for hypertension in SSA. However, an in-depth understanding of the local context was required to situate how the potentially malleable risk factors identified in the scoping review (excess body weight, unhealthy diet, physical inactivity, alcohol intake and smoking) were perceived by community members, in order to co-develop a culturally sensitive lifestyle intervention to reduce the risk of hypertension. To gain this understanding, resident FGDs and stakeholder interviews were conducted in Maramba, Livingstone following the methodology outlined in Chapter Three. This formed Phase Two of the project and contributed to elements of Steps One to Four of the 6SQuID Model (Wight et al., 2014).

The residents (FGDs) discussed common health conditions in Maramba, the prevalent risk factors for hypertension, their perceived malleability in the local context and initial proposals for changes that could be made. Exploration of these topics in the FGDs was triangulated with stakeholder interviews. The latter also explored the change delivery channels (where/how to deliver the intervention). Findings from the FGDs and stakeholder interviews have been reported together; including common diseases, risk factors for hypertension and their drivers, change solutions and change delivery channels. This is because, despite the stakeholder interviews exploring delivery channels in detail, the themes for the two methods were the same and information obtained complimented each other.

5.1.0 Study participants

5.1.1 Focus group discussion participants

As Table 5.1 shows, four FGDs, each comprising eight participants, were conducted with Maramba residents to explore the perceptions and experiences of the lifestyle risk factors for hypertension and their underlying drivers locally. A total of 32 residents aged ≥18 years participated, of which 17/32 (53.1%) were female. Participants included teachers, businessmen/women, general workers, hospitality industry workers and housewives. Two focus groups comprised one gender (male-only and female-only) while the other two were mixed. This design aimed to assess if interactions across gender influenced the discussion vis-à-vis level of participation and content of what was discussed.

Table 5. 1 Summary of the composition of resident FGD by sex

Focus Group	Sex		Total participants per FGD
	Male	Female	
FGD 1	4	4	8
FGD 2	3	5	8
FGD 3	8	0	8
FGD 4	0	8	8
Total participants	15	17	32

5.1.2 Stakeholder interview participants

Thirteen (13) semi-structured stakeholder interviews were conducted each lasted between 30 and 45 minutes. As Table 5.2 shows, all participants held influential positions in the community or the organisations they represented. Interviewees came from religious groups, community leaders, non-governmental organizations, the health sector, local authority (Council) and government ministries such as the Ministry of Education. Of the 13 participants, five (38.5%) were female.

Table 5. 2 list of stakeholder interviews participants

Participant	Gender
1. Church Leader	Male
2. Community Health Worker	Female
3. Community Leader	Male
4. Company Leader	Male
5. District Health Office staff	Female
6. Government Department Leader - Social Services	Female
7. Government Department Leader - Education	Male
8. Health Centre Advisory Committee Member	Male
9. Health Care Worker – local health centre	Female
10. HIV-AIDS NGO Leader	Male
11. Social services-related NGO Leader	Female
12. Health-related NGO Leader	Male
13. Community leader (Ward Leader)	Male

5.2.0 Themes

As shown in Table 5.3, FGD and stakeholder interview themes were organised around the topic guides and included health conditions, community understandings of how hypertension presents, risk factors, drivers of unhealthy behaviors and change solutions. Unique to stakeholder interviews, an additional theme was change delivery channels.

Table 5. 3 FGDs and Stakeholders' interview themes, respective codes, and indications of where the codes where applied

THEME	CODES	FGD	S/INTERVIEW
Health conditions	Common diseases	✓	✓
	Personal experiences of hypertension	✓	✓
Community understanding of how hypertension presents	Signs and symptoms	✓	✓
Risk factors	Body weight	✓	✓
	Diet	✓	✓
	Physical activity	✓	✓
	Socioeconomic factors	✓	✓
	Stress	✓	✓
	Alcohol use	✓	✓
Drivers of behaviour increasing the risk of hypertension	Change barriers	✓	✓
Change solutions	Change solutions (to the identified problems)	✓	✓
Change delivery channels	Delivery through churches	N/A	✓
	Delivery through community groups/activities	N/A	✓
	Delivery through community leaders	N/A	✓
	Delivery through engaging the community	N/A	✓
	Delivery through media	N/A	✓
	Delivery through schools	N/A	✓
	Delivery through workplaces	N/A	✓

5.3.0 Health conditions

5.3.1 Common diseases

FGDs participants and interviewees mentioned a number of diseases as being prevalent in Maramba. Table 5.4 shows ten health conditions perceived as being most prevalent in the community, divided into communicable and non-communicable diseases.

Table 5. 4 List of the diseases/health conditions perceived by the participants as most common in Maramba

COMMUNICABLE DISEASES/HEALTH CONDITIONS	NON-COMMUNICABLE DISEASES/HEALTH CONDITIONS
HIV/AIDS	Hypertension (High Blood Pressure)
Diarrhoea	Diabetes Mellitus
Malaria	Headaches
Tuberculosis	Trauma
Coughs and colds	Malnutrition

The ranking of the most common diseases varied across the FGD participants and stakeholder interviewees:

> *"In my area I think diarrhoea [tops the list], especially in children. In adults, most of them have developed a chest problem, coughing"* [FG1 female participant 8]

> *"We've got Malaria, diarrhoea. We have things like kidney problems, right. BP is one of them. High BP, So there's quite a few."* [Female NGO Leader]

Despite this variation, hypertension was consistently mentioned among the top five diseases in all the FGDs and stakeholder interviews; demonstrating that it was commonly experienced in the community. Moreover, hypertension was the most common NCD reported by participants. To emphasise the reality of the problem of hypertension in the community, a female health care worker intimated that health facilities were seeing a lot of patients with hypertension and its complications. She explained that she had noticed that cases of

hypertension and its complications were in most of the daily reports from health workers on duty at the local clinic:

> *"There's no report that we read without reporting hypertension patients [……..] The night nurse, who was doing night duty last week, I think she, if we look at the whole night duty reports, she had strokes and things like hypertension. Yesterday we had a BID* [Brought in Dead]*, a known hypertensive, who just had a stroke and died."*
>
> [Female HCW]

The reality of hypertension in the community was also evidenced by some FGD participants and stakeholders giving their personal experiences of the disease. For example, one female FGD participant recounted how she lost her brother to hypertension:

> *"……it may be because of a nasty experience that I had in my home. This gave me a 10-0 beating* [overwhelmingly defeated] *and only later did I come to realise to say this is how hypertension behaves. There was a complaint of a headache, then feeling body weakness, even some vomiting took place. So, when we could not control this situation, we had to rush to the hospital and to be told this person has high blood pressure, what are you doing all along? I had seen it for the first time, and we only stayed with him for two days and the second day he passed on* [died]*."*
>
> [FG2 Female Participant 1]

Similarly, a female Community Health Worker (CHW) shared a personal experience of how her husband died of complications of hypertension following his dismissal from work:

> *"I talk with the experience from what happened with my husband when he was working for* […company name…]. *So, he was dismissed because* […reason for dismissal...]. *So, that was how he was dismissed. He ended up being stressed, BP went up. He ended up even dying."* [Female CHW]

Taken together then, the FGDs and interviews demonstrated that hypertension is a concern in Maramba and one that has impact directly on people's lives. These findings were in line with existing evidence that the prevalence of hypertension is increasing in SSA (Guwatudde et al., 2015b). The individual experiences of the disease gave more credence to the existence of the problem and its impact on individuals and their families. Additionally, the extracts

above reveal that participants often viewed hypertension as fatal. Therefore, it is likely that people might be motivated to intervene on hypertension and hence reduce its prevalence.

5.3.2 Community understanding of how hypertension presents.

Having established that hypertension was prevalent in the community and that residents were aware of the impact this has on individuals, families and the community, the researcher next explored residents' and stakeholders' understanding of the disease's presentation (i.e., the signs and symptoms of hypertension). These are summarised in table 5.5.

Table 5. 5 The signs and symptoms of hypertension as described by participants.

Signs and symptoms of hypertension	
Headache	Frequent urination
Body weakness	Sudden collapse
Body swelling	Numbness of body parts
Fast breathing & breathlessness	Sudden death
Swelling of feet	Getting tired quickly
Dizziness	Sweating
Having a hot temper	Neckache
Disability like paralysis	Heart racing
General body pains, (in the legs, shoulders and neck)	Sight becoming poor
Irritability (they do not to be disturbed/want quietness)/ moods	
Vomiting	

This study established that both FGDs participants and key stakeholders were aware of some ways in which hypertension presents. They described the signs and symptoms in different ways, most of which were in lay language as would be expected in non-health workers:

> *"Sometimes it's what's wrong with him, he'll get tired easily. If taking a walk, just a few steps someone is tired"* [FGD3 Male participant 4]

This extract shows that the residents had ideas on how to identify a suspected case of hypertension and its complications. Some participants intimated the complex relationship between some symptoms and hypertension. For example, one businesswoman described:

> *"To me the symptoms of BP, […….], when it starts temper goes up, I don't know, sometimes that you become moody, different from your own mood sometimes, you get moods like that."* [FGD3 female participant 3]

Participants viewed emotional disturbance as a symptom for raised blood pressure. Intuitively, this extract shows that participants were able to associate rising blood pressure to prolonged emotional disturbance; albeit the causal direction stated as the reverse of the conventional biomedical understanding advanced by some researchers that prolonged emotional stimulation may result in increased blood pressure (Wiener et al., 2020, Ostir et al., 2006). Alternatively, this finding may mean that some participants felt that hypertension and emotions were intertwined: that those with high blood pressure were more likely to have volatile moods. This is in keeping with existing evidence about the bidirectional relationship established by some researchers where, besides prolonged emotional stimulation potentially causing rises in blood pressure, hypertensive patients are deemed to be more likely to have exaggerated emotional reactions (Liu et al., 2017).

Interestingly, both the residents and stakeholders were aware that hypertension may not always be symptomatic. They acknowledged that it might be silent until complications set in as one male FGD participant indicated:

> *"One of the problems that I've noticed is the sudden killer disease and very silent. It sometimes will not show any signs of any symptoms. Just feel bad, few minutes, few hours, it's not even days; you hear someone has died."* [FGD3 Male participant 7]

And a female NGO leader echoed similarly in a stakeholder interview:

> *"…there are some also who just drop dead. We've had such instances where someone is not sick. No-one knows that the person is sick. You just know this person was just okay, but they just dropped, and they died."* [Female NGO Leader]

Some residents understood that hypertension had complications that if not recognised and controlled early, may lead to disability, as one female resident explained:

> *"Another thing that I've noticed, it brings a disability. I find that if it is too high you get paralysed, you are told, no it was BP which shot up too high".*
>
> [FGD1 Female participant 4]

Section Summary

The findings from the focus groups and interviews suggest that people living and working in Maramba were aware of the increase in hypertension in the area as most had experience of it and some very deep and negative personal experiences of it. Participants also had a range of views about how it presents. They were also aware that hypertension may be asymptomatic and if left untreated could be very serious or even fatal. Participants indicated having had personal experiences of hypertension either as patients themselves or in their loved ones and this could have reinforced the understanding that hypertension was common in the community.

Having established that hypertension was perceived as being prevalent in Maramba, the next step was to understand people's perceptions of what was be responsible (risk factors) for the problem of hypertension locally.

5.4.0 Risk factors for hypertension and their drivers

Participants mentioned several risk factors for hypertension. These included weight gain, unhealthy diet, low physical activity, stress, socioeconomic factors and substance abuse (alcohol). This section will explore each of these in turn.

5.4.1 Body weight

The problem of unhealthy body weight was reported to be prevalent in Maramba. Residents and stakeholders described how that some people in the community were overweight:

"Some people [in the community] they are too fat, so this is a problem"

[FGD4 Male participant 1]

"It would be obesity; a lot of people have put on weight. Most of the hypertension patients they are obese" [Female HCW1]

However, being overweight was reported as desirable and admired by residents, demonstrating the social and cultural norms in the study site. Moreover, those who were overweight were proud of it and sometimes viewed by the community as role models, potentially inspiring others to be like them. The fact that some men viewed overweight women with big waists as desirable served as an incentive for women to gain weight. Furthermore, married women who gained weight were viewed as well-kept by their spouses. For some, it was a sign of a good life:

"They even boast to say us we are very healthy, very fat…. not knowing that that is a problem [……] now people still admire being fat. You start wishing you could gain and be like some people with big bodies." [FGD2 Female participant 6]

"…. a good woman, one, who has no big waist…some men have less interest in them."

[FGD2 Male participant 1]

"Others even say the woman is not being kept well by the spouse if they are slim".

[FGD2 Female Participant 4]

The study also established that residents and stakeholders were aware that weight gain was inter-related with other risk factors for hypertension. Weight gain was seen as a product of unhealthy diets, with one health worker suggesting that lack of knowledge about healthy eating was becoming more and more of a problem as people's incomes increased and adoption of (unhealthy) Westernised lifestyles became widespread:

"It would be obesity; a lot of people have put on weight. We have Shoprite [South African supermarket chain] *now with all those foods that are fattening, fast food restaurants and we will say our people in Maramba, [……] they afford to go to Shoprite and those shops and now the part where we're coming maybe we are not educated on the importance of eating healthy enough. Most of the hypertension patients they are obese"* [Female HCW]

This understanding was not only portrayed by the HCW but also by FGDs participants. For example, one female resident indicated that people ate a lot of food and aspired to gain weight, suggesting the coming together of traditional values and aspirations (weight gain) with Westernised dietary practices (ready availability of high salt, processed food) in a way that was damaging to people's health:

> *"There is a very nice term that people use, food kill me if you don't kill me then change the shape of my body. I, they can swallow anything apart from the needle [……..]. On top of that too much salt. They even boast to say us we are very healthy, very fat…. not knowing that that is a problem."* [FGD4 Female participant 5]

As well as understanding the association between overweight/obesity and hypertension, some stakeholders were aware that people of normal weight could develop hypertension, in recognition that there are other factors contributing to the increased risk for hypertension.

> *"…. you know people of late had the misconception. They thought these non-communicable diseases, particularly hypertension …. had to do with size of the body. But today you find people who they're slim, but they've got hypertension."*
>
> [Male Education Leader]

Overall, being overweight was viewed as a common risk factor for hypertension in the study site, driven by factors such as the community viewing it as desirable, admirable and a sign of living well. This emphasises the role of community beliefs and norms on behaviour. Weight gain was driven by unhealthy diets and a lack of knowledge on healthier lifestyles, increasing incomes and availability of Westernised lifestyles.

5.4.2 Unhealthy diet

The local context revealed that unhealthy diets were common in the community. As Table 5.6 shows, these included high salt intake, fatty foods such as fried and fast/junk foods, meat and low consumption of fruit. For example, some participants emphasised:

> *"When you have prepared food, people without even tasting, they just add salt."*
>
> [FGD Female participant 3]

"The most thing that we have in the communities, it's fatty things, fatty diets in the homes. Already seeing all the junk food is becoming so common so people don't know what they eat." [FGD3 Male participant 3]

"I think high blood pressure is caused by the food that we eat. Some of the food that we eat causes high blood pressure……. Like junky foods, they call it."

[Female NGO leader]

Table 5. 6 Foods and drinks increasing risk of hypertension as perceived by the study participants in Maramba

Unhealthy diets
High salt intake
Fatty foods
Fried/oily foods
Fast foods/ Junk foods
High meat consumption
Low vegetable and fruit consumption
High intake of carbonated drinks
High sugar intake

Despite being aware of the prevalence of unhealthy diets in the community, residents and stakeholders tended to be a bit vague about how a poor diet might increase hypertension risk. For example:

"…and also other drinks that we drink, they can also cause hypertension and the type of exercises we do, yes [……] The drinks? I can't know exactly which ones and how much....". [Male GRZ Leader 2]

This evidence from the residents and stakeholders suggest that unhealthy diets were common in Maramba and were viewed as only be part of the reason why levels of hypertension were increasing. Another lifestyle perceived as contributing to hypertension was low physical activity as explained in the next section.

5.4.3 Low physical activity

Residents and stakeholders indicated that physical activity (such as walking, jogging and working out at the gym), was quite low among the residents. For example, one church leader explained:

> *"Yeah, if you look at how people live today, there are very few people that can, for example, go to the gym or go to…for your road run, for example, or walk, you know. So for me I think it has to do with type of lifestyle that people have embraced"*
>
> [Male Church Leader]

Physical inactivity was reported as being worse in those with formal employment, another illustration of a transition to Westernised lifestyles. Many people drove to work, sat in the offices during the day, drove back home, ate and spent their evenings either on the computer or watching television. As such, they spent less time walking or exercising, as some participants recounted:

> *"After work, if you go to work, they go sit in their office, from the office, home they are on a laptop. From there they sleep, wake up just eat."* [Female NGO Leader]
>
> *"From home into a car, from car into office, office to car, home, home again not a bit active. Because someone doing some work, either on your computer or watching TV and just changing channels."* [FGD2 Participant 1]

Asked specifically about the situation with those not in formal employment, participants insisted that, in general, people used motorised transport, especially cabs, more often than they walked:

> *"So, for us we don't want to do that [exercise]…. its cab…. taxi….cab…taxi. Even when you want to go and buy vegetables here, you want to use a vehicle, you want to be driven there and then come back. So that is also impacting on our health."*
>
> [FGD1 Participant 2]

These findings suggest that physical activity levels were perceived as low in Maramba because most people preferred to use motorised transport rather than walk, and those in

formal employment tended to have sedentary lifestyles, sedentary jobs and sedentary leisure activities.

5.4.4 Socioeconomic status (SES)

Having a higher SES was recognised as having its risks. Stakeholders and residents indicated that people with more financial resources adopted unhealthy lifestyles. This was driven by either a lack of knowledge about healthy choices or the desire to prove to onlookers that they were wealthy by, for example, always using their car to move from place to place (hence reducing physical activity levels). A female participant emphasised:

> *"……those with money also don't know these things [about risk factors for hypertension]. They just drive any time because they want to show that they are well up……."* [FGD 1 Female Participant 4]

High socioeconomic status, therefore, predisposed individuals to other intermediate risks factors for hypertension. as will be discussed in detail later. Nonetheless, the views of the residents and stakeholders were that low SES also had detrimental effects on people's health in Maramba. They indicated that financial challenges due to poverty or perceived low-income lead to more stress in the affected people. High stress, in turn, was seen as increasing the risk of hypertension, as both FGD and interview participants highlighted:

> *"…. maybe the lifestyle we live, when you look at our finances also the poverty level...here is one mother who has orphans and has to fend for them. Even us who work, for you to wait for that salary to come you find that pressure in the head, also that causes the hypertension as well."* [FGD2 Participant 3]

> *"Well, a lot of people think a lot right, as far as the poverty is concerned, you have got problems in the house because you're not eating well. The pressure, children can't go to school. You think a lot and as a result people are developing High BP."* [Male Company leader]

Potentially, stress due to perceived low SES could be worsened by increased aspirations to acquire things within the community, especially items associated with higher income status (e.g., being able to afford using motorised transport instead of walking). It also emerged that

financial challenges predisposed people to making unhealthy choices. Both residents and stakeholders indicated that food choice was dependent on the resources at a person's disposal or the availability of time to prepare healthy meals (e.g., traders spend more time doing business to earn a living, with no time to cook and only surviving on junk foods), as this extract illustrates:

> *"And for others, it could be that maybe they are very busy. Like here in Livingstone where we are we have got a lot of traders, cross border traders and maybe people who are working. So, they don't have time to prepare food, they'd rather go for fast foods."* [FGD2 Participant 1]

These findings suggest that both high and low SES individuals were at risk of hypertension. Whereas those with high SES adopted more westernised lifestyles, such as consumption of fast foods and sedentariness, because they could afford to do so, people from low SES households had increased pressure to live like higher SES households. Additionally, those with low SES had limited choices of healthier diet as they may not have had the capacity to buy fruit, for example, to ensure daily consumption of the recommended portions.

5.4.5 Stress

This study established that high stress levels among community residents contributed to the increase in levels of hypertension. Residents and stakeholders highlighted that in addition to economic challenges previously discussed, the most common causes of stress were domestic/family relationships. They reported that the high occurrence of marital disputes and child disobedience were stressful situations, especially for women. For example, some residents said:

> *"Actually, our men, they are big headed. They are the most reason why women suffer from BP. Busy giving women problems and worrying them. Some men only drink and do nothing at home."* [FGD4 Participant 1]

> *"Even our children…. drinking alcohol. So, every day you are worrying about your child, and at the end of the day you can end up dying because the BP is rising each*

time your son comes back home at 2a.m., knocking on the door"

[FGD4 Participant 2]

5.4.6 Alcohol use

As the extract below illustrates, both residents and stakeholders also reported that alcohol was one possible cause of hypertension in the community. Indeed, a lot of people were perceived as drinking too much alcohol:

> *"Maybe some people you could say consumption of alcohol it can also be a contributing factor, people drink……. too much drinking."* [FGD2 Participant 2]

Further discussion revealed that a lot of men and youths did not have job and resorted to drinking heavily as the only activity:

> *"Another thing is lack of jobs. Our children have no jobs. They are just in the streets loitering and drinking alcohol."* [FGD4 Participant 8]

Moreover, there were no recreation facilities (e.g., public physical activity facilities such as swimming pools) to keep people busy, as most places that were initially designated for this purpose did not exist anymore as they either have never been developed to provide space for recreation activities or had been repurposed into something else e.g., residential places:

> *"…the compounds where government had plans to say, here people can one day meet and do an activity, they are no longer there. So, the only remaining maybe activity is alcohol drinking. You find people getting drunk as early as, I don't know what time. Is that really going to improve on our health?"* [FGD3 Participant 8]

Section summary

Overall, risk factors for hypertension, as perceived by participants, included overweight/obesity, unhealthy diet (high salt intake, consumption of fatty and oily foods, and low fruit and vegetable consumption), low physical activity (due to increased use of motorised transport and less engagement in exercise), high stress levels and high alcohol

intake especially among young people and men. Interestingly, both low and high socioeconomic status were perceived to increase the risk of hypertension.

The risk factors for hypertension identified in the local context were in keeping with scoping review findings for the wider SSA region. This confirmation in line with Step One of the 6SQuID Model (Wight et al., 2014), potentially improved community empowerment and the critical consciousness of local people (concepts from the Community Organisation Model) (Glanz et al., 2008) in relation to local issues. However, in order to intervene on these risk factors, understanding what their drivers, as described in the next section, is key.

5.5.0 Drivers of behaviors increasing the risk of hypertension

Having identified the main lifestyle-related risk factors for hypertension in Maramba, the potential drivers of the unhealthy behaviours were explored. These were defined as change barriers: that is the behaviours/factors likely to hinder the adoption of healthier lifestyles. As shown in Table 5.7, barriers were reflective of three broad issues, including low socioeconomic status (residents), low health literacy and an unsupportive social and built environment. These arose from several factors. For example, low health literacy levels resulted from a lack of health education programmes about healthy lifestyles, and an inadequate emphasis on hypertension by health workers. Additionally, participants reported a lack of opportunities to adopt healthier lifestyles, like the unavailability of information in health facilities to facilitate knowledge acquisition, and a lack of recreation facilities to promote physical activity. For example, a female FGD participant explained:

> *"Even in here* [Maramba] *in the clinics, if you go out, the only pictures you'll find are those talking about sexual, condoms and that kind. I can't see any poster showing me to say there is need for these types of foods at our homes, so we need to be seeing that."* [FGD 3 Female Participant 3]

Table 5.7 provides the three broad categories of barriers mapped onto the levels of influence according to the Socioecological Model (SEM), consequently suggesting where to intervene. For example, one individual level barrier with a far-reaching impact on behaviour was lack of knowledge about healthier lifestyle choices as one stakeholder explained:

> *"Hypertension will manifest because it's like people don't have information on hypertension and on foods which we have to eat. There is no information which has been given… It's not as it is with other diseases. With hypertension people don't have information…. people don't even know what BP is."* [Female NGO Leader]

Lack of information was viewed as affecting choices around diet, physical activity and weight control. Thus, some people had no intention to change lifestyles because they had little or no information about hypertension. However, some participants also felt that there were people who had the knowledge but failed to act on it:

> *"But again, some people they know these things that for example eating too much fat is not good for their health. But they still do the same thing."*
>
> [Female NGO Leader]

The quote above was in keeping with evidence suggesting that whilst the provision of information will be important for the intervention, this will have to be supported by other activities to promote behaviour change (Wight et al., 2014).

Table 5. 7 Barriers to adoption of healthy lifestyles as discussed by residents and stakeholders

Broad category	Barriers to change	How the barriers identified are likely to prevent adoption of healthier lifestyles	Levels of the Socioecological model at which barriers act
Socioeconomic status	Poverty/insufficient finances	✓ Unable to afford healthy meals	Individual level
	Inadequate jobs	✓ People do not have things to do, hence spending most of their time drinking alcohol	Policy level
	Gyms are expensive	✓ Few people can afford membership costs	Organisational/policy level
	Fruit is expensive (coupled with a perception that suitable fruits are only those bought from expensive supermarkets)	✓ Low fruit intake	Policy and Individual levels
Low Health literacy	Lack of information in health clinics (e.g., posters, leaflets etc) on hypertension	✓ Few opportunities for community members to find out about hypertension and how to prevent it	Organisational level
	Lack of knowledge on healthy lifestyles and diets, low literacy levels	✓ Unhealthy choices of diets	Individual and Community levels
		✓ People see no need for physical activity	
		✓ People view weight gain as healthy	
Unsupportive environment	Attitude and perceptions	✓ Not acting on knowledge	Individual level
	Homes have a lot of gadgets/games/phones/computers	✓ More time spent watching TVs, playing games, on phones or computers leading to increased sedentary lifestyles	Individual level
	No physical activity programmes suitable for older people.	✓ Older people exercise less	Community level
	Societal norms (including standing in society) and negative perceptions about healthier lifestyles	✓ Frying food most of the time to compete with neighbours especially in high density residential areas ✓ Eating junk~~y~~ foods/takeaways ✓ Walking is not appealing to many	Community level

Broad category	Barriers to change	How the barriers identified are likely to prevent adoption of healthier lifestyles	Levels of the Socioecological model at which barriers act
	Insufficient attention and community engagement by health workers on hypertension and other NCDs	✓ Hypertension not seen to be a problem hence community members not seeing the need to do anything ✓ Communities not owning public health programmes/interventions	Organisational level Community level
	No physical activity /recreation facilities	✓ No free places for engaging in physical activity	Community and policy levels

This study also established that there were some societal norms and perceptions acting as barriers to the adoption of healthier lifestyles. These were explored by all the focus groups and stakeholders and the findings are summarised in Table 5.8. For example, it was established that people preferred some unhealthy diets like fatty foods because they perceived eating fried food every day as eating well and a sign of wealth/doing well/living well in the community as one church leader indicated:

> *"I think people think that when they eat a lot of chicken every day and they put a lot of butter on their bread and this milk that is not, for example…that has a lot of fat, people think that they are living good life."* [Male Church Leader]

Conversely, eating a lot of vegetables was viewed as indicative of suffering, as one resident echoed:

> *"Even if they see me eat more vegetables than I eat meat, still it's there. They say, they are afraid they'll be looked down upon…."* [Female Health worker]

Evidently, such perceptions may discourage some people from consuming sufficient vegetables and thus increasing the risk of hypertension in Maramba.

Table 5. 8 Summary of perceptions driving adoption of unhealthy behaviours likely to raise risk of hypertension

Perception	Impact of the perception
People think eating meaty and fried food everyday means eating well and a sign of wealth/doing well/living well	Eating fatty/oily food is incentivised by the sense of recognition that one is doing well in life
	More people eating fatty/meaty/oily foods
Eating vegetables is interpreted as a sign of suffering	To avoid being perceived as suffering, people do not desire vegetable meals. They would rather have meat/fried foods without vegetables and not the reverse
	Eating vegetables is not incentivised and consumption is low in most homes
Gaining weight is a sign that one is living well/sign of wealth	People are motivated to gain weight
	People are proud of weight gain
	People eat unhealthy diets to gain weight
Some men love women with big bottoms	Some women are motivated/encouraged to gain weight and consequently becoming more appealing to the menfolk
Salt is good for men's sexual prowess	High salt intake incentivised among men (with anticipation of the reward of sexual prowess)
Walking (as opposed to driving, using cabs or buses) is a sign of suffering or not having resources	Walking is disincentivised
	People opting to use motorised transport (despite walking being the cheapest way of engaging in physical activity)
	Low physical activity
Family planning methods (especially hormonal long term contraceptive implants) are good for weight gain.	Some women use contraceptive implants for purposes of gaining weight
More people realising that hypertension is affecting a lot of people and causing death	People are willing to change given the right health information

Another important perception among the Maramba community was the view that walking was a sign of suffering.

> *"Even if you have a vehicle but to park it, you decide you'll be walking for the sake of exercising, they will say "basila manje" [they are now finished]; they have no fuel in their vehicle you know."* [Female Health worker]

This, potentially, contributed to low physical activity levels in Maramba as explained earlier.

As mentioned in section 5.4.1, there was a growing realisation that hypertension was no longer only affecting people who were overweight and/or wealthy. This was also supplemented by the belief that hypertension was a killer disease (as described in section 5.3.2). As such, the fear of hypertension is growing, thus social norms are being questioned/changed, as explained by one community leader:

> *"Previously, hypertension was a sign of wealth/prestige. People were proud of it. Now it is becoming scary because it is affecting a lot of people and causing death"* [Male Community Leader]

The local context also illustrated the importance of the trusted other (someone respected - like a health care worker) in the community in bringing about behaviour change through offering guidance to people:

> *"…. because me I used to like junky foods, there was a time when I went to the clinic and the doctor said you have gone overweight, you need to work on your diet. I had to do away with a lot of foods…I wasn't able to fit in this dress but now I am fitting."* [FGD2 female Participant 2]

This extract therefore illustrates that with the 'right' intervention, despite unsupportive societal norms, people can embrace and value changes such as weight loss.

Section summary

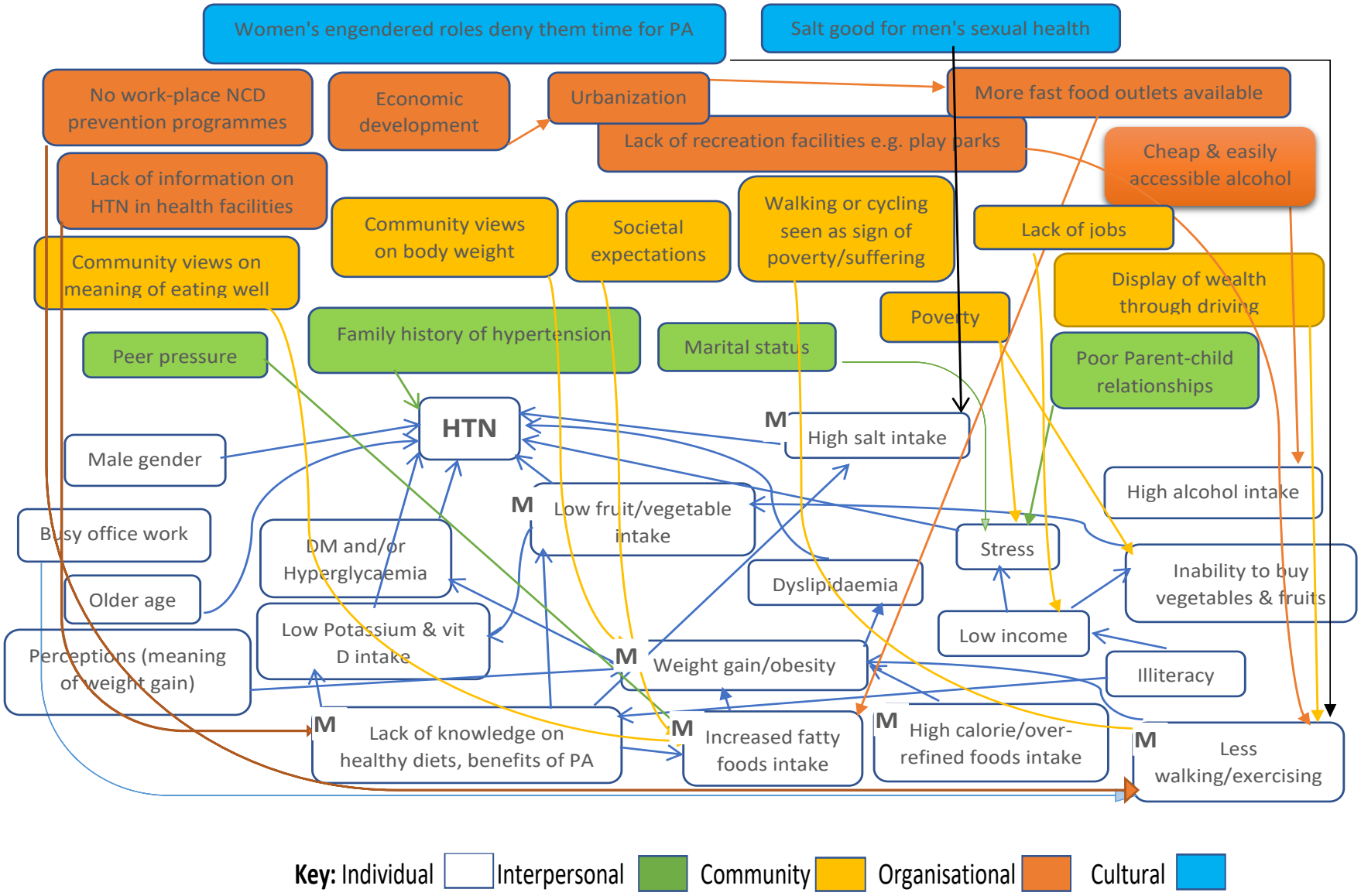
Taken together, the evidence presented suggests that although social norms and perceptions may contribute to people's adoption of unhealthy lifestyles, the fear of hypertension and understanding that anyone could be affected (and without knowing), given appropriate health information, tools, skills and opportunities (such as guidance and support from the trusted others in the community), people may embrace and value lifestyle changes.

The understanding of the risk factors for hypertension in the local context, as well as their drivers, was then used to generate a causal pathway to provide a rationale of how risk factors lead to hypertension, as described in the next section.

5.6.0 The causal pathway

The causal pathway (Figure 5.1) shows the risk factors for hypertension in the study site (from findings of the scoping review and the local context) organised according to the SEM levels of influence i.e., individual, interpersonal, community, organisation, and cultural levels. The causal pathway diagrammatically explains established associations between the risk factors (and their drivers) and hypertension (Paasche-Orlow and Wolf, 2007).

Figure 5. 1 Causal pathway for hypertension in Maramba incorporating different levels of the Socioecological Model (malleable factors marked with a letter M)



5.7.0 Contextual malleable risk factors

The residents and stakeholders mentioned various factors (including lack of knowledge, unhealthy diets, low physical activity and overweight/obesity) that were possible for the community to change, and hence considered to be malleable in the local context. These risk factors are identified in the causal pathway (Figure 5.1) with the letter **M**. For example, residents and stakeholders considered it was essential to improve health literacy about hypertension and its risk factors, as one church leader explained:

> *"For me I think first it's important that we deal with the issue of lack of knowledge. This can be changed."* [Male FGD4 Participant 2]

Similarly, a male leader from the Ministry of Education highlighted how knowledge is perceived as interconnected with multiple other risk factors for hypertension:

> *"Knowledge would be the first thing. So, I think when empowered with knowledge they* [residents] *will know what to do. This will trickle down to change their lifestyle in terms of what they eat, in terms of how they're supposed to conduct themselves, to carry themselves, having exercise."* [Male Education Leader]

The focus groups also revealed that residents felt that promoting healthy and inexpensive locally produced foods could be a feasible way of improving diets:

> "*I think in my view diet is the easiest. Why I am saying so is because we have a lot of cheap foods around, like sweet potato leaves, cassava leaves; those are very cheap compared to these other unhealthy foods".* [Male FGD 2 Participant 1]

Similarly, residents regarded physical activity and body weight as intertwined and changeable:

> *"It will all be in the name of physical activity, yes it's workable. Like increasing physical activity through a netball team for the market or football team. Like this also weight can be controlled"* [Female FGD 3 Participant 4]

As described in Step three of the 6SQuID model, the foregoing section identified what the community felt could be intervened on based on perceived malleability. In line with the Community Organisation Model's concept of critical consciousness (Glanz et al., 2008), the risk factors were prioritised together with the community in a participatory approach in order to improve local ownership of the intervention. The next section describes the participants' views on how the identified malleable risk factors could be changed (change solutions) to reduce the risk of hypertension.

5.8.0 Change solutions

Having identified the risk factors for hypertension with the highest scope of change (malleable), activities that could be implemented to bring about the desired change, i.e., solutions were explored. Table 5.9 shows potential ways to bring about change organised according to the SEM levels of influence. Community, organisational and policy levels were excluded, as focus of the intervention was at the individual and interpersonal levels.

Table 5. 9 Malleable risk factors for hypertension and activities/strategies to bring about the desired change at the different levels of the SEM (suggested by residents and stakeholders)

MALLEABLE RISK FACTORS	POSSIBLE WAYS OF BRINGING ABOUT THE DESIRED CHANGE	
	INDIVIDUAL	INTERPERSONAL
Lack of knowledge about healthy lifestyles such as what healthier diets constitute, the benefits of physical activity/what activities are healthier and body weight	Health education e.g., through stories and using local people	Use local champions (someone close to the community)
Inadequate physical activity		Use role models to demonstrate merits and demerits of physical inactivity
		Forming physical education groups in communities
Unhealthy diet (high salt intake, fatty/oily foods, over-refined food, low fruit/vegetable intake)	Guiding people on which foods to eat and what not to/what to minimise through health education and training on how to change lifestyles	Use group-based activities. Use role models to demonstrate merits and demerits of unhealthy diets
	Health education on the demerits of unhealthy foods	
	Encourage consumption of natural wild fruits	
Overweight/obesity	Help individuals with techniques for weight loss through training	Use role models to demonstrate merits and demerits of weight gain/obesity

Note: COMDEV – Community Development; MoE – Ministry of Education

5.8.1 Solutions to the identified problems

Having identified low health literacy as an issue, residents and stakeholders proposed provision of individual-level health education to improve people's understanding of the various risk factors for hypertension, as well as how to change these as a starting point to behaviour change:

> *"I think what mostly is here is information, if the information is given to people, proper information Proper information on the disease. High BP, hypertension, if the information is properly given, even the nutrition is part of it, I'm sure people would appreciate."* [Female FGD3 Participant 2]

To facilitate diet related behaviour change, residents and stakeholders suggested that people needed guidance on how to change diets, and how to identify what foods and drinks were healthier at individual level. However, group-based activities (interpersonal level) were also proposed as a potentially useful way of bringing about dietary change:

> *"Also, maybe if they can start a similar programme with hypertension, guiding on which foods to eat and what not to, how we should do...how we can live our lifestyle for us to prevent the hypertension."* [Female FGD2 Participant2]

As explained in section 5.3.1, there was also a suggestion to encourage and value consumption of local natural foods while distrusting processed foods as a lever for change.

The discussions also revealed factors that were considered not to be easy to change locally. These included alcohol intake (especially among children and men), stress, marital conflicts and child disobedience. For example, one female resident said:

> *"But things like alcohol intake we can't change. This is because, in the case of children, even if I don't give them money, they go out with friends. Their friends have got money, they will drink."* [FGD4 Participant 3]

These findings were then used to develop the theory of change as described in the next section.

5.9.0 Development of the hypertension theory of change in Maramba

Having identified potential risk factors to intervene on, the BCW (see Chapter Three for details) (Michie et al., 2014) was used to describe the intervention functions (actual activities) to facilitate the desired changes. Six intervention functions through which the target population could change their lifestyles (education, persuasion, modelling, incentivization, training and social environment restructuring) were identified from the findings from the FGDs and stakeholder interviews, as well as discussions between the researcher and the supervisory team anchored in existing scientific evidence. For example, residents and stakeholders indicated that the community adopted certain unhealthy lifestyles because they lacked health information; a situation that required health education to change. In addition, as Table 5.10 demonstrates, intervention functions were only selected for use in the current intervention if they were likely to be Affordable; Practical; (cost) Effective; Acceptable by the community; Safe (with no adverse side effects) and Equitable (Michie et al., 2014), i.e., APEASE. The APEASE framework is designed to guide intervention developers in making context sensitive choices in relation to intervention functions and content based on local information, empirical evidence and expert judgement (Michie, 2015, Atkins and Michie, 2015).

Table 5. 10 Selection of Intervention functions using the APEASE criteria (guided by FGDs and stakeholders' interviews)

Intervention Function	**Definition**	**Affordable**	**Practical**	**(cost)Effective**	**Acceptable**	**Safe**	**Equitable**	**Choice of intervention function: (**Does it meet the APEASE criteria?)
Education	Increasing knowledge or understanding	Likely	Yes	Likely	Likely	Yes	Likely	**Yes**: There is a lack of knowledge on healthy lifestyles that can reduce the risk of hypertension & unhealthy perceptions about the meaning of weight gain/obesity, and good diets
Persuasion	Using communication to induce positive or negative feelings or stimulate action	Likely	Yes	Likely	Likely	Yes	Likely	**Yes**: This can create the needed motivation for users to drive their own change, self-manage/regulate/monitor progress
Incentivization	Creating an expectation of reward	Likely	Yes	Likely	Likely	Yes	Likely	**Yes**: There is a need to create ~~a~~ positive expectation of the benefits of adopting healthy behaviours as an incentive
Coercion	Creating an expectation of punishment or cost	Yes	Yes	Likely	Unlikely	Yes	Likely	**No:** Unlikely to be acceptable though

Intervention Function	**Definition**	**Affordable**	**Practical**	**(cost)Effective**	**Acceptable**	**Safe**	**Equitable**	**Choice of intervention function: (**Does it meet the APEASE criteria?)
Training	Imparting skills	Likely	Yes	Likely	Likely	Yes	Likely	**Yes**: Skills for self-regulation such as goal-setting and self-monitoring. This was an expert contribution building from evidence of effectiveness in behaviour change interventions
Restriction	Using restrictive rules to reduce the opportunity to engage in the target behaviour (or to increase the target behaviour by reducing the opportunity to engage in competing behaviours)	likely	Unlikely	Likely	Unlikely	Yes	Likely	**No**: This is not applicable to the project and may not be suitable for the individual and interpersonal level intervention because it may require upstream functions such as developing rules to restrict undesired behaviour.
Environmental restructuring	Changing the physical or social context	Likely (Social context)	Yes (social context)	Likely (Social context)	Likely (Social context)	Yes	Likely	**Yes:** The social context needs to be more supportive of healthy lifestyles

Intervention Function	**Definition**	**Affordable**	**Practical**	**(cost)Effective**	**Acceptable**	**Safe**	**Equitable**	**Choice of intervention function: (**Does it meet the APEASE criteria?)
Modelling	Providing an example for people to aspire to or imitate	Likely	Yes	Likely	Likely	Yes	Likely	Yes: Finding a model for the desired behaviour will facilitate for observational learning
Enablement	Increasing means reducing barriers to increase capability (beyond education and training) or opportunity (beyond environmental restructuring)	Unlikely	Unlikely	Likely	Likely	Yes	Likely	**No:** There will be no physical or medical treatments to provide enablement to engage in healthy activities e.g., giving prostheses to enable someone's engagement in physical activities

Understanding how intervention functions identified would lead to improved capability, opportunity and motivation (COM-B) (Michie et al., 2014), underpinned by other theories of behaviour change is key to appreciating the rationale in the ToC. For example, health education and training can be used to build self-regulation, autonomy and competence in intervention users underpinned by the SCT (self-regulation) and the SDT (autonomy and competence) (Wehmeyer and Shogren, 2016, Beauchamp et al., 2019). Self-regulation is likely to improve the self-management skills, such as goal setting and self-monitoring, that have been shown to be effective BCTs in health behaviour change interventions (Gillison et al., 2019, Hartmann-Boyce et al., 2014, Michie et al., 2009a, Michie et al., 2011b, Michie et al., 2013). When intervention participants develop self-management skills, they are likely to feel more confident about their competence/capacity to change behaviour as agents of their own change (Nabi and Prestin, 2017). Moreover, increased health knowledge and a greater understanding of the rationale for adopting desired behaviours has been shown to build autonomy (Wehmeyer and Shogren, 2016); with intervention users able to personalise, value and endorse their own behaviour change i.e. identified and integrated regulation (Wehmeyer and Shogren, 2016).

Table 5. 11 Table showing selected theories of behaviour change and what was selected to be the starting point for the ToC

	Intervention Functions to use in the TOC (Derived from the BCW)	**What would be built**	**Behaviour change theory**
1	Education (awareness raising, changing perceptions and persuasion)	➢ Self-reflection, intention formation, self-efficacy and outcome expectation, autonomy building, competence/capability building, internalisation	SCT, SDT and COM-B
	Incentivisation	➢ Promoting outcome expectations for adopting healthier lifestyles	SCT
2	Training	➢ Competence/capability building (e.g., self-management skills), motivation (internalisation), self-regulation	SCT, SDT and COM-B
3	Modelling	➢ Coping skills, motivation & imitation	SCT, SDT and COM-B
4	Environmental restructuring (Provide opportunities to facilitate healthier lifestyles)	➢ Supportive social environment *(e.g., behaviour sustenance techniques such as enlisting social support from family members to sustain newly adopted behaviour)* ➢ Relatedness	SCT, SDT and COM-B

SCT – Social Cognitive Theory, SDT – Self-determination theory, COM-B – Capability, Opportunity, Motivation, Behaviour. Persuasion is likely to be a part of education.

Building from Table 5.11, the main activities (intervention inputs) for the ToC for a behavioural intervention at individual and interpersonal levels were defined as: i) providing health education (raising awareness, clarifying meanings, increasing knowledge, persuasion and incentivisation [promoting positive outcome expectations by providing a rationale for behaviour change]), ii) training (providing tools and skills for changing and monitoring behaviour) and iii) creating opportunities (supportive social environment). These, through complex linkages (as shown in Figure 5.2a), would lead to immediate outcomes, including increased motivation for behaviour change, opportunities to support behaviour change, capacity and skills for changing behaviour and improved health knowledge (about physical activity, diet and body weight). Further linkages (as shown in Figure 5.2b) would lead to intermediate outcomes (reduced body weight, increased physical activity and adoption of healthier diets). The impact of all these changes is likely to be a reduction in blood pressure.

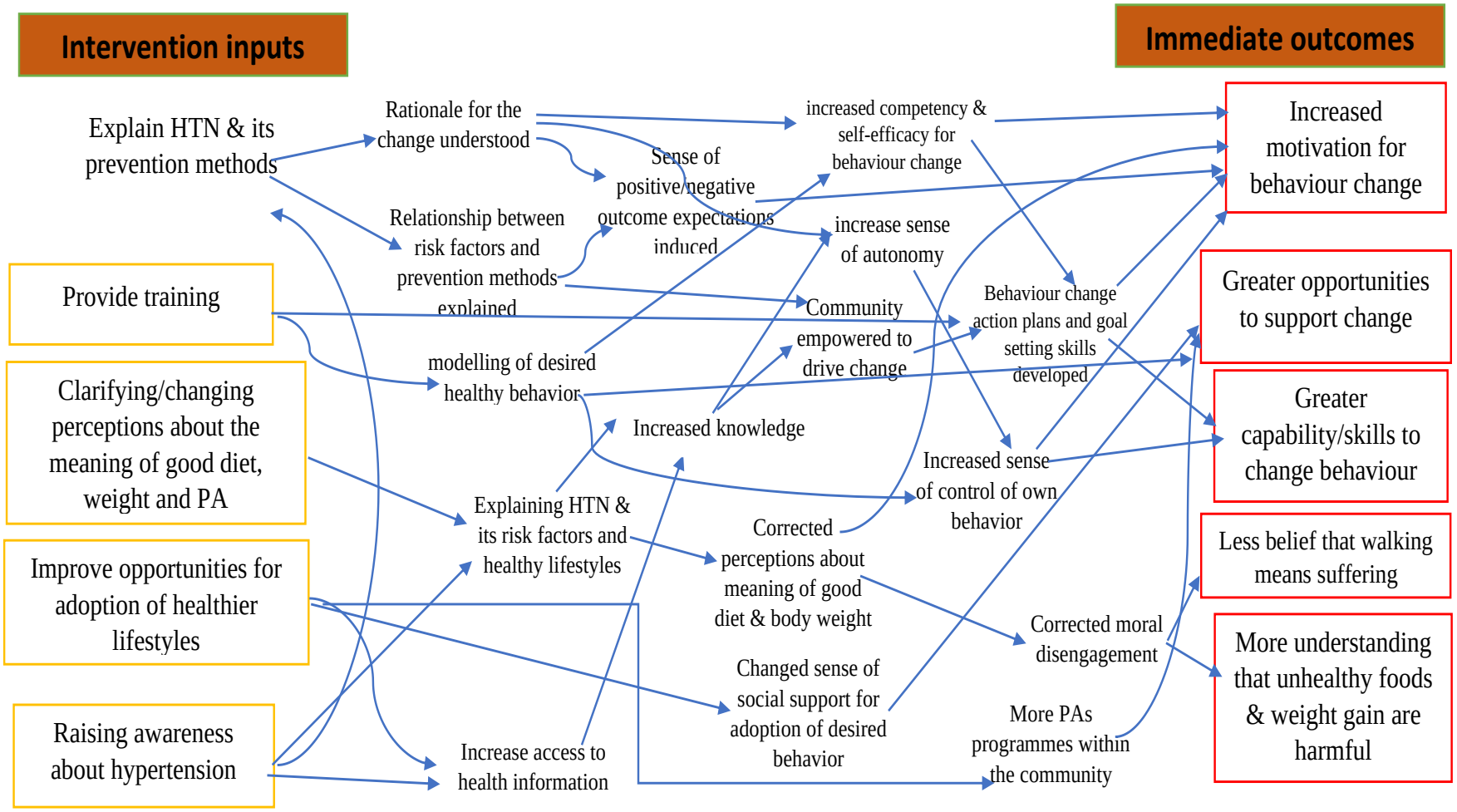


Figure 5. 2a The intervention theory of change developed with residents and stakeholders (the second figure is a continuation of the first one)

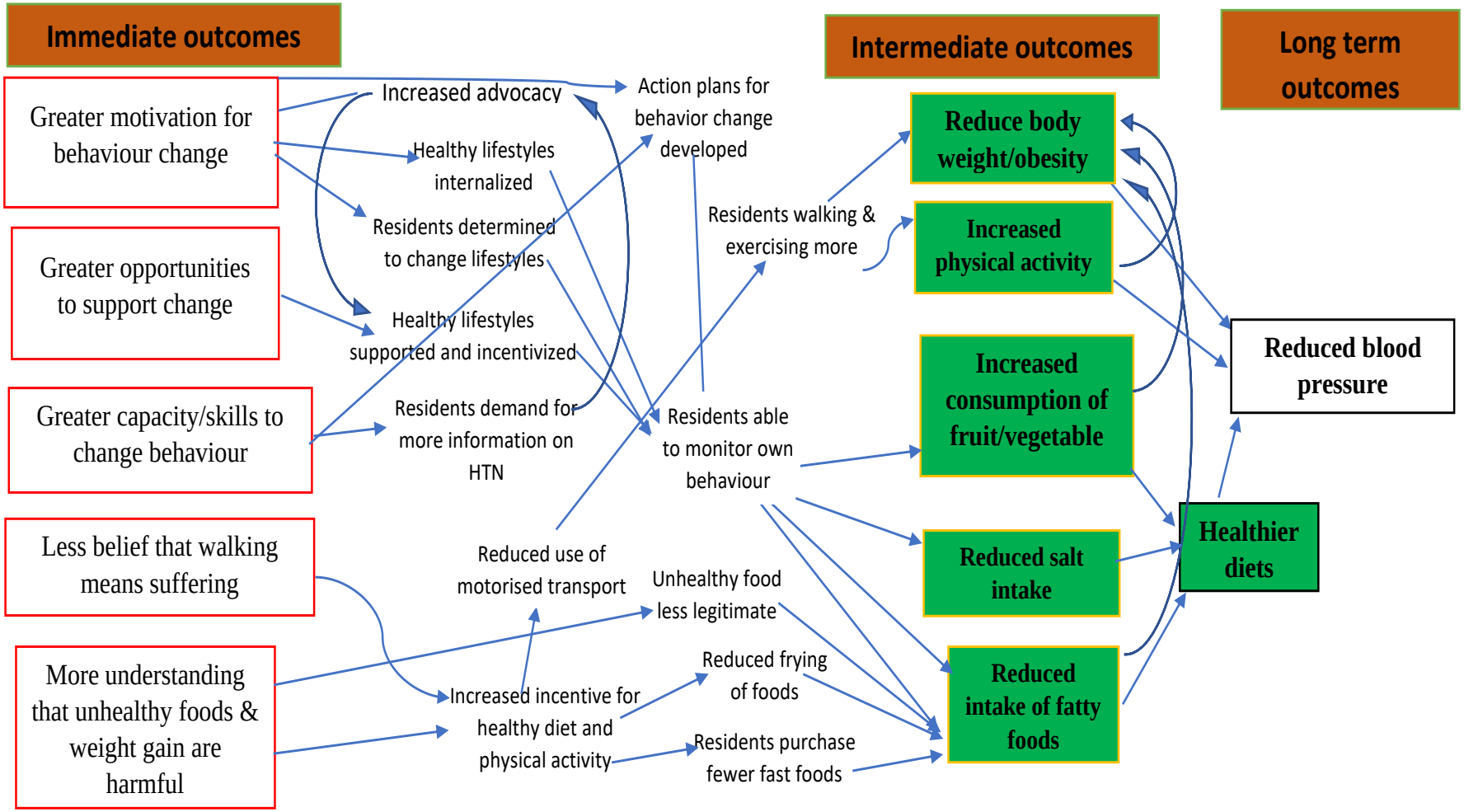


Figure 5. 2b The intervention theory of change developed with residents and stakeholders (the second figure is a continuation of the first one)

The final step, following development of the ToC, was to understand how the intervention would be delivered. Suggestions for change delivery channels are presented in the next section.

5.8.0 Change delivery channels

Eight potential modes of intervention delivery were explored with the stakeholders. These included delivery through churches, community groups, community leaders, community engagement, the media, and schools. Table 5.12 summarises these delivery channels, with details of potential activities and the structures available through which the activities could be implemented in each setting.

5.8.1 Churches

The majority of stakeholders suggested using churches to deliver the identified change solutions. The church leader was particularly enthusiastic about this and highlighted why churches would be suitable to run the intervention. He suggested that the number of congregants at each weekly church gathering provided an opportunity to reach many people.

> *"So, I think for me this time around as in preachers, every Sunday we have 300 plus people that come to listen to our stories, you know. So, I think for me that would be the best method to engage."* [Male Church Leader]

The recommendation to deliver interventions through the church was echoed by other stakeholders. For example, an NGO leader highlighted:

> *"...it is a very good approach because the church also…everybody belongs to one church or the other. Some even belong to two churches because today we even have what we call interdenominational gatherings."* [Female NGO leader]

Table 5. 12 Summary of change delivery channels proposed by the stakeholders

Delivery channel	**Health promotive activities suggested by stakeholders**	**Opportunities** (structures/programmes likely to offer a platform for engagement/implementation)
Churches	Information dissemination/awareness raising in church groupings	Church groupings, Men's fellowship, Women's fellowship, Youth fellowship, Church Services
	Physical activity programmes e.g., walks, sports and games	
	Sermons incorporating health information	
Community Groups and Activities	Health education/knowledge dissemination	Neighbourhood health committees, Community Clubs, Women's clubs, NGOs e.g., Lushomo Trust, Ward Development Committees, Zones and Zonal leaders/Ward Councillors, Health facility, Traditional healers
	Door-to-door campaigns to raise awareness and improve health knowledge	
	Safe parks (see section 7.2 for details)	
	Integrated meetings (see section 7.2 for details)	
Community Leaders	Health education/knowledge dissemination	Political/Civic leaders (MPs, Ward Councillors), Party structures, Zonal leaders, Neighbourhood Health Committee Chairs
	Providing community leaders with health information which they can share with others during their meetings	
	Coordination and influencing	
	Gatekeeping (providing authority to access communities)	
Community Engagement	Health education through door-to-door campaigns	NHC members and volunteers for door-to-door campaigns, Community gatherings, Markets, Women groups/clubs, Health workers (e.g., Nutritionist)
	Knowledge sharing during social gatherings	
	Community sensitization using drama and sports	
	Health check-ups combined with health education	
	Cooking demonstrations and competitions	
	Training and imparting skills on exercises and diet	
	Community sensitisation using public address systems	
Media	Health education/community sensitisation through radio presentations	Local/community radio stations
	Print and distribute pamphlets and fliers	
	Video shows (health education movies)	
Schools	Introduce NCD prevention activities in schools	Schools are found everywhere, Inter-schools games (can be integrated with health programmes), Annual General Meetings (can
	Health education and other health promotion activities integrated with existing activities	

Delivery channel	**Health promotive activities suggested by stakeholders**	**Opportunities** (structures/programmes likely to offer a platform for engagement/implementation)
	Physical activities e.g., games	introduce a health activity), Teachers (a good resource)
Workplaces	Workplace sporting activities e.g., games/sports	Presence of workplaces in the community (e.g., markets, companies, NGOs)
	Gymnasia in workplaces, health education	

In addition to providing an opportunity to reach many people, the existing organisation within churches was perceived as a great benefit for getting the intervention up and running. It was further emphasised that the church had established women, men and youth groups through which these health promotion activities could be delivered:

> *"I think for me in these churches we have what we call three main fellowships. We have the men's fellowship, the women's fellowship and the youth fellowship……And for example, we can say, okay, today men's fellowship, instead of us just sitting down and talk about Jesus and the woman at the well, they are going to go to the grounds and run."* [Male Church Leader]

This stakeholder further suggested prioritising women' fellowships for nutrition programmes because of their pivotal influence in relation to the foods consumed in the home:

> *"And I think for me we can rely heavily on the women's fellowship, because these are people that buy the foods in the house. These are the people that prepare the foods in the house."* [Male Church Leader]

A summary of all potential activities suggested for implementation in churches is provided in Table 5.13.

5.8.2 Community groups and activities

Nearly all of the stakeholders also suggested delivering interventions through community groups and activities, as was indicated by one participant.

> *"The Ministry of Health I think deliberately embark on the programme, that at least can go target churches and community groups."* [Male Church leader]

Similar to the use of church fellowships, some suggested using existing community groups instead of forming new ones, as the latter might be unsustainable. A stakeholder representative with vast experience working with communities on health programmes explained:

"Forming groups, we can try it. Try it, but in my view, it would be a challenge. It might work but you have to sustain those groupings. People will say, no muzatipasa chani (what will you give us)? What will you give us? such things."

[Male HAC member]

Among the community groups suggested were Neighbourhood Health Committees, community clubs, women's clubs e.g., Silk clubs (these are community banking groups), ward development committees and zones. Such groups form an interlinked network within the community and if used effectively, would potentially facilitate health promotion activities.

Another proposed community activity was group discussions, to share knowledge and foster peer support for behaviour change and relatedness among group members, as one interviewee explained:

"Yes, which is easy to change because if you get, let's say in a week you get about 20 to 40 community members in a day, sit down with them for 20 to 30 minutes in a group discussion, under a tree somewhere in the community, tomorrow you are in this group, in two weeks' time you will have covered a good number of people in that community." [Female NGO leader]

5.8.3 Community leaders

The majority of stakeholders suggested that community leaders were key to the delivery of interventions locally:

"Also, these civic leaders because they are the most influential people in the community and other stakeholders like people who have organisations in the community, they are influential, using them to disseminate the information."

[Male NGO leader]

Interviewees therefore considered the perceived influence held by community leaders as likely to be instrumental in encouraging behaviour change and suggested that they could use

their influence to promote health messages at the community meetings they already attend regularly.

> *"Also, these political leaders are also invited to such meetings so that when they have their own meetings again, they have their own men again, they disseminate the messages."* [Male Company leader]

To achieve this, leaders would have to be provided with information on hypertension which they would use to educate other community members. One of the community leaders indicated how he would transcend political affiliations to carry the health messages to the people he represents:

> *"But immediately I start representing them, when we've got...even at council we are called up as civic leaders. We don't go there as* [Name of the party], *we go there as civic leaders. So even when I go in there, when I'm addressing a meeting, I go with all of them. I go with my colleague, with chairman in* [Name of another party], *and say people, this is what we are going to discuss. I'm not going to talk there about my party, I'm talking about things that concern us as human beings. I'm talking about health matters."* [Male Community Leader]

It was therefore clear from the interviews that community leaders were seen as important to the success of community level programmes. They could play key roles, as gatekeepers, in providing access to the community, coordinating, mobilising and influencing change. However, the extracts may also illustrate that the stakeholders (many of whom held positions of authority) may simply be asserting their power/influence and positioning themselves as necessary for inclusion in such health activities. Regardless, these views indicate that local leaders appear willing to participate in health promotion projects, such as the current study.

5.8.4 Community settings

Most of the stakeholders indicated that community settings, such as households and markets, would be a possible delivery channel for the intervention. Community sensitisation campaigns would be a useful way of delivering the intervention in community settings. Various activities were proposed, including door-to-door hypertension information

campaigns. A leader of one of the private companies stated how they would approach such an activity:

> *"I would go in the community, door to door, telling them the disadvantages and the advantages of those things, for you to live better…."* [Male Company leader]

Similarly, a female NGO leader emphasised that door-to-door campaigns were likely to be an effective and quick way to reach more people. Her views were based on her own prior experience of running a door-to-door campaign on a different programme:

> *"It is faster actually to have the information reach the community. It will be a one-on-one sensitisation. I took part with the CIDRZ* [Centres for Infectious Disease Research in Zambia] *on community mobilisation. We went on one on one, the whole of Livingstone where we would see people one on one. It took us about three months to finish the whole of Livingstone. Actually, door to door is number one……. It was faster than these other group discussions."* [Female NGO Leader]

Door-to-door campaigns, however, would come at a cost. One male Community Leader suggested that Neighbourhood Health Committee volunteers and Community Health Workers would be available to conduct the activities but would require logistical support and incentivisation:

> *"Well normally what they do is if you have to go out, you are given an incentive, right, to say...we will give you so much right, and they should be given some water to drink, you know that Livingstone is very hot, right. Something to make you carry on the job. An incentive, usually a form of kwacha [money], right..."*
>
> [Male Community Leader]

Additionally, to conduct community sensitisation, stakeholders suggested that programmes could be designed for delivery in places where larger populations were found, such as markets. They also indicated that using speaker systems would spread the information in such settings. For example, a ward leader explained:

"Maybe a PA [public address] *system in markets, you also talk to them, first of all you give them information – it's not just sports. The idea is to change their lifestyles"*
[Male Ward Leader]

To promote healthy eating, interviewees suggested conducting community cooking demonstrations and competitions. Participants in these cooking demonstrations would be required to compete in the preparation of healthy meals to compliment the delivery of health education messages.

"…do weekly or monthly cooking lessons, how to educate women, women usually are found doing the cooking competitions, how to cook healthy food and they like traditional foods. I think that's a starting point right there…. Also do some cooking sessions, you know, competitions and, you see…." [Female HCW]

The stakeholders also suggested offering community health checks to raise awareness about hypertension would be a successful way of engaging local people. They further indicated that once people were attracted by the health checks, the health workers conducting the checks could offer health education as well as measuring people's blood pressure. Interviewees indicated that such an activity would not only make people aware of their hypertension status, but also help increase their knowledge of the disease, its risk factors and how to prevent it. A community leader suggested that:

"They should not just check your BP without telling you the causes, how you can reduce or how it can increase if you did that, you know, you are killing yourself, you know." [Male Community Leader]

5.8.5 Media

A few stakeholders suggested that information be delivered through radio presentations particularly in the evenings when many people participate in live phone in programmes. An NGO leader working closely with community groups indicated:

"Even on the radio, our community radios, people participate especially in the evening programmes. If you take such topics to radio programmes, a lot of people

will participate where they'll ask questions, and you are also there you give them information then they also ask." [Female NGO Leader]

Radio stations were the major delivery channel among the media options suggested because they were viewed as easily accessible and controlled locally. Print material in terms of pamphlets and fliers were also suggested:

"The idea is to change their lifestyles, so to have pamphlets, fliers or what, you have some of them in vernacular. They are distributed, you know, or someone is reading, and they have an interpreter. " [Male Ward Leader]

However, the use of print material for raising awareness was not endorsed by some stakeholders who highlighted low literacy levels within the community. This would make print media less effective if used alone because many people would not read the information.

"So, what I'm saying is that the reading culture of most of us Africans is extremely bad." [Male Church Leader]

Similarly, the use of movies was not favoured because it was felt that they usually attract children (who would not be the main target audience for intervention) rather than adults.

"So also, the video, we don't know what type of video, sometimes some videos they just attract young ones." [Female NGO Leader]

5.8.6 Schools

Despite the fact that children were not the main target audience, most interviewees recommended intervening through schools at the same time as conducting community-based programmes. However, they were often unclear about how change delivery could be implemented in schools.

"Well, the other one, although I don't know how, even the schools. We have children who come from those yards and go to schools for education and that. I don't know how helpful it can be, while others are going in the residential areas, the schools are also attacked." [Male Community leader]

To establish more information on how delivery through schools could be achieved, an additional interview was conducted with an experienced leader of a large local school. He agreed that schools were well situated in the community to deliver public health programmes because they were widely distributed:

> *"We are well placed because we are right, Ministry of Education actually is everywhere. If you talk of prevalence, I think we are in almost in every community, yes. So, I think the only way Ministry of Education can actually be quite effective in disseminating such information…."* [Male Education Leader]

The education leader further explained that schools could be used for information dissemination through the introduction of health promotion programmes to empower children with knowledge. The assumption would be that children could then spread the information to their family members:

> *"So, I'm to believe that if people probably came up with initiatives and interventions like broadly coming up with deliberate policies in the school, so we talk about some of these non-communicable diseases, I think information would trickle down and people would know what to do in some of these conditions."*
>
> [Male Education leader]

Another suggestion was to embed health promotion activities into existing school events such as Open Days, Annual General Meetings, Teachers' Days, Inter-Schools Games and Older People's Teams (like madalaz football teams). For example, at Inter-School football matches, this could be done by adding health education activities for both players (e.g., football players) and spectators (community members), as well as offering health checks for hypertension:

> *"……So, such events can actually be used as a conduit for actually disseminating such* [health] *information."* [Male Education leader]

5.8.7 Workplaces

Some stakeholders suggested reaching people through activities or programmes conducted from their workplaces. Workplaces were defined as any place, such as markets, private and public organisations and institutions, where people spend most of their day conducting activities to earn a living. For example, one respondent explained:

> *"Today people are so busy. Even seeing their children, some don't see their children. They leave home at 3 a.m. You only find them at the market. You don't find them at home."* [Female NGO leader]

The interviewees also suggested that many workplaces had some sporting activities, particularly sports teams for football and netball. However, one female health worker suggested that most workers were not actively involved in these activities as the arrangements favoured particular age groups and men:

> *"Like now we do, every Friday we do have football, but ask the women, we are left out. They do meet every Friday; they go for exercises or whatever."* [Female Health worker]

These workplace-based sporting activities, therefore, needed to be broadened to attract and be accessible to the majority of people. Besides making the sports more inclusive, participants suggested creation of gymnasia in workplaces. It was envisioned that convenient gyms would motivate people to exercise regularly, and encourage women to be more involved as a health care worker explained.

> *"Mamas are rushing home, to cook and what, but if there was a gym where I can go just by the corner in the street, only exercise for ten minutes, 30 minutes, I can do that before I go home."* [Female Health worker]

Section summary

Using a CBPA, the residents and stakeholders clarified the problem of hypertension in the study site and identified the salient risk factors and their drivers. Many of the risk factors

noted as modifiable in the scoping review were supported by findings in the local context. However, residents and stakeholders limited socioeconomic factors to poverty and wealth, leaving out other proxies of SES such as level of education. Similarly, despite having been identified among modifiable risk factors in the scoping review, place of residence was not recognised as a modifiable risk factor in the local context. These differences could reflect the fact that communities may not have all the information about hypertension. As such, a good balance needs to be struck between information obtained from the local context and existing research evidence.

Malleable factors at individual and interpersonal levels of the SEM were identified, including unhealthy diet, low physical activity and body weight. Additionally, there was an insistence on the need to improve health literacy as it was perceived that most residents had little or no knowledge about hypertension and its prevention. All the risk factors classified as malleable in the exploration of the local context were in keeping what was established in the scoping review.

Activities to implement to bring about the desired change in the malleable risk factors were also proposed by the residents and stakeholders, and the latter further proposed various options for delivery of these activities. These findings were used to inform the development of the causal pathway to understand the interplay between risk factors for hypertension at the different levels of influence (SEM) (Schmied, 2017) and how they potentially cause the disease. Furthermore, understanding of the drivers of unhealthy lifestyles was key to appreciating how interventions can bring about the desired change. With this understanding, potential ways to reduce risk factors, such as increasing awareness for intention formation to change behaviour, were appreciated.

5.9.0 Intervention delivery personnel

The residents and stakeholders suggested that delivery of the change solutions described in section 5.6.0 would best be done by someone from within the community. Such local people were seen as better placed to engage with the intervention users leading to better results, as one FGD intimated:

> "*So at least if you do use local people to target those groups, you will make it bigger and make a point out of it. Those who come from outside might be perceived to be just interested in money* [doing this work because they are being paid]. *But a local person might attract them more."* [Male FGD1 Participant7]

Moreover, a local person was perceived to provide better traction among community members; an attribute considered likely to attract more people to the programme. Various other advantages for using local people to deliver change solutions were suggested.

> *"I have seen it work better when you use the local human resource. One, they* [residents] *have confidence in that person. Two, they know him* [her]. *Three, it's easy to consult when they're not very sure of anything. For example, when people come from outside to talk to them, people will not get everything. When they go, then people start looking for where to inquire from. So those are some of the advantages of using the local person …. he also understands the culture, understands the time they are supposed to meet with those people, the language and so on."*
>
> [Female FGD2 participant3]

This extract brings to the fore the fact that community connectedness and trust appear to be key to the success of delivering interventions in the study site. Furthermore, the value the community places on respect for cultural sensitivity by those delivering change solutions was deemed as important to the success of interventions.

Some participants, however, felt that technically trained people such as health care workers would be important for the successful delivery of educative messages to the community.

"I wish maybe there could be programmes where the communities are called, mobilised, and health people [Health care workers] *go out there to go and sensitize on good lifestyles, that's to prevent these type of diseases."* [Male FGD2 Participant 1]

As such, options for delivery agents in the community include locals and those perceived as having technical knowledge on the subject matter. This must be considered when deciding on facilitators for the intervention under development.

5.10.0 Chapter summary and discussion

Building on the findings from the scoping review in Phase One, Phase Two revealed that Maramba residents and stakeholders were aware of the growing problem of hypertension locally. Hypertension was considered among the top five most prevalent diseases in the community. Recognising that hypertension is a problem in the community is important as a first step to intervention development (Michie et al., 2014). The risk factors for hypertension were also identified, including being overweight, unhealthy diet (high salt intake, low vegetable and fruit consumption, fatty foods), low physical activity, stress and alcohol use. Of the identified risk factors for hypertension, unhealthy diets, low physical activity and excess body weight were considered to be malleable at individual and interpersonal level.

Clarifying the problem of hypertension, understanding what causes it (risk factors) (Step 1 of the 6SQuID Model) and recognising which of the risk factors are malleable (Step 2 of the 6SQuID Model) are essential steps to understanding what risk factors to intervene on (Wight et al., 2014). The malleable risk factors were identified through synthesis of existing empirical evidence in SSA (scoping review) and indigenous views from the study site (local context). Before exploring how to intervene on the identified malleable risk factors, the local residents and stakeholders indicated what they considered the drivers of these risk factors to be, including low health literacy, low socioeconomic status and unsupportive environments (e.g., social norms about body weight). This represented a key step in the development of a

lifestyle intervention to reduce the risk of hypertension because addressing these drivers is likely to have an impact on individual behaviour.

Following the identification of the problem, a causal pathway and theory of change were developed to understand how changes in identified risk factors would come about and how they would lead to a reduction in blood pressure through a behaviour change intervention. Guided by the BCW model (Michie et al., 2014), it was established that target intervention users needed changes in capability, opportunity and motivation to adopt healthier diets and become more physically active. These changes were to be achieved through health education (awareness raising), self-management skills (goal-setting and self-monitoring) training, promoting of outcome expectation and creation of a supportive social environment. The mechanism by which these intervention functions would produce improvements in capacity, opportunity and motivation were underpinned by two other theories of behaviour change: the SDT and SCT. Using this information, the theory of change (ToC) for the intervention was developed. The possible channels for delivering the ToC (Step four of the 6SQuID model) including churches, community groups and activities, community leaders, direct community engagement, radio, schools and workplaces were identified from the stakeholders. This provided a wide range of options for delivering behaviour change interventions in the study site. Additionally, the findings from the local context suggest that intervention designers must strike a balance between community representativeness and technical knowledge when deciding on who should deliver interventions. As such, engaging locals to agree on who should facilitate the change solutions appears to be important.

After developing the ToC, core-intervention components were then co-developed with target intervention end-users in Phase Three of this study. This process is described in Chapter Six.

CHAPTER SIX - INTERVENTION DEVELOPMENT

To bring about behaviour change leading to the reduction of the hypertension risk, the theory of change developed in Chapter Five indicated that the intervention needed to include awareness raising (through information dissemination and health education), training to provide skills for behaviour change and creation of a supportive social environment. This Chapter describes findings of the iterative process to co-develop, with local community members (and stakeholders), the core components, content and format of the intervention underpinned by the theory of change.

The co-development activities were conducted through five workshops (as described in Chapter Three). The first three and the fifth workshops were attended by local residents, while the fourth involved key stakeholders. The co-development process was based on the concepts of the Community Organisation Model (building community capacity, social capital, enabling direction setting and critical consciousness raising) (Nabi and Prestin, 2017, Wehmeyer and Shogren, 2016, Nilsen and Hasson, 2020) operationalised through a Community Based Participatory Approach (Wallerstein and Duran, 2017, Appiah, 2020). This approach was likely to lead to the development of an intervention well targeted to the community needs, intervention approaches relevant to the target intervention end-users.

This chapter presents the results of the co-development workshops and describes the final pilot intervention that was tested in the Phase Four feasibility study.

6.1.0 Co-development workshops

All co-development workshops were conducted in a hired hall in Maramba. Participants included Maramba residents (potential intervention end-users) and key stakeholders (people likely to be involved in delivering the intervention). Twelve residents (58.3% female) were enrolled. The mean age of the participants was 29.5 years. Workshops One to Three with residents iteratively developed a prototype intervention. The intervention was taken to key

stakeholders for their input in Workshop Four and then refined in a final iteration with the residents in Workshop Five. Findings from each workshop have been described in this section.

6.1.1 Workshop One (residents)

The first workshop comprised 12 participants and lasted for four hours. The objectives for this workshop focussed on discussing and obtaining feedback on the causal pathway and the theory of change, identifying what (among the several malleable risk factors identified in Phase Three of the current study) to intervene on and how to set SMART Goals for behaviour change in the local context and monitor personal progress toward meeting set targets.

Following the presentation of the causal pathway and the theory of change, the residents supported what was presented and did not propose any changes. They, however, prioritised three risk factors (from those identified in the causal pathway) to intervene on; salt intake, other dietary factors (such as fruit and vegetable consumption, fatty foods), and body weight. After being trained in goal setting and self-monitoring; the residents agreed (through consensus) on Nyanja (a Zambian language commonly used in cosmopolitan cities) as the language to use to explain what a SMART target meant to the community. The participants went on to practice goal setting to have initial appreciation of whether the target intervention users would manage to develop SMART goals using the description given up to this point. This exercise revealed some difficulties around understanding goal setting, emanating from inadequate understanding of what SMART targets were and how to set them.

Workshop One deliverables included the clarified and confirmed causal pathway and theory of change for the intervention. Additionally, the residents started narrowing the range of risk factors to intervene on; to three in the first workshop. and gained an initial understanding of goal-setting and self-monitoring as behaviour change techniques. Furthermore, the researcher appreciated the community's initial indications of what risk factors they wanted to intervene on.

The findings from this workshop were discussed with the supervisory team; a necessary input to ensure the community views were anchored with expert advice and existing empirical evidence (Hawkins et al., 2017). Through consensus, it was agreed that, from the three prioritised risk factors, body weight needed to be taken back to the community to brainstorm on whether it was possible to substitute it with physical activity bearing in mind that body weight can be managed through dietary change and physical activity. Findings from Workshop One (use of Nyanja to describe SMART goals, feedback on the ease of setting goals and the top three priority risk factors) were discussed with the supervisory team and challenges identified. Supervisors advised to explore the locally available programmes and interventions and how these relate to the to the identified priority risk factors. These were taken back to the residents in Workshop Two for refining.

6.1.2 Workshop Two (residents)

The second workshop was attended by all the 12 participants and lasted four hours twenty minutes. This workshop aimed to refine the target risk factors (from Workshop One) to intervene on, identify the top three change delivery channels for the intervention, consolidate the idea of setting goals in a culturally acceptable manner and design intervention components around the priority risk factors and delivery mechanisms identified.

After summarizing Workshop One findings, a few changes were proposed. Priority risk factors to intervene on were changed to replace body weight with physical activity so that weight management becomes a component in the physical activity and diet changes. As well as reflecting feedback from the supervisory team, this change was also prompted by a recognised need to fill gaps in existing national physical activity programmes. Participants observed that the national programmes were too centralized to enable large numbers of people to participate (in Livingstone, participants were expected to attend Central Business District [CBD]). Thus, the majority of the residents, who live a long way from the CBD, did

not usually participate in these programmes. Workshop participants suggested a decentralized approach to PA programmes so that they are conducted by individuals once they have developed the capacity and skills to do so. Additionally, residents prioritised three delivery channels (from those identified in Chapter Five) including churches (more people can be reached because majority of the people in the area belong to a church), schools (children can be used to send health messages to their parents and health activities can be integrated in existing school events) and community-based activities (participant indicated these would reach more people).

To improve acceptability and cultural embeddedness of the description of SMART targets, the residents reiterated the use of the commonly spoken local language (Nyanja as proposed in Workshop One) to define 4Cs reminiscent of the SMART acronym and informed by the 5Cs concept of the MAFANs material as explained in Chapter Three. Initially, these included **C**hotheka (Achievable); **C**holinga (What you need to do), **C**hofunika – What is required, and **C**hochitika munthawi yake (Time bound). Participants could not find a Nyanja word for measurable; hence the initial proposal being 4Cs instead of the MaFANs 5Cs. Three participants whose native language was Nyanja (they were originally from the Eastern Province of Zambia where Nyanja is indigenous) volunteered to consider a way to express 'measurable' in Nyanja and report back to the rest of the participants in Workshop Three. Furthermore, participants were asked to try to develop a SMART goal for themselves targeting behaviours of their own choice and provide feedback in Workshop Three.

Thereafter, participants worked in three groups to generate initial ideas on the core intervention components targeting diet and physical activity. The outputs of this activity were proposals for 12, weekly intervention sessions addressing the priority risk factors above. Each session included health education (awareness raising), goal setting and self-monitoring of progress made towards achieving the set targets in previous sessions.

Preliminary discussions about what the intervention would be called arrived at the suggestion of the Hypertension Prevention Initiative (HyPI).

From Workshop Two findings, the researcher used and adapted (to the Maramba context) the MaFANs material to draft a 12 week-long intervention for review and refinement in Workshop Three.

6.1.3 Workshop Three (residents)

All 12 participants attended Workshop Three, which lasted for four hours. The workshop objectives included identifying one delivery mechanism from the top three identified in Workshop Two, consolidating goal setting in a culturally acceptable manner, and refining the draft intervention components including the intervention name.

From the initial three delivery channels proposed in Workshop Two, participants prioritised delivery through churches; viewing them as having the potential to reach a wide population because the majority of the residents in the study site were perceived as belonging to a religious grouping (which confirmed stakeholders views from the exploration of the local context). Additionally, the residents indicated that religious groups were established already (hence did not need rigorous mobilization), and members were likely to be consistent in attending intervention activities for several weeks.

During a review of the SMART goals that participants had attempted to generate in Workshop Two, some were found to be immeasurable and unspecific. Further discussion revealed that there were challenges with setting goals and self-monitoring salt intake i.e., it was difficult to determine quantities of salt. For example, men would not know how much salt was added to food during preparation, which is usually done by women. Additionally, it was seen as difficult to measure how much extra salt was added to a plate of food at the table. Participants therefore suggested the adoption of locally acceptable measures when adding salt to food. They indicated that when cooking, they normally would pinch salt with their hands, pour directly into the pot from the salt container or use spoons. At the table, they

used salt sellers to shake the salt onto the plate. Using this information, there was a suggestion that adding salt to the pot during preparation could be measured using spoons or number of pinches, and that added salt on the plate could be measured using the number of "shakes". For the current intervention, residents agreed to count the number of shakes to measure added salt to the plate during mealtimes because this was easier to change than salt added when cooking.

As observed in Workshop Two, the 4Cs goal setting approach adapted from the MaFANs material had no local language word for "Measurable." The participants who volunteered to consult on this after Workshop Two gave feedback on their findings. Participants then brainstormed on this and the 4Cs target-setting approach was changed to 5Cs with the addition of measurable (**C**hoyeseka). The duration of the programme was also adjusted from 12 to 8 weeks following concerns that 12 weeks sounded too long.

The content of the intervention at this stage was viewed as acceptable. However, residents proposed an addition of visual pictorial illustrations of the information provided, e.g., pictures of food types, to make it easier for participants to understand and follow.

The choice to deliver the intervention through churches informed the refinement of the name of the intervention and the composition of stakeholders to be invited to Workshop Four. The residents agreed to change the name from the hypertension prevention initiative (HyPI) to the Church Hypertension Prevention Initiative (CHyPI). They also agreed that Workshop Four stakeholders should mainly comprise religious leaders, who were viewed as the best informants on the feasibility of delivering the intervention through churches including the practical issues to be considered. However, they also felt it was important to consider healthcare perspectives, and thus suggested the further inclusion of a health worker.

Following Workshop Three, the researcher used the residents' feedback to further refine the draft intervention in readiness for further iterations in Workshop Four.

6.1.4 Workshop Four (stakeholders)

Workshop Four involved 10 religious leaders and one health worker and lasted four hours thirty minutes. From the 12 key stakeholders invited by the researcher, 11 attended the workshop; three of these were female. The majority (n=9) of participants were Christian Church Leaders. Others included one from the Islamic Society and a health care worker. The workshop objectives were to allow the researcher to summarise the project (up to this point), discuss the draft intervention, obtain feedback, and agree on the practical delivery of the intervention; including when, where, and who would deliver it.

Stakeholders supported the draft intervention and agreed that it should be delivered in a church. Initially, stakeholders suggested using church groups such as those for Women, Men, Youths, Couples and the Choir, in line with earlier opportunities identified in the local context stakeholder interviews. These were, however, noted to be biased in relation to gender (e.g., the Men's Ministry would leave out women) and age (e.g., the Youth Ministry is for young people only). The stakeholders' view was that the intervention should be open to all adults regardless of gender. As such, the stakeholders settled for delivering to a sub-sample from the church membership, recruited using adverts in church premises, as well as announcements by the secretary during church services.

The stakeholders agreed on delivery through weekly two hour interactive, group-based, face-to-face sessions. They also suggested that the sessions should be jointly facilitated by someone with experience of working on community health programmes (e.g., a Community Health Worker [CHW]) and a leader from the church where the intervention would be delivered. It was envisaged that delivery in this way (with church leadership participation) would support programme ownership by the participating church in line with the community organisation model (Glanz et al., 2008), and also support participant recruitment and retention. The suggestions of involvement of the CHW and a church leader in delivering the

intervention agreed with local context findings that guidance from trusted others in the community was considered pivotal to behaviour change.

The name of the programme (CHyPI) was viewed as too technical. Stakeholders brainstormed and agreed to replace hypertension with high blood pressure as this would be easier to understand by the community. The name was refined to the Church High blood pressure Prevention Initiative (CHiPI).

Finally, considering there were many churches in the study area, stakeholders proposed eight criteria (see Table 6.1), which churches would need to meet to be selected as a delivery site.

Table 6. 1 Checklist for identifying the churches to deliver the CHiPI intervention.

	PARAMETER
1	Reverend/Pastor/Priest fully in support of the programme
2	Reverend/Pastor/Priest ready to inspire congregants to enroll into the study
3	Reverend/Pastor/Priest ready to attend at least two programme sessions
4	Church able to provide room for the sessions
5	Church ready to provide a leader to co-deliver the programme
6	Church willing to allow a CHW from outside the church to deliver the programme
7	Reverend/Pastor/Priest willing to allow participants to give a 5-minute testimony on their participation in the programme and the lessons learnt during church services to disseminate information to other members of the church as well as motivate them to follow suit
8	The church pastor able to allow a 2 hours long (as minimum) meeting with the church members (the participants)

By the end of Workshop Four, stakeholders supported the draft intervention and delivery through churches. Instead of using existing church groups, recruitment of a sub-sample from the church was preferred and a group-based face to face delivery format was agreed. Sessions were to be facilitated by a CHW and a church leader (to ensure ownership by the host church). To avoid biases in selecting a church to host the small-scale intervention, selection criteria were developed. These suggestions were summarised by the researcher and presented back to the residents in Workshop Five.

6.1.5 Workshop Five (residents)

Eleven participants attended Workshop Five: one woman resident was unable to attend because of personal matters. The workshop lasted three hours thirty minutes. The findings from the stakeholders' workshop were fed back to the residents. The objective of this workshop was to take the stakeholders' inputs back to the residents for a final iteration of the co-development process. No further changes were advised by the residents in the fifth workshop. As such, the researcher was able to finalise the final pilot intervention materials ready for the small-scale feasibility and pilot testing.

6.1.6 Summary of the co-development process

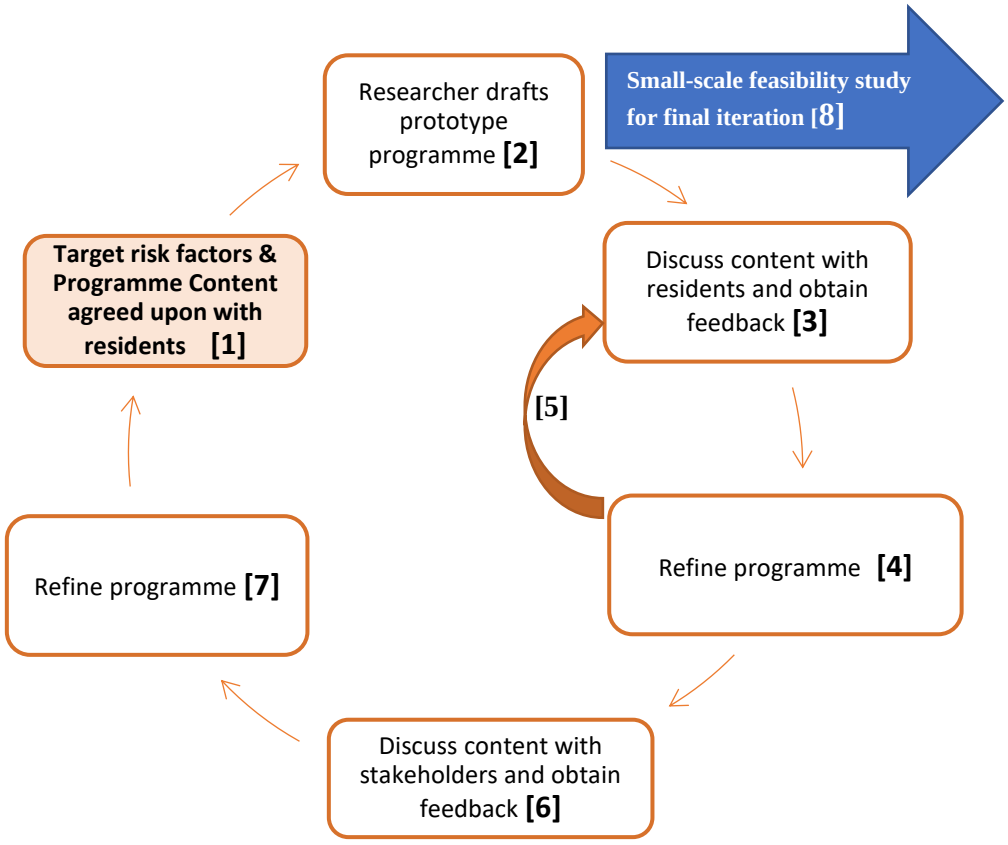


Figure 6. 1 The CHiPI framework for intervention co-development

As Figure 6.1 shows, the entry point to the ChiPI co-development framework [1] represents the first two workshops where the researcher and target intervention users agreed on the risk factors to intervene on and potential intervention components. The researcher used this

information to draft a programme [2] and brought it back to residents [3] to obtain feedback. Following the feedback, the researcher refined the draft programme [4]. This cycle was repeated twice [5] in the current study (and, in line with the 6SQuID Model (Wight et al., 2014), this step may potentially be repeated several times before proceeding to stakeholder involvement). Once the programme was deemed to be well refined by the residents, the researcher took it to the stakeholders [6] for discussion, feedback and input on the practical aspects of implementation (e.g., selection of facilitators, where to deliver the intervention from, etc). The refined programme after stakeholders' submissions [7] was taken back to the residents [1] for any final inputs, after which the researcher was able to refine [2] and draft the final pilot intervention (described in the next section) suitable for testing in the Phase Four small-scale feasibility study [7].

6.2.0 Description of the pilot intervention

The output these workshops was a church-based programme called the **C**hurch **Hi**gh blood pressure **P**revention **I**nitiative (CHiPI). This was an 8-week programme (programme materials are provided in appendix 5) designed to be delivered in one 2-hour session per week. The intervention targeted dietary factors (including salt intake) and physical activity while also improving health knowledge. The core intervention components are summarised in Table 6.2, together with the BCTs and assignments given to participants in each session.

Table 6. 2 Summary of the topics covered, BCTs used, and assignments given during CHiPI intervention weekly sessions

Session	Topic covered	BCTs used	Assignments given/actions
1	Hypertension awareness (what hypertension is and its causes) Goal setting and self-monitoring training	- Awareness raising - Intention formation /outcome expectation - Goal setting	- Each participant to track salt intake (added salt on the plate) using a monitoring table during the week
2	Reduction of salt intake (provision of information about salt and goal setting)	- Awareness raising - Intention formation /outcome expectation - Goal-setting - Self-monitoring	- Review of the record of salt intake the previous week by each participant - Each participant sets a goal to reduce added salt
3	Diet (provision of information about the classes of food, goal setting and self-monitoring)	- Awareness raising - Intention formation /outcome expectation - Goal-setting, graded tasks - Self-monitoring - Feedback	- Review of progress on goals set to reduce salt intake and increase physical activity (salt intake and physical activity) - Setting a new goal to reduce salt intake further (if necessary) - Setting goals to reduce high calorie and fast foods
4	Keeping rhythm1 – Diet - a focus on vegetables and fruits (provision of information, goal setting and self-monitoring)	- Awareness raising - Intention formation /outcome expectation - Goal-setting, graded tasks - Self-monitoring - Feedback	- Review progress made on salt intake and physical activity. - Set a goal to reduce salt intake further. - Set a goal to increase vegetable and fruit consumption
5	Keeping the rhythm2 – Diet- a focus on fatty foods (provision of information, goal setting and self-monitoring)	- Awareness raising - Intention formation /outcome expectation - Goal-setting, graded tasks - Self-monitoring - Feedback	- Review progress made on salt intake and fruits and vegetables. - Set a goal to reduce salt intake further. - Set a goal to reduce fatty foods consumption
6	Physical activity (provision of information about PA, goal setting and self-monitoring)	- Awareness raising - Intention formation /outcome expectation - Goal-setting, graded tasks - Self-monitoring	- Review progress on goals set so far (salt intake) - Take stock of the sources of hidden salt eaten by participants. - Set a new goal to reduce salt intake from hidden sources.

Session	Topic covered	BCTs used	Assignments given/actions
		- Feedback	- Set a goal on Physical activity (if this is identified to be inadequate)
7	Preparing for challenging times (Information, goal setting and self-monitoring)	- Coping strategies - Intention formation - Goal-setting - Self-monitoring	- Review progress made on salt intake and fatty foods consumption. - Each participant sets a strategy on how they would manage potential challenges to the adoption and sustenance of healthier lifestyles
8	Gathering social support (provision of information, goal setting and self-monitoring)	- Coping strategies - Goal-setting - Self-monitoring	- Assess progress made on all the targets set over the preceding 7 weeks. - Each participant to identify possible sources of social support for their behaviour change

As shown in Table 6.2., session one was designed to address awareness raising, i.e., understanding hypertension and its risk factors (salt intake, other dietary factors and physical activity). The subsequent weeks were focussed on salt intake (Session two), other dietary factors (Sessions three to five), physical activity (Session six), sustaining behaviour change (Session seven) and enlistment of social support for behaviour change (Session eight). Being an important risk factor for hypertension in SSA (Nkyi, 2017, Menyanu et al., 2017), changes in salt intake were to be monitored in all the sessions.

As designed in the co-development workshops, each session followed a set format, starting with a prayer and either a bible reading or a bible-based game. This was followed by a description of the session objectives and then awareness raising and knowledge generation about hypertension and/or specific risk factors to promote intention formation for behaviour change (SCT) (Luszczynska and Schwarzer, 2005). Other than session one, where goal setting and self-monitoring were to be introduced to the participants, in the next sections (two to eight), each participant was required to report on how they monitored their progress toward meeting their own goals. This was followed by action planning for behaviour change (goal setting-behaviour) using the 5 C's (**C**hotheka, **C**hoyeseka, **C**holinga, **C**hofunika, **C**hochitika munthawi yake). For example, a session on salt intake would start with sharing information about what salt is, its benefits if taken in recommended quantities and why too much of it (in reference to WHO maximum salt intake recommendations (WHO, 2018a) adapted to local ways of measuring salt quantities) is unhealthy. This information sharing, which was designed to raise awareness, intention formation and outcome expectations for reducing salt intake, was followed by participants' practical engagement in developing goals to reduce their own salt intake.

Using the co-developed draft of the core-intervention components the researcher developed a facilitators' guide and the CHiPI was drafted into a participants' manual; presented in lay language and with pictorial presentations as guided by residents.

6.2.2 CHiPI behaviour change techniques

The CHiPI's behaviour change techniques (BCTs) were informed by existing evidence of the techniques established as most effective in behaviour change interventions targeting diet and physical activity as was the focus of the current intervention study. The BCTs included underpinned by the COM-B Model (Michie et al., 2014), SCT (Beauchamp et al., 2019, Shamizadeh et al., 2019) and the SDT (Ackerman, 2018, Wehmeyer and Shogren, 2016). These BCTs included a combination of intention formation for behaviour change, building of outcome expectations for adopting desired healthier behaviours (self-regulation), goal setting and self-monitoring (self-management skills and capabilities) (Cradock et al., 2017, Michie et al., 2009b, Michie et al., 2009d, Samdal et al., 2017). For behaviour change maintenance, aspects of feedback on progress toward set goals, graded tasks such as reducing salt intake gradually and enlistment of social support (Samdal et al., 2017) were also included.

6.3.0 Chapter summary and discussion

The pilot CHiPI intervention was iteratively designed through co-development workshops with residents and key stakeholders (religious leaders and a health worker). The first three residents' workshops resulted in a draft of intervention components, which was taken to the key stakeholders in Workshop Four where feedback on the content of the programme and practical implementation issues (such as the church setting, participant recruitment, programme delivery and facilitators) were discussed. Findings from Workshop Four were taken back to the residents for final feedback. The output from the workshops was an 8-week pilot intervention called the Church High Blood Pressure Prevention Initiative (CHiPI). It was designed to improve participants' intention to change behaviour, outcome expectation, self-efficacy, and self-management skills (goal setting and self-monitoring) [SCT] (Luszczynska and Schwarzer, 2005), satisfy psychological needs for autonomy, motivation,

competence to change behaviour, and relatedness [SDT] (Ackerman, 2018, Wehmeyer and Shogren, 2016), as well as behaviour change maintenance skills (Kwasnicka et al., 2016).

As explained earlier, the pilot intervention co-developed through participatory approaches and in line with the community organisation model, offered an increased likelihood of the intervention being context sensitive, well targeted on what was priority for the community, acceptable to the users and stakeholders and, therefore, more likely to be effective (Abildgaard et al., 2020). The CHiPI pilot intervention required optimization through testing for acceptability and feasibility (Step Five of the 6SQuID Model) as well as assessment of potential effectiveness (Step Six of the 6SQuID Model). These last steps were combined in a small-scale feasibility study, as described in Chapter Seven.

CHAPER SEVEN: FEASIBILITY AND OPTIMISATION OF THE PILOT CHiPI INTERVENTION

To avoid wasting resources by implementing public health interventions with inadequate acceptability, feasibility and effectiveness, it is essential to test them on a small scale and ascertain its likely effectiveness before full scale evaluation in a multi-centre randomized controlled trial or widespread roll-out (Wight et al., 2014). Accordingly, a small-scale feasibility study of the pilot intervention was undertaken in a large church in Maramba with an average weekly church service attendance of over 300 congregants. As is common with Reformed Churches World Council of Churches (2020), the church had a well-structured leadership and programme, with several functional church groups that conducted weekly meetings, thereby, providing an organised framework likely to inform group-based intervention delivery.

This stage combined Steps Five and Six of the 6SQuID Model to include the assessment of potential effectiveness of the CHiPI in a small-scale feasibility and pilot study. This chapter begins by explaining the methodology for the small-scale feasibility study. The results are then presented including recruitment, perceived feasibility, acceptability and suggestions for adaptations. The chapter concludes with a description and analysis of the potential effectiveness of the CHiPI.

7.1.0 Methodology for the feasibility study

Phases One to Three of this study (6SQuID Steps One to Four) developed a church-based intervention called CHiPI. The Phase Four, before and after study assessed feasibility, acceptability and potential effectiveness, and the findings were used to optimize the intervention (Blase and Fixsen, 2013). Optimization refers to the process of refinement to produce an intervention that is likely to be (cost-)effective, context sensitive and acceptable, as well as scalable (Collins, 2018, Bleijenberg et al., 2018).

7.1.1 Setting

The selection of a church to deliver the feasibility study was made using the checklist developed by the stakeholders in co-development Workshop Four (see Chapter Five). The researcher administered the checklist to the churches and the mosque represented in Workshop Four. In order to do so, appointments were made to meet the resident pastors of the churches and the leader of the Muslims in a public place. The church that met all the checklist criteria was selected to host the small-scale feasibility study.

The chosen church was a large church in Maramba with a membership of slightly over 400 was selected. It was well organised and had several functional groupings that conducted meetings at stipulated times on specific days of the week. This allowed scheduling of intervention sessions without conflicting important church programmes. It also had a well-structured leadership and programme. There was an enshrined sense of respect for leadership, which was expected to be a key factor in the success of the recruitment process and retention to the programme.

7.1.2 Participant recruitment

To recruit participants, a poster advert was placed in the church to invite people to express an interest in the programme. Additionally, an announcement was made during a church service by the Resident Pastor encouraging members to enrol onto the programme. One church leader was given the responsibility of receiving expressions of interest from church members during church gatherings. The church leader then passed details of those indicating willingness to the researcher. Once expressions of interest had been received, the researcher organised a separate meeting with potential participants to explain the programme and distribute the participant information sheet. Those willing to participate were asked to sign consent forms at the end of the meeting.

7.1.3 Facilitators

As decided in Workshops Four and Five, a Community Health Worker (CHW) and a Church Elder delivered the intervention jointly. The stakeholders proposed selection of a CHW through the Local Urban Clinic. The in-charge at the local clinic was then asked to nominate a respectable, trusted, experienced and reliable CHW. The nominated CHW was a man with over 20 years' experience of community health work and was also a leader of the Maramba Neighbourhood Health Committee which supervises community health work in the Maramba Central Zone. The researcher organised a meeting with the CHW to explain the programme and ask if he would co-facilitate it. The Church Elder facilitator, a male, was a professional teacher and also served as a Church Secretary. Another male Church Elder supported delivery by organising the venue for all the sessions and encouraging participants to attend; including following up those who missed sessions. These elders were assigned by the Church Pastor.

7.1.3.1 Facilitator training

The two facilitators received an initial 4-hour training in programme delivery from the researcher a day before the first intervention delivery session. Immediately after each session, a de-brief was conducted jointly by the researcher and facilitators. The de-brief and information from the researcher observations of each session were used to refine the session delivery guide and participants information sheets/handouts for the following week. This approach allowed the researcher to adapt the facilitator guide and participants' handouts in an ongoing fashion, with each session being informed by the previous session. In this way, any improvements required were made and assessed immediately rather than waiting until the end of the eight weeks. The researcher shared the refined session delivery guide with the facilitators at least four days before the session to give them time to read it thoroughly. An hour before each session, the facilitators were given an opportunity to ask the researcher questions and clarify any uncertainties that had arisen during their reading.

Considering the researcher and both the facilitators were men, the researcher minimised the potential power imbalances this may have caused by encouraging facilitators to be conscious of their gender and its possible impact on participation by intervention users. During the intervention delivery, any reference to gender-associated unhealthy behaviour was avoided. In addition, it was made clear that all participants had an equal voice in the study regardless of their gender.

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7.1.4 Intervention delivery

The 8-week pilot intervention was delivered face-to-face to a group of church members, at a day and time initially proposed by church leaders and agreed with participants at the first session. One 2-hour session was held weekly. Sessions were conducted in the church hall, and participants sat in a semi-circle, with the facilitator for that session standing in front to ensure all participants had a clear view of the facilitator and the flip charts which were used to support delivery. Any participant who missed a session was followed up by the Church Elder co-facilitator or the other church leader identified by the Church Pastor to establish reasons why they missed the session, as well as to offer encouragement to attend future sessions.

Each session started with a prayer and a Bible-based game or scripture in line with the objectives of that particular session. The sessions were interactive: for each point, facilitators posed a question and allowed participants to discuss it. Thereafter, the facilitator explained the answers to the question with the help of the session delivery guide. Despite the CHW

serving as a lead facilitator, responsibilities were shared equally with the Church Elder facilitator. One handled the first part of the session and the other took the last part. The Resident Pastor attended two sessions to motivate participants.

7.1.5 Data collection

Baseline assessments were conducted at the church a week before the commencement of the programme to assess pre-programme knowledge about hypertension and its risk factors, and self-reported salt intake, diet, and physical activity using a researcher administered questionnaire. Additionally, objective physical measurements (blood pressure [mmHg], body weight [kg], height [m], waist and hip circumference [cm]) were taken by the researcher.

The researcher observed each session while passively sitting at the back in the workshop, to assess the feasibility and acceptability of the intervention. An observation proforma was used to identify five main indicators of feasibility and acceptability, including: participants' demonstration of the understanding of the purpose of the intervention, facilitators' ability to implement the set-out activities (use of the intervention material and tools), interaction between participants, interaction between facilitators and participants, and suitability of the setting.

The researcher remained passive except when called upon to respond to a question which facilitators felt they were unable to address. If there was a question, it was first answered by the Church Elder facilitator. If more clarification was required, the CHW provided this. If the CHW felt unable to provide an answer, he invited clarification from the researcher (a qualified medical doctor). Each question that could not be responded to adequately by the facilitators was taken note of for use in refining the facilitators' manual.

7.1.5.1 Post-programme interviews

Short (~30 minute) digitally recorded post-intervention qualitative interviews were conducted (some in English and others in Nyanja according to participant preference) with eight participants and the two facilitators to allow more in-depth exploration of the feasibility and acceptability of the intervention components and any changes needed. Five intervention participants were selected for an interview using a random process where all attendees at the final session (i.e., completers) were assigned numbers written on small pieces of paper and placed in a cup. A volunteer from the participants picked five names from the cup. All non-completers were invited to participate in the interviews and all those who agreed were included. Owing to the COVID 19 pandemic, all interviews were conducted by phone. Interviews were suitable for this study because they are one of the most commonly used methods for assessing feasibility and acceptability (Ayala and Elder, 2011).

7.1.5.2 Pre-and post-programme questionnaire

Potential effectiveness was assessed through pre- and post-intervention paper questionnaires adapted from the WHO STEPwise approach to communicable disease risk factor surveillance (WHO, 2002b) in a before and after design (Choi and Wong, 2018, Hovland and Lumsdaine, 2017). This was done to assess changes in knowledge about hypertension and its risk factors, self-reported health behaviours (diet and physical activity) and objective physical measurements (blood pressure, body weight, height, waist, and hip circumference) and their derivatives (BMI and waist-hip ratio). Levels of knowledge about the relationship between hypertension and salt intake, fruit and vegetable consumption, fatty/oily foods, smoking, alcohol, and physical activity were assessed to identify changes likely to be due to the CHiPI. Health behaviour change was assessed using self-reported changes in the same parameters through which health knowledge was assessed. To determine the impact of the intervention on physical measurements, the researcher took three blood pressure measurements (to the nearest 0.1mmHg) using a digital blood pressure machine (Healthease

NABPM-01) at least 1 minute apart; the first of which was taken after allowing the participant to rest quietly for 5 minutes. The average of these was used in statistical analyses. Body weight was measured to the nearest 0.1 kg using a portable analogue floor scale with shoes off, empty pockets and no jewellery. Height (to the nearest 0.1cm) was measured at baseline only using a stadiometer without shoes on. Height and weight were used to calculate each participant's body mass index (BMI) as body weight (kg)/height squared (m^2). A single measurement for waist circumference was taken (using Seca 201 waist measurement tape) to the nearest 0.1cm midway between the inferior aspect of the rib cage and the superior iliac crest at approximately the level of the umbilicus. For hip circumference, participants were asked to stand straight up with feet together. Measurements were taken from the greatest gluteal protuberance. For waist and hip circumference, and body weight, the participants removed excess clothing to prevent erroneous measurements. Waist to hip ratio was calculated to provide information on the differential fat distribution.

7.1.6 Data handling and analysis for the small-scale feasibility study

Digitally recorded qualitative data were handled and analysed as explained in section 3.2.5 Quantitative data (from pre- and post-intervention questionnaires and measurements) were entered into an excel sheet, cleaned and uploaded to the Statistical Package for Social Sciences (SPSS version 27). Analysis was guided by the STEPs Manual for data analysis, which is also informed by the Global Physical Activity Questionnaire (GPAQ) guide for analysing physical activity data (WHO, 2002a).

Descriptive analysis (frequencies, means and modes) was used to describe participant characteristics and baseline data on health knowledge, health behaviours (e.g., diet, physical activity), blood pressure and anthropometric measurements. Inferential analyses (i.e., statistical significance tests) were conducted to compare the before and after data to determine potential programme effectiveness. These included paired T-tests (for normally distributed continuous variables), Wilcoxon Signed Rank Tests (for non-normally

distributed and ordinal variables) and Marginal Homogeneity Tests (for nominal variables) with a 95% confidence interval.

For continuous variables, differences between the pre- and post- data were computed by deducting baseline data from the post programme data. These difference variables were assessed for normality using the Kolmogorov-Smirnov and Shapiro-Wilk tests (appendix 1). A p-value below the 95% significance level ($p<0.05$) indicated that data were not normally distributed. Where p-values from the two tests were in conflict, associated histograms and/or Q-Q (Quantile-Quantile) plots were analysed to aid assessment of normality. Histograms where most of the observations clustered around the central peak and the values further away from the mean tapered off equally/nearly equally in both directions were considered to be normally distributed. A Q-Q plot compares the observed quantiles of the data (dots/circles) with the expected quantiles (solid line). For normally distributed data, the observed quartile points on the Q-Q plot are expected to be on or close to the solid line. If the Q-Q plot met this criterion of normality, the variable was taken as normally distributed despite the conflicting p-values for the normality statistical tests.

Inferential statistical analysis was conducted in keeping with Step Six of the 6SQuID Model, which recommends a demonstration of potential effectiveness in a before and after design before embarking on a large scale evaluation such as a phase III randomised controlled trial (Wight et al., 2016). It also aligned with the common practice of assessing potential effectiveness (without making firm causal inferences) for novel interventions using within-group changes in before-and-after designs (Sim, 2019). Moreover, being able to demonstrate potential effectiveness in this way can strengthen dissemination of findings to key stakeholders and health sector leaders/policy makers to advocate for support for the full-scale evaluation of the intervention.

7.1.7 Ethical consideration

In addition to the ethical clearance obtained together with the current study described in section 3.4.0, ethics approvals for the feasibility study required amendments for the post-programme qualitative interviews as restrictions due to the COVID-19 pandemic meant face-to-face interviews could not be conducted to minimise the risk of disease spread between the researcher and the respondents. As such, ethical approval was obtained from the University of Glasgow to conduct phone interviews (Application Number: 400180248). Participant information sheets were shared before the start of the feasibility study and respondents gave consent over the phone before proceeding with the interview.

7.2.0 Feasibility study results

7.2.1 Demographic information

As Table 7.1 shows, 34 participants were enrolled into the programme, the majority of whom were female (n=28/34, 82.4%) with a mean age of 44.8 years (SD±14.3). The majority (n=22/34, 64.7%) were married. The rest were widowed (n=8/34, 23.5%), divorced (n=2/34, 5.9%) or never married (n=2/34,5.9%). Over half (n=20/34, 58.8%) had attained secondary school or had a higher level of education. Despite the majority of the participants having gone beyond secondary school level education, only 5/34 (14.7%) were in formal employment. Over two-thirds 23 (67.6%) were self-employed, and the rest (n=6/34, 17.6%) were unemployed.

Table 7. 1 Demographic characteristics of participants in the CHiPI feasibility study

Variable	Mean ± SD(*n*) for continuous variables (age) and %(*n)* for categorical variables (the rest)
Age (years)	44.8 ± 14.3 (34)
Sex	
Male	17.6 (6)
Female	82.4 (28)
Marital status	
Never married	5.9 (2)
Currently married	64.7 (22)
Separated	0.0 (0)
Divorced	5.9 (2)
Widowed	23.5 (8)
Cohabiting	0.0 (0)
Education	
< Primary school	8.8 (3)
Primary school	32.4 (11)
Secondary school/high School	50.0 (17)
College/University	8.8 (3)
Work	
Government employee	14.7 (5)
Self-employed	67.6 (23)
Unemployed (able to work)	11.8 (4)
Unemployed (unable to work)	5.9 (2)
Monthly household income (Zambian Kwacha)	
<1000	20.6 (7)
1000 - 1999	23.5 (8)
2000 - 2999	26.5 (9)
3000 - 3999	14.7 (5)
4000 - 4999	2.9 (1)
5000 - 5999	5.9 (2)
>5999	2.0 (5.9)

7.2.1 Feasibility of intervention delivery

Feasibility was assessed by participant recruitment, retention to the CHiPI and views of the participants from the qualitative interviews (Cassidy et al., 2019, Dombrowski et al., 2012). Using within-church adverts and announcements, 39 church members indicated a willingness to participate, but only 34 (87.2%) joined the programme. The reasons for the non-response were not explored. However, such a response rate suggested that it was possible to recruit participants using the approaches in this study. Furthermore, it also

revealed the likelihood that the majority of the community (church members) were potentially available to participate and that recruitment using the methods indicated was feasible. The recruitment, however, enrolled more females and people in informal employment than men and those in formal employment.

Of the 34 participants enrolled, nearly all (n=31/34, 91.2%) stayed with the intervention for the entire eight weeks. Participants who completed the programme attended a mean of 6.3 (SD ±1.8) sessions, with a majority (n=25/34,80.6%) attending more than six sessions (Figure 7.1). Completers (Comp) viewed the intervention as relevant to their needs (e.g., desire to prevent hypertension) and enjoyable, as some explained:

> *"I wanted to know more about high blood pressure and how I can keep myself from acquiring it. This is what made me come to take part in the programme."*
>
> [Female CompPart1]

> *"I really had a good experience because I was enjoying every meeting and learning a lot of things. The experience of doing it in church was good also."*
>
> [Female CompPart5]

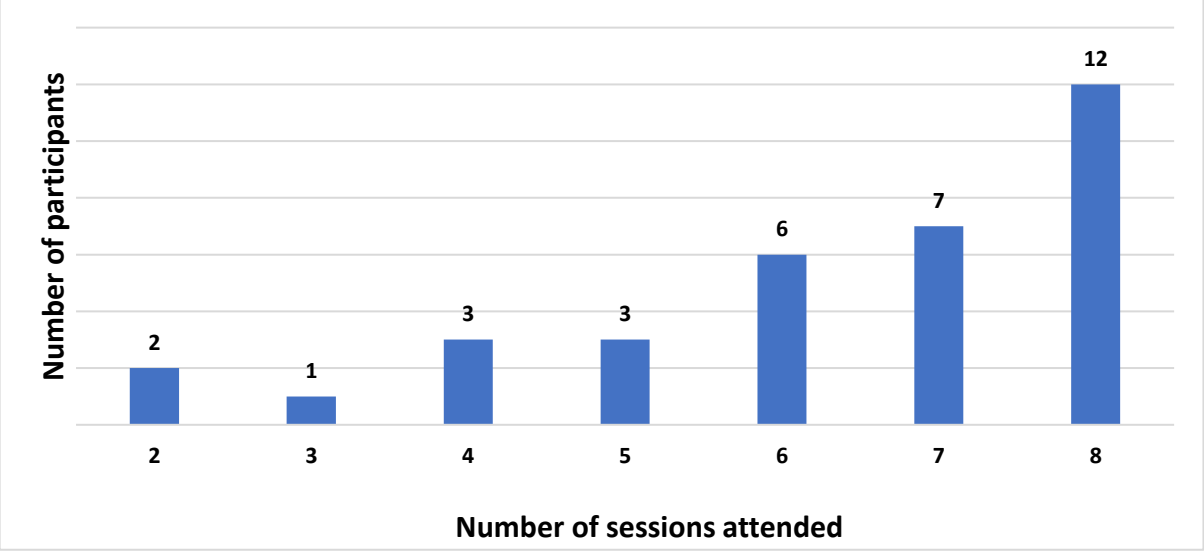

Figure 7. 1 Number of sessions attended by CHiPI participants

Regular reminders from the church leadership, in addition to the facilitators, on the importance of being consistent in attending the sessions supported the high retention rate.

Some completers missed a few sessions and follow ups by the church leader after each missed session suggested this was because of personal reasons such as clashes of programmes with unplanned for activities and illness. The three female participants who dropped out of the programme took part in telephone interviews. All left for work reasons: one because she had to travel for business too often; while the others had to leave due to the sessions conflicting with their formal employment, as one non-completer (NonComp) explained:

> *"Well, I was very eager to participate up to the end of the programme because it was interesting. But my work schedules changed. When the programme started, I was working in the morning, so it was easy for me to attend the programme in the afternoon. But when I reported back for work, I was put in the afternoon shift. The first week, I made an arrangement to knock off earlier and that is how I managed to come late. The next weeks I failed to leave work."* [Female NonCompPart1]

Despite being unable to complete the programme, these three participants all felt they had benefited from taking part. They highlighted the practical ways of changing lifestyles and receiving information about behaviour change techniques (e.g., goal setting) and healthier diets as some of the positives of the programme:

> *"I enjoyed the 3 sessions I attended. I liked the approach where we were learning about simplified ways to change lifestyle."* [Female NonCompPart1]

> *"Ooh yeah, I actually have learnt a lot. Now I know how to keep myself. We learnt about blood pressure and how to prevent it. Previously I was just eating anything, but now I know."* [Female NonCompPart2]

The small-scale evaluation also showed that it was possible to run weekly 2-hour intervention sessions for eight consecutive weeks at the church. The sessions were held on Thursdays from 2p.m. to 4p.m. However, two sessions overran by 30 minutes because participants had a lot of questions that required clarification: these were the first session (which involved the discussion of what hypertension is, its causes and complications) and the fourth session (which discussed the different food classes).

In addition, the resident church Pastor provided his support throughout the intervention. He re-echoed the announcement to recruit participants during the church service (following the secretary's notices), attended two sessions and gave permission for three participants to give a testimony each during one church service. These testimonies were given in week seven of the CHiPI after completing key sessions on hypertension awareness, salt intake, fruit and vegetables consumption, oily/fatty food and physical activity.

7.2.2 Acceptability

Despite a few suggested changes (see intervention adaptation/optimisation below), the intervention setting, content, delivery and materials/tools were reported to be broadly acceptable by the participants and facilitators. Delivery through and at the church was viewed as appropriate by most participants; not only for programme delivery but also as continuous advertisement to other church members who were not part of the programme, as one man explained:

> *"The experience of doing it in church was good also. In fact, some people who learnt about the programme later on would say we never knew that the programme was nice, but I was telling them that the programme was announced in church you should have responded."* [MaleCompPart5]

The intervention was so acceptable to the participants that expressed this to the rest of the church members, thereby making it attractive to those who initially did not come forward to join the intervention.

Another aspect of the intervention viewed as acceptable was the group-based, face to face delivery. The researcher observed that participants grew increasingly comfortable as the programme progressed: became free with each other and more expressive. This facilitated interpersonal support when some participants encountered difficulties. For example, if one participant failed to achieve their targets, they were more likely to seek for support from a fellow participant as the intervention progressed than at the beginning:

"I was also feeling shy to ask at first. But later I worked on this [shyness] and improved." [FemaleCompPart4]

The intervention handouts included information about hypertension and its causes, planning for behaviour change, goal setting and self-monitoring tools, as well as how to maintain changes made. Participants were able to follow the handouts and appreciated the use of visual images as one participant indicated:

"…the pictures in the guides made it easier for me to understand things."

[MaleCompPart2]

And one facilitator reiterated:

"I think what I saw, especially after presenting to the participants is that everything was okay. Because even the participants themselves were able to follow nicely. I think it was okay. Because where they did not understand very well, the pictures and illustrations could help them." [Facilitator1_CHW]

Using the planning tools, participants were able to set goals and monitor their own implementation. During each session, participants were reminded about the 5Cs targets and encouraged to set personal targets. Facilitators then went round to review the set targets to ensure they aligned to the 5Cs. However, being new to most participants, goal setting, and self-monitoring were viewed as difficult by many in the initial stages of the programme. Nonetheless, participants accepted, understood and utilised the action planning and self-monitoring tools more easily as the programme progressed:

"At first it was difficult to set goals and also act on them. I did not understand it well at the beginning because it was new to me. But after 3 sessions, I started understanding it [……] Maybe I just needed more time to learn how to do it [….] Those tables were okay with me." [FemaleCompPart1]

For most participants, the duration of the sessions (weekly two-hour sessions running over eight weeks) and the overall programme were acceptable:

"Yes, we met for 8 weeks. I think the programme was okay because we only met once per week and only for a few hours. So that did not take a lot of our time. So, I think it was okay." [FemaleCompPart4]

The pace at which the programme was delivered provided participants with enough time to learn the programme content slowly, without feeling rushed, such that even those who viewed some of the content (e.g., goal setting) as difficult initially had enough time to understand it.

"That arrangement [one topic per week] *was good because we were learning slowly"* [FemaleConsPart1]

In keeping with evidence on effectiveness of using graded tasks (Samdal et al., 2017), participants also appreciated the advice to make small, gradual changes instead of changing lifestyles suddenly:

"Because sometimes when you are used to doing something, stopping abruptly is what was difficult. But I still liked the lessons we learnt that you don't have to stop abruptly, but slowly." [FemaleCompPart3]

Furthermore, the programme was flexible enough to allow participants to decide what would work best for them. For example, participants learnt about the importance and optimal levels of physical activity. However, there was no prescription of what each person was supposed to do. Instead, they were free to choose what activity and how much would work for them. This was in keeping with the SDT concept of autonomy (Ryan and Deci, 2000):

"For me, I like gardening and walking so that was easy for me to set a goal that I could manage to do." [FemaleCompPart4]

Participants were also satisfied with the way facilitators handled the sessions. Attributes identified as desirable for the facilitators were patience and tolerance, an acceptable pace of delivering sessions, clarity of explanations and respect for participants, as demonstrated by some completers below:

"The facilitators were good because they were slow and patient. They were allowing

questions and answered them well. They also explained things in simple ways."
[FemaleCompPart3]

"Those who were teaching us were teaching us well. They explained things clearly and responded to questions without looking down on anyone. They treated us with respect. They considered every question as important and did not look down on any question." [FemaleCompPart5]

7.2.3 Proposed intervention adaptations

Despite the intervention being largely feasible and acceptable, participants proposed some changes to the intervention. These included the duration of the intervention, the timing and duration of the sessions and day of the week when sessions were held.

Despite some participants viewing the length of the intervention as acceptable, a few felt that eight weeks was insufficient. Participants suggested increasing the programme duration by a couple of weeks:

"It was just fine, and it could have even gone beyond the weeks. I think 8 weeks was short. Maybe we need to come and learn some more in future." [FemaleCompPart2]

Alternatively, some participants proposed increasing the number of the two hour-long weekly sessions to twice per week:

"For me, I would suggest we do 2 per week. But I do not know about my other friends what they would think. But for me, twice per week would be good."
[FemaleCompPart3]

The proposed changes were also in line with the findings above where some participants felt they needed more time to understand goal-setting and self-monitoring concepts.

Considering sessions were held on weekdays during working hours, non-completers felt this arrangement was inhibiting for some people. As such, proposals were made to move the sessions to either weekends or after working hours:

"I think the arrangement was good, except it was not fit for those in formal employment. Maybe next time we can try over the weekend possibly when more people tend to be off. At least even us who work can manage to attend…. If we have to run this in church again, Saturday or Sunday afternoons would be good".

[NonCompPart1]

"…. Alternatively, maybe holding the sessions after 17 hours [5p.m.] *when people have knocked off from work."* [NonCompPart2]

As indicated above, the programme attracted fewer men than women. It was observed that this could be due to unfavourable practical programme arrangements. To attract more men, facilitators supported the suggestion to move the sessions to an appropriate time.

"Maybe on timing. I don't know if it would be possible to convince the participants maybe to shift the sessions to the weekends. Because maybe that was the reason more men could not participate. Because it was done during working hours. If you look at most of the women who were attending, they are free that time. They are not in employment so they could easily attend. But men would usually say they were working. So maybe if it can be shifted to weekends, I think it can also help."

[Facilitator 2 Church leader]

Section summary

The majority of the 34 participants in the feasibility study were females and self-employed. The findings suggest the intervention was feasible and acceptable to most of the participants and could be delivered in the same or similar settings with minimal adaptations. Two-hour long weekly sessions were viewed as favourable for the current intervention. Minor changes were proposed to optimize the intervention, including shifting the timing of the sessions to after work (i.e., after 5pm) or at the weekends (Saturday or Sunday). It was felt that moving the time of meeting would increase the likelihood of men and those in formal employment joining and being retained in the programme.

There was also a desire among participants to increase the duration of the programme by a couple more weeks or to increase the number of sessions to two per week and/ or follow-up activities beyond the core part of the intervention. Some felt the programme was too short,

presumably because it was acceptable, appropriate and was perceived as enjoyable by participants and facilitators. This proposal was necessary considering that it took most participants long (during the intervention delivery) to become proficient in the use of BCTs such as goal setting and self-monitoring. Despite this suggestion, and other studies showing that more or longer sessions/programmes can improve behaviour change maintenance (Baig et al., 2015, Tang et al., 2014), extending the programme is likely to be challenging as it may increase cost. In addition, it is likely that an 8-week programme with one session per week, as was the delivery of the CHiPI, can be sustained, as this format has been successful in other faith-based physical activity (Jorna et al., 2006) and weight loss (Kim et al., 2008) interventions. However, the fact that two sessions overran by 30 minutes suggests that these sessions should be refined, either by increasing their duration, reducing their content or splitting them into two sessions (resulting in a 10-week intervention). However, considering that the main reason for the overrun was because participants had a lot of questions, future implementation may provide answers to frequently asked questions apriori.

Another suggestion was to move the day or time of meeting to weekend (Saturday or Sunday) or after working hours, respectively. This was because fewer people in formal employment managed to join the programme and attend sessions consistently to the end because of their work commitments. Such a change would allow formally employed residents to attend sessions. The same changes were viewed as likely to encourage more men to participate despite evidence showing that attracting men to similar public health interventions has been problematic, as revealed by a systematic review on physical activity interventions delivered in Faith-Based Organizations (Parra et al., 2018).

7.3.0 Potential effectiveness

The baseline findings were compared with the post-programme data to assess likely effectiveness. Changes in levels of health knowledge, behaviour (diet and physical activity), and physical measurements (blood pressure, body weight, waist circumference, hip circumference) are reported. This section starts with the presentation of baseline data before providing the results of the analyses on potential effectiveness.

7.3.1 Baseline information

7.3.1.1 Health knowledge levels

As Table 7.2 shows, levels of health knowledge where low at baseline. Over one-third of participants (38.2%) did not know that high salt intake could cause hypertension. Additionally, almost half (44.1%) did not know that reducing dietary salt was important. Nonetheless, over a third (38.2%) recognised that lowering their salt intake was very important.

Over three quarters of participants (76.5%) did not know that eating five servings of fruit/vegetables per day was recommended, not only to reduce the risk of hypertension, but also for other health benefits. Indeed, a few (5.9%) thought that eating a lot of vegetables was a sign of suffering. Regarding fatty diets, almost half of participants (41.2%) indicated that low fat in one's diet (e.g., low fried and fast foods) was unhealthy or meant poverty, in line with the local social norms. This was in keeping with the findings from the exploration of the local context where participants indicated that fried foods were desirable and a sign of a good life. Moreover, about a fifth of the participants (20.6%) did not know about whether fatty foods were unhealthy or healthy.

Table 7. 2 CHiPI participants' levels of knowledge about salt intake, diet, physical activity and body weight at baseline (N = 34)

Health knowledge about	Levels	%(*n*)
Whether too much dietary salt could cause health problems	Yes	44.1 (15)
	No	5.9 (2)
	Don't know	50.0 (17)
Salt intake	Reduced salt in your diet can cause HBP	11.8 (4)
	High salt in your diet can cause HBP	50.0 (17)
	Don't know	38.2 (13)
Importance of lowering salt intake in diet	Very important	38.2 (13)
	Somewhat important	8.8 (3)
	Not at all important	8.8 (3)
	Don't know	44.1 (15)
Vegetable & Fruit intake	Eating at least five servings of fruit and/or vegetables/day is good	17.6 (6)
	Eating at least five servings of fruit and/or vegetables/day is not good/its suffering	5.9 (2)
	Don't know	76.5 (26)
Oily/fatty diets	Low fat in your diet/low fried and fast foods are unhealthy/mean suffering	41.2 (14)
	Low fat in your diet/low fried and fast foods are healthy	38.2 (13)
	Don't know	20.6 (7)
Sugary/fizzy drinks	Having fewer sugary beverages (e.g., Coke, Fanta) in your diet is healthy	23.5 (8)
	Having fewer sugary beverages (e.g., Coke, Fanta) in your diet is unhealthy	52.9 (18)
	Don't know	23.5 (8)
Walking (Physical activity)	Walking a lot is healthy	79.4 (27)
	Walking a lot is unhealthy	11.8 (4)
	Don't know	8.8 (3)
Body weight	Gaining weight means living well and being healthy	38.2 (13)
	Gaining weight is unhealthy	35.3 (12)
	Don't know	26.5 (9)

Over half of participants (52.9%) were aware that sugary/fizzy drinks were unhealthy. Some participants, however, either did not know (23.5%) or thought that taking a lot of sugary/fizzy drinks was healthy (23.5%).

Despite the findings from the local context showing that low physical activity was an important risk factor for hypertension in Maramba, most participants (79.4%) knew that physical activity was healthy. However, almost a quarter (11.8%) thought that walking a lot was unhealthy, and others (8.8%) indicated that they did not know whether walking was healthy or not.

Although over a third participants (35.3%) understood that weight gain was unhealthy, almost two-fifths (38.2%) felt that weight gain signified a good and healthy living. About a quarter (26.5%) did not know whether weight gain was healthy or unhealthy. Put together, the figures above suggest that those who lacked knowledge about body weight and those who thought weight gain was healthy, accounted for the majority of the participants. This also supports evidence from the local context which revealed that health knowledge about body weight was low in the community. Furthermore, this is in keeping with the social norms in the local context that valued weight gain and, in some cases, regarded it as beautiful.

7.3.1.2 Baseline behavioural risk factors

a) Diet

As Table 7.3 shows, self-reported salt consumption was generally high among participants at baseline. Nearly all (97.0%) said they added salt to food during preparation. Additionally, participants always (20.5%) or often (35.0%) added extra salt to their plate at mealtimes. Consumption of processed foods high in salt was not found to be a major source of dietary salt intake, as almost all participants only consumed these either sometimes (50.0%) or rarely (47.1%).

At baseline, no participants were consuming the recommended five servings of fruit and vegetable servings (portions) per day. However, due to the participants' inability to estimate how many fruit and how much vegetable constituted a serving, participants considered, for example, a plate of vegetables during a meal as representing one serving. As such, the consumption of vegetables is likely to have been underestimated. It was however noted that all participants consumed vegetables at both of their two main daily meals, i.e., lunch and dinner. Consumption of fried foods was found to be high: each participant consumed at least 1.5 fried meals per day.

b) Physical activity

In general, physical activity levels were high. The majority of participants (64.7%) engaged in moderate physical activity for more than the recommended 150 minutes per week (WHO, 2010). In addition, a few participants (23.5%) engaged in vigorous physical activity for longer than the recommended 75 minutes per week. These finding of high physical activity at baseline was in line with the high level of knowledge about health benefits of physical activity as reported in section 7.3.1.1. However, this finding was at variance with evidence from the local context study, where residents and stakeholders felt physical activity was low in the area. The difference may be due to the sample of the feasibility study mainly comprising self- or unemployed individuals who were less likely to be able to afford regular use of motorised transport: the local context revealed that the use of motorised transport was more predominant among the formally employed.

Table 7. 3 CHiPI participants' self-reported dietary intake and physical activity levels - N= 34

Variable	Levels	%(*n*)
Frequency of adding salt, salt seasoning or salt sauce to food during preparation	Always	97.0 (33)
	Often	2.9 (1)
	Sometimes	0.0(0)
	Never	0.0 (0)
How often salt or salty sauce is added to the plate at mealtimes.	Always	20.6 (7)
	Often	35.3 (12)
	Sometimes	26.5 (9)
	Rarely	5.9 (2)
	Never	11.8 (4)
Consumption of processed food with high salt	Often	2.9 (1)
	Sometimes	50.0 (17)
	Rarely	47.1 (16)
	Never	0.0 (0)
		***Mean* (SD)**
Fruit and vegetable consumption	Fruit servings per day	1.2 (±0.9)
	Vegetable servings per day	1.9 (±0.4)
Fatty/oily foods	Meals fried per day	1.5 (±0.5)
[a]Moderate physical activity (mins per week)	<150	26.5 (9)
	≥150	64.7 (22)
[a] Vigorous physical activity (mins per week)	<75	67.6 (23)
	≥75	23.5 (8)

a *– Categorized baseline self-reported level of physical activity depicting proportions of participants below and above WHO's recommended minutes per week; guided by the GPAQ in the STEPs Manual*

7.3.1.3 Physical measurements

As Table 7.4 shows, mean blood pressure at baseline was 134.1 mmHg (±18.6) and 90.6 mmHg (±11.1) for SBP and DBP, respectively. Indeed, 41.2% of participants had raised SBP and 44.1% had raised DBP (over 140mmHg and/or 90mmHg (Chobanian et al., 2003)). In addition, 11.8% had a high-normal SBP (SBP of 121-139mmHg) while 35.3% had high-normal DBP (DBP of 81 - 89mmHg), indicating a high risk of progressing to hypertension. More women had elevated blood pressure readings than men. For example, 42.9% of women

had SBP above the normal range compared to 33.3% of men. However, the low numbers of men limit the robustness of this comparison.

The majority of participants had excess bodyweight (mean BMI 29.9 kg/m^2 (SD ±5.7)): nearly half (47.1%) were obese (BMI ≥30 kg/m^2) and a few (17.6%) were overweight (BMI 25 – 29.9 kg/m^2). Women had higher BMIs compared to men: 14/28 (50.0%) of women were obese compared to one-third (33.3%) of men. Similarly, the majority of women participants (82.1%) had central obesity, compared to only half (50.0%) of the men. As such, based on these obesity scores determined using waist circumference, more women were at a higher risk of developing hypertension than men. Anthropometric measurements also showed that the majority of the women (75.0%) and two thirds of the males (66.7%) had elevated waist to hip ratios. The apparent lower risk among men should, however, be interpreted cautiously in view of the low number of men among the participants.

The baseline findings above (health knowledge, dietary habits, physical activity levels as well as physical measurements of body weight, waist and hip circumference and blood pressure) were compared with the post-programme results to assess potential effectiveness.

Table 7. 4 Physical measurements for all enrolled participants at baseline

Variable	Levels	Overall	Men (n=6)	Women (n=28)
Systolic Blood Pressure (mmHg) - *n* (%)	<120	16 (47.1)	4(66.7)	12 (42.9)
	120 - 139.9	4 (11.8)	0(0.0)	4 (14.3)
	≥140	14 (41.2)	2(33.3)	12 (42.9)
Diastolic Blood Pressure (mmHg) - n (%)	<80	7 (20.6)	1(16.7)	6 (21.4)
	80 - 89.9	12 (35.3)	3(50.0)	9 (32.1)
	≥90	15 (44.1)	2(33.3)	13 (46.4)
Body weight - (kg) *mean (±SD)*		75.6(±16)	76.2(±19.9)	75.5(±15.5)
Body Mass Index (kg/m^2) - *n* (%)	18.5 - 24.9	6 (17.6)	2 (33.3)	4 (14.2)
	25 - 29.9	12 (35.3)	2 (33.3)	10 (35.7)
	≥30	16 (47.1)	2 (33.3)	14 (50.0)
[a]Waist circumference (cm) - men (*n*=6) - *n* (%)	≤94		3 (50.0)	
	>94		3 (50.0)	
- women (n=28) - *n* (%)	≤80			5 (17.9)
	>80			23 (82.1)
[a]Waist to hip ratio - Men (*n*=6) - *n* (%)	< 0.9		2 (33.3)	
	≥0.9		4 (66.7)	
- Women (n=28) - *n* (%)	<0.85			7 (25.0)
	≥ 0.85			21 (75.0)

a *– waist circumference and waist to hip ratios were categorized differently for males and females because these have different normal ranges according to WHO. Normal range for the ratio is* < 0.90 (men) and < 0.85 for women.

7.3.2 Observed changes post-programme

The potential effectiveness of CHiPI on health knowledge, health behaviour (diet [including salt] and physical activity) and physical measurements (blood pressure and anthropometry) is reported here. Given the small number of men, results for men and women were not disaggregated by gender.

7.3.2.1 Health knowledge levels

As Table 7.5 shows, participants' knowledge of salt intake had improved post-programme. Post-programme, more participants were aware that high salt intake could cause hypertension (88.2% post-programme vs (50.0%) pre-programme, p=0.001) and more recognised that reducing salt in their diet was important (88.2% post- vs 38.2% pre-programme; p = 0.001).

The study also showed that by the end of the programme more participants understood that a five-a-day fruit and vegetable intake is healthy and important for reducing the risk of hypertension than at baseline (85.3% post- vs 17.6% pre-programme; p =0.001). Furthermore, knowledge that high fatty/oily diet was unhealthy also increased significantly (88.2% post- vs 38.2% pre-programme, p = 0.01). There was also increased awareness that high intake of fizzy/sugary drinks (79.4% post- vs 23.5% pre-programme, p=0.004) was unhealthy. Knowledge that excess weight above the recommended cut offs by WHO is unhealthy also increased (88.2% post- Vs 35% pre-programme; p=0.006). However, health knowledge about physical activity did not show a statistically significant improvement (p=0.09) perhaps because of the high physical activity levels at baseline.

Table 7. 5 Pre-post-programme change in health knowledge levels presented as *n* (%) [N=31]

HEALTH KNOWLEDGE ABOUT	LEVELS	PRE-	POST-	*P*-VALUE
Salt intake	Reduced salt in your diet can cause HBP	4 (11.8)	1 (2.9)	0.001
	High salt in your diet can cause HBP	17 (50.0)	30 (88.2)	
	Don't know	13 (38.2)	0 (0.0)	
Importance of lowering salt intake in diet	Very important	13 (38.2)	30 (88.2)	0.001
	Somewhat important	3 (8.8)	1 (2.9)	
	Not at all important	3 (8.8)	0 (0.0)	
	Don't know	15 (44.1)	0 (0.0)	
Whether too much dietary salt could cause health problems	Yes	15 (44.1)	31 (91.2)	0.001
	No	2 (5.9)	0 (0.0)	
	Don't know	17 (50.0)	0 (0.0)	
Vegetable & Fruit intake	Eat at least five servings of fruit and/or vegetables each day is good	6 (17.6)	29 (85.3)	0.001
	Eat at least five servings of fruit and/or vegetables each day is not good/its suffering	2 (5.9)	2 (5.9)	
	Don't know	26 (76.5)	0 (0.0)	
Oily/fatty diets	Low fat in your diet/low fried and fast foods are unhealthy/mean suffering	14 (41.2)	1 (2.9)	0.01
	Low fat in your diet/low fried and fast foods are healthy	13 (38.2)	30 (88.2)	
	Don't know	7 (20.6)	0 (0.0)	
Walking (physical activity)	Walking a lot is unhealthy	4 (11.8)	1 (2.9)	0.088
	Walking a lot is healthy	27 (79.4)	30 (88.2)	
	Don't know	3 (8.8)	0 (0.0)	
Body weight	Gaining weight means living well and being healthy	13 38.2)	1 (2.9)	0.006
	Gaining weight is unhealthy	12 (35.3)	30 (88.2)	
	Don't know	9 (26.5)	0 (0.0)	
Sugary/fizzy drinks	Reduced sugary beverages (e.g., Coke, Fanta) in your diet is good life and healthy	8 (23.5)	27 (79.4)	0.004
	Reduce sugary beverages (e.g., Coke, Fanta) in your diet is unhealthy	18 (52.9)	4 (11.8)	
	I don't know	8 (23.5)	0 (0.0)	

7.3.2.2 Behavioural changes

a) Diet

As Table 7.6 shows, dietary habits improved in several ways post-programme. There were statistically significant reductions in the reported frequency of adding salt both during food preparation (p=0.014) and on the plate at mealtimes (p=0.001). For example, the proportion of participants who added salt on the plate at mealtimes reduced by over half: from 35.3% (n=12) at baseline to 14.7% (n=5) at post-programme. This reduction in salt intake was also reported by some participants during the post-programme qualitative interviews as achieved through reduced added salt on food on the table:

> *"The thing I have noticed to have changed a lot is my salt intake. I have reduced eating salt a lot. I don't add salt on the plate when eating."* [FemaleCompPart4]

The reduction in consumption of processed foods rich in salt was, however, statistically insignificant (p=0.09). This was not surprising as consumption of fast foods was low at baseline.

Table 7. 6 Pre-post-programme change in self-reported dietary habits (N = 31)

Variable - *n (%)*	**Level**	**Pre-**	**Post-**	**P-Value**
Frequency of adding salt or salty sauce to the plate (mealtime)	Always	7 (20.6)	2 (5.9)	0.001
	Often	12 (35.3)	5 (14.7)	
	Sometimes	9 (26.5)	10 (29.4)	
	Rarely	2 (5.9)	3 (8.8)	
	Never	4 (11.8)	11 (32.4)	
Frequency of adding salt, salt seasoning or salt sauce to food during preparation	Always	33 (97)	24 (70.6)	0.014
	Often	1 (2.9)	5 (14.7)	
	Sometimes	0(0)	1 (2.9)	
	Never	0 (0)	1 (2.9)	
Consumption of processed food with high salt intake	Often	1 (2.9)	0 (0)	0.09
	Sometimes	17 (50.0)	14 (41.1)	
	Rarely	16 (47.1)	14 (41.1)	
	Never	0 (0)	3 (0.8)	
Variable - *mean (SD)*	**Pre-**	**Post-**	**Change (Post -Pre)**	**p-value**
Mean fruit servings eaten on one of the weekdays	1.0 (1.0, 2.0)	3.0 (2.0, 4.0)	+2.0	<0.001
Mean vegetable servings eaten on one of the weekdays	2.0 (2.0, 2.0)	2.0 (2.0, 2.0)	0.0	0.030
Mean meals fried per weekday	1.5 (±0.5)	0.90 (0.4, 1.1)	-0.6	<0.001

Mean fruit servings eaten each day increased significantly from 1.0 to 3.0 at post programme (p=0.001). However, there was no change in the number of vegetable servings post-programme, as servings remained 2.0 per day (p=0.03), perhaps due to poor measurement as explained in section 7.3.1.2. There was, however, a statistically significant reduction in the mean number of fried meals consumed per day from 1.5 to 0.9 (p=0.001).

The types of dietary changes participants made were further elucidated by the qualitative interviews. One completer explained how participation in CHiPI had helped her make healthier food choices:

> *"Some things have changed. Like eating habits, I now chose what to eat, I have reduced eating food with a lot of fat. I also eat more fruits now than before I knew that they were important and that fruits did not just mean apples from Shoprite."*
>
> [FemaleCompPart2]

This extract illustrates those changes in dietary habits were made possible by participants' increased understanding of the importance of certain foods e.g., fruit, and the practical ways of making these changes without depending on the high-cost fruit and vegetables from supermarkets.

b) Physical activity

As Table 7.7 shows, improvements were observed in self-reported physical activity (walking) despite this having been high at baseline. Weekly moderate physical activity increased from 270 to 360 minutes (p=0.01). Moreover, there was a statistically significant reduction in time spent sitting or reclining per day from 180 to 120 minutes (p=0.001). Some interviewees explained about how they were able to increase their physical activity by choosing types of exercise that they found convenient, manageable, and beneficial:

"*And with walking, I walk a lot. I have given myself walking as my exercise, so I have stopped getting on cabs."* [FemaleCompPart4]

"I exercise in my house, running in one place, I stretch myself and this makes me feel better. My dresses and skirts are now becoming big. So, this programme has really helped me [lose weight] and I am feeling good." [FemaleCompPart3]

These extracts illustrate how participants managed to exercise autonomy (from SDT) (Ackerman, 2018) in changing their physical activity and were able to make choices that suited their own circumstances. Encouraging participants to tailor their exercising to suit their own capacity and ability is likely to have improved their sense of self-efficacy (from SCT) (Beauchamp et al., 2019) for physical activity. Additionally, some participants exhibited internalised forms of regulation (identified - SDT) by recognising the personal benefits such as them of losing weight (outcome expectation - SCT).

Table 7. 7 Pre-post programme change in self-reported minutes of physical activity

Variables *(N = 31)*	**Pre-**	**Post-**	**Change (Post -Pre)**	**p-value**
Minutes of vigorous activity per week	0.0 (0.0, 50.0)	0.0 (0.0, 100.0)	0.0	0.003
Minutes of moderate activity per week	270.0 (0.0, 900.0)	360.0 (120.0, 900.0)	+90.0	0.005
Minutes of sitting/reclining on a typical day	180.0 (120.0, 240.0)	120.0 (60.0, 180.0)	-60.0	0.002

Total minutes spent on physical activities per week (the median and interquartile range (IQR) are reported as these were non-normally distributed variables)

There was, however, no noticeable change in vigorous physical activity. Despite the interquartile range (describe the spread of the data) for time spent on vigorous physical activity increasing after the programme, the median remained the same (p=0.003). This

was not surprising considering that the intervention did not specifically target vigorous physical activity. Additionally, physical activity levels were already high at baseline.

The self-reported changes above: reduced salt intake, reduced consumption of fatty/fried foods, increase in fruit and vegetable consumption and moderate physical activity levels potentially led to changes in physical measurements explained below.

7.2.2.2 Physical measurements

As Table 7.8 shows, there were significant improvements post-programme in objectively measured blood pressure. Both mean systolic and diastolic blood pressure reduced significantly, by -3.0 mmHg (p=0.003) and -4.0 (±7.7) mmHg (p=0.001), respectively. Statistically significant reductions were also observed in body weight (mean decrease 3.5kg, SD±2.8, p = 0.002), BMI (mean decrease 1.4 m/kg^2 SD±1.1, p = 0.001) and waist circumference (mean decrease 4.9 cm, SD ±8.2, p = 0.001).

Table 7. 8 Pre-post programme mean change in objective physical measurements (N=31)

Variables	**Pre-**	**Post-**	**Mean Change Post -Pre (SD)**	***p*-value**
Systolic BP (mmHg)	134.2 (±19.0)	124.3(115.7,144.7)	-3.0 (±10.9)	<0.001
Diastolic BP (mmHg)	90.8 (±11.4)	86.6 (±8.6)	-4.0 (±7.7)	<0.001
Body weight (Kg)	45.5 (±15.7)	72.1 (±14.4)	-3.5 (±2.8)	<0.001
BMI (m/kg2)	29.5 (±5.7)	28.5 (±5.2)	-1.4 (±1.1)	<0.001
Waist Circumference (cm)	94.0 (±19.2)	89.6 (±14.4)	-4.9 (±8.2)	<0.001

Section summary

Baseline data showed that participants' knowledge of diet (including salt), sugary drinks and physical activity in relation to hypertension was low. This supported the local residents and stakeholders' views that people had inadequate information about hypertension and its causes. The poor health knowledge was reflected in unhealthy lifestyles behaviours at baseline. For example, participants reported high salt

consumption at baseline with most common sources being salt added to the pot while cooking and to the plate at mealtimes. Despite vegetables being consumed at each of the two main meals daily, consumption of fruit was low. Additionally, fried foods (oily/fatty foods) were consumed at all main meals by most residents.

Contrary to the findings from the local context focus groups and interviews where physical activity was considered to be low, most of the participants knew that physical activity was healthy and engaged in either moderate or vigorous physical activity at baseline. As explained above, this could have been due to the feasibility study sample composition: majority were unable to afford using motorised transport all the time. On average, the mean blood pressure for the participants was normal despite the mean diastolic blood pressure being minimally raised. However, assessment of how many participants had raised blood pressure found more with blood pressure readings above 140/90mmHg, especially women. Furthermore, most of the participants were overweight or obese, with the majority having central obesity.

The small-scale evaluation showed that CHiPI had potential to deliver improvements in health knowledge, adoption of healthier lifestyles as well as changes in blood pressure, body weight, and hip and waist circumference. At the end of the programme, there was an increase in the levels of health knowledge of the benefits of healthier diets (reduced salt intake, increased fruit and vegetable consumption and reduced fatty foods intake and increased physical activity). Additionally, post-programme assessment of health knowledge revealed an increased understanding of the risk of excess body weight. Considering that change in health knowledge alone is not adequate in changing behaviours (Wight et al., 2014), increase in health knowledge combined with the use of behaviour change techniques (e.g., goal-setting and self-monitoring of behaviour), may have contributed to the improvements in the adoption of healthier lifestyles by

participants as was hypothesised in the ToC. There was a self-reported reduction in salt and fatty foods intake as well as increased fruit and vegetable consumption. These changes meant a potential reduction in the levels of risk of hypertension among participants.

The changes in risk factors were associated with a concomitant change in objectively measured anthropometric measurements and blood pressure. Changes in diet and physical activity may have contributed to the observed reduction in body weight, BMI and waist circumference.

7.4.0 Chapter summary and discussion

Testing the CHiPI on a small scale revealed that the intervention was largely feasible, acceptable and potentially effective. This study, therefore, demonstrated that interventions co-developed with target end users offer a high likelihood of feasibility, acceptability and effectiveness, as other CBPA intervention studies in SSA have shown (Appiah, 2020).

Assessment of feasibility revealed that it was possible to recruit (with a high response rate of 87.2%) and retain participants (with a 91.2% retention rate) to the CHiPI. Further, delivery of the programme through 8 weekly sessions was viewed as possible considering the sessions ran smoothly. However, two sessions took longer than the allocated time by 30 minutes due to the high number of questions asked by participants, suggesting that for these sessions, it was not possible to run them within 2 hours. A frequently asked questions section will be developed to address this challenge. Other aspects that were considered feasible was the involvement of the church leadership to encourage enrolment, participation in and retention to the CHiPI. Overall, the high feasibility was consistent with the findings from the exploration of the local context that churches were

well suited to deliver interventions as the majority of the local residents belonged to a church.

Acceptable aspects included the church setting, the group-based delivery, the participants' handouts drafted in simple language and with pictorial illustrations, as well the use of BCTs such as goal setting and self-monitoring. The group-based delivery promoted a supportive social environment by building a sense of relatedness (from SDT) (Legault, 2017) among participants. The use of simple language and pictorial illustrations was appropriate for participants who may not have understood technical language or narratives without visual aids. Such an approach has been shown to improve understanding among intervention users, including those with low literacy levels (Sudore and Schillinger, 2009).

The intervention participants also considered the facilitators as acceptable because they were viewed as having been patient, understanding and empathetic with all participants, clear in their explanations and having had respect for participants. This was viewed as important by the participants and arguably contributed to their commitment to the programme and active participation in sessions. Most participants also appreciated the favourable pace of the delivery of the intervention, coupled with the flexible and individual tailored, small-steps approach to achieving targets, e.g., reducing salt intake in small gradual adjustments spread out over several weeks. This step-by-step approach likely contributed to participants building a sense of competence/self-efficacy to achieve their set behaviour change targets as anticipated in the theory of change. Evidence shows that flexible programme delivery with graded tasks are important BCTs in interventions targeting diet and physical activity (Samdal et al., 2017).

The CHiPI also showed promising results in relation to improving health knowledge about diet (salt intake, fruit and vegetable consumption, fatty foods and sugary drinks)

and physical activity. Beside this, adoption of healthier diets (less salt, more fruit, less fatty foods), and improvements in the level of physical activity may have potentially resulted in reductions in body weight considering the documented relationship between these (Zyaambo et al., 2012, Yuan et al., 2018). Furthermore, there was a reduction in waist circumference. The changes may have potentially reduced the risk of hypertension among the study participants and, therefore, explain the observed reduction in blood pressure. This is in line with existing evidence showing that reducing salt intake ((Muthuri et al., 2016, Rai et al., 2017), increasing consumption of fruit and vegetables (Li et al., 2016), reduced dietary fat (Ndanuko et al., 2016) and reduced body weight (Leggio et al., 2017) lower the risk of hypertension, potentially leading to a reduction in blood pressure. This, though on a small-scale, demonstrated that an optimized CHiPI has the potential to reduce the risk of hypertension and this needs to be assessed using an RCT. Finally, although this study did not explicitly set out to test the ToC in the feasibility study, the qualitative interviews provided some support for it., and this would be tested quantitatively in a full-scale evaluation.

CHAPTER EIGHT: DISCUSSION AND CONCLUSION

8.1.0 Discussion

The overall aim of this study was to develop and assess the potential effectiveness of a culturally sensitized lifestyle intervention to reduce the risk of hypertension in Zambia's urban areas using community-based participatory methods. There were four associated research questions. To address the first of these - What are the most prevalent lifestyle risk factors for hypertension in SSA? – a scoping review revealed that the increasing rates of hypertension in SSA are driven by two broad categories of risk factors. First, non-modifiable risk factors included older age, family history of hypertension, black ethnicity and foetal programming. The role of sex in this study was inconclusive. Second, modifiable risk factors included non-malleable and malleable ones. Non-malleable risk factors included high serum lipids, serum sugar, socioeconomic factors (e.g., low level of education) and urban residence. Malleable risk factors included unhealthy diet (high salt intake, fatty/oily foods, low fruit and vegetable consumption), low physical activity, smoking, alcohol intake and excess body weight (including central obesity).

To address the second research question - Which of the risk factors for hypertension in SSA are common in the study site and which ones have the greatest scope of change? – qualitative focus group discussions with local residents and stakeholder interviews established that unhealthy diet, excess body weight, low physical activity, stress and alcohol intake were important risk factors contributing to the increase in the problem of hypertension in the area. Participants considered unhealthy diet, excess body weight, and low physical activity to be malleable risk factors, but interestingly, they also viewed low

health knowledge, perceptions of what constitutes a healthy lifestyle and social norms as important drivers of unhealthy behaviours which required to be changed.

To address research question three - Can a culturally sensitized lifestyle intervention to reduce the risk of hypertension be co-developed with target end users? – iterative workshops with local residents and key stakeholders agreed the theory of change and developed an 8-week, group-based diet (salt, oily/fried food, fruit and vegetable intake) and physical activity intervention (CHiPI) for delivery in churches by a Community Health Worker (CHW) and a Church Elder over through eight weekly sessions.

To address the final research question – Can a culturally sensitized lifestyle intervention co-developed with target intervention users be acceptable, feasible and effective in changing users' health behaviours? – a small scale, mixed-method before-and-after feasibility study of the CHiPI intervention demonstrated high feasibility, acceptability and good potential effectiveness in improving participants' health knowledge, salt intake, fatty/oily foods intake, fruit and vegetable consumption, and moderate physical activity, and in reducing sedentary time. Participation in CHiPI was also associated with significant reductions in systolic and diastolic blood pressure, body weight, BMI and waist circumference.

This chapter considers the use of the CBPA in identifying malleable risk factors and co-developing core intervention components with the community. It compares feasibility, acceptability and potential effectiveness of CHiPI with existing literature on other church/faith based public health behavioural interventions. Aspects of the development process, CHiPI content and delivery that potentially contributed to these positive outcomes are then discussed. Thereafter, the strengths and limitations of the study are explored, conclusions drawn, and recommendations made.

8.1.1 Community-based participatory approach

The current study demonstrated that it is possible to co-develop (with target end-users) a culturally sensitized intervention to reduce the risk of hypertension in an urban community in Zambia. To the researcher's knowledge, this is the first time a CBPA has been successfully used to intervene on hypertension in Zambia.

Similar approaches have been used to intervene on communicable diseases in SSA, as summarised in section 2.4.3. The current study extends the use of CBPA in intervention development in several ways. Firstly, whereas in similar studies in SSA, researchers determined the study sites, the local health service management office (the District Health Office) guided the researcher on where to locate the current study. Secondly, beside engaging the community to identify and analyse their health problems, and prioritise solutions, the researcher also involved residents to refine and validate the causal pathway and the theory of change. This contributed to increasing the target end-users' understanding of the need for the intervention and supported their commitment to designing one.

With the rising prevalence of hypertension in SSA (Ker, 2019), understanding its risk factors most prevalent in the region, as done in this study, was key to establishing how interventions can be designed to reduce the prevalence of hypertension. However, developing successful behavioural change interventions also require identification of the most common potentially changeable and context sensitive risk factors in the study site to intervene on. In keeping with the CBPA (Appiah, 2020, Bergold and Thomas, 2012, Oetzel et al., 2018, Wallerstein, 2020), this study drew on community experiences, strengths, culture and norms by taking the scoping review findings to residents and stakeholders to explore the local context through FGDs and interviews, respectively. Understanding contextual risk factors and their drivers in the study site was essential in

ensuring the intervention developed was tailored to address aspects viewed as important by the target intervention users (Rimer and Kreuter, 2006, Vandenbroek et al., 2019).

Commonly used in research to improve health and equity in minority or vulnerable populations (Oetzel et al., 2018), the CBPA is a well-recognised way of involving people most affected by health conditions to determine how their problems can be addressed (ICPHR, 2013, Wallerstein et al., 2018, Bergold and Thomas, 2012). In the current study, the researcher used local people's opinions and worked with them to identify intervention priorities in keeping with interactive participation: a form of CBA (Cornwall, 2008). Additionally, initial ideas on how to bring about the desired change were proposed for further consideration during the core-intervention components development phase. A continuous dialogue with local people empowered and helped them to link problems to their root causes and understand how these were related to the desired behaviour change, consequently raising their critical consciousness (Chronister et al., 2020).

In line with the Community Organisation Model (Mangum and Dacanay, 2016), critical consciousness enabled the community to analyse their contextual problems and identify the priority issues, local capacities and resources required to effect the desired change. For example, community engagement in Phase Two (Local context) provided evidence that residents and stakeholders in Maramba viewed hypertension as one of the commonest causes of morbidity locally. This was important as it likely contributed to the community valuing participation in finding solutions, including identifying potential change delivery mechanisms and channels. Furthermore, a discussion around the causal pathway (showing how the identified risk factors lead to hypertension) at the beginning of the intervention co-development workshops helped the residents to consciously analyse their own problem (i.e., contributing to the improvement of critical

consciousness) and decide on what needed to be prioritised from the initial set of risk factors for hypertension identified as malleable (Chronister et al., 2020, Glanz et al., 2008, Paasche-Orlow and Wolf, 2007). In addition, an appreciation of the pathways describing how change could be brought about to reduce the risk of hypertension (i.e., the ToC), empowered residents and stakeholders to suggest what needed to be changed and how this change would be driven. With this empowerment and critical consciousness, participants were able to identify available resources and capacities (e.g., infrastructure, skills and leadership) (van Herwerden et al., 2019) within the community to effect the desired change (Mangum and Dacanay, 2016).

Once residents had selected delivery in churches (thus enhancing ownership and acceptability of the CHiPI's delivery), stakeholders agreed churches could provide premises for intervention sessions instead of using a hired venue (which would have been costly). Additional local resources identified by stakeholders were the intervention delivery facilitators (with key skills and attributes as described below) – a CHW and a leader (Church Elder) from the hosting church. The use of local people as facilitators thus further contributed to the cultural sensitivity of the CHiPI delivery.

The extensive community involvement in co-development workshops is likely to have contributed to the promising findings from the feasibility study of the CHiPI. Considering communities and individual needs are complex and vary greatly, co-development of the intervention with target end-users and stakeholders was essential to produce appropriate, context sensitive intervention content and materials, and thus increase its feasibility and acceptability (Leask et al., 2017, Sandlund et al., 2019). Additionally, the locally driven careful description of SMART goals, ensured that goal-setting and self-monitoring (two key BCTs used in the CHiPI) were easier for intervention users to understand than if a generic, non-tailored description had been

provided. This bottom-up approach to the development of goal setting and self-monitoring activities and materials was in keeping with existing evidence that top-down approaches have previously produced interventions with limited context sensitivity and effectiveness (Finegood et al., 2014).

The CBPA used in this study did not end with co-development workshops. It extended into the pilot/feasibility study. For example, the interactive brainstorming process to agree on practicalities of the intervention (e.g. agreeing on the date and time for holding the weekly CHiPI delivery sessions) by feasibility study participants potentially promoted group cohesion, as well as improved engagement and retention to the programme (Appiah, 2020). This is likely to have contributed to the success of the delivery of CHiPI and hence its potential effectiveness. In addition, debriefing with the facilitators after each session provided more community input in the refinement of the CHiPI. Moreover, the feedback given by participants and facilitators post-programme should be considered as part of the co-development process, because this fed into the final refining of the intervention.

Despite the benefits of CBPA, there are potential challenges associated with its application. Inadequate community involvement may result in the development of culturally insensitive behaviour change interventions which may compromise feasibility, acceptability and effectiveness (Derose and Rodriguez, 2020). Conversely, over-reliance on the community (over-engagement) may result in an intervention that is detached from research evidence (Appiah, 2020). Another potential challenge of using a CBPA is the conflict between the researcher's scientific expertise and world experience and that of the community. If the researcher does not exercise reflexivity adequately, they may impose their knowledge on the community leading to low levels of community input,

which may leave study participants feeling exploited. As such, a balance must be achieved to avoid extremes in community engagement.

Moreover, for time restricted research such as the current study, following all the steps in CBPR can lead to rushed engagement with the steps leading to superficiality. Consequently, it may be necessary to either combine the steps or prioritise the ones likely to provide the community with sufficient involvement.

Finally, it is often hard to determine the end-point of satisfactory community involvement, which may result in multiple iterations during intervention development with increased cost and minimal benefit (Minkler et al., 2003). More research is required to design guidance to intervention developers on endpoints to or markers of adequate community involvement.

8.1.2 Engagement with intervention development frameworks and behaviour change theory

Engaging with a recognised intervention development framework (6SQuID) (Wight et al., 2014), and models and theories of behaviour change ensured that the intervention development process followed in this study was robust. However, the 6SQuID Model follows iterations of steps which could potentially take long and be extremely costly. As such, a trade-off was made by combining steps five and six of the 6SQuID Model to reduce both the duration and cost of the development process. To reduce the risk of developing an inadequately tested and adapted intervention, this trade-off was coupled with weekly iterations, feedback and debriefs during the Phase Four small-scale feasibility study to strengthen the intervention development process. However, considering the CHiPI's potential effectiveness was based on the implementation of an intervention that was not fully adapted, the results of the feasibility study may be an underestimate of the impact of the final optimised intervention.

Given the 6SQuID Model does not provide adequate detail on practical ways to engage communities and the results of doing so, this study used concepts of the Community Organisation Model (community empowerment, developing community critical consciousness and capacity for issues selection) (Glanz et al., 2008, Chronister et al., 2020) implemented through the CBPA (Zimmerman and Eisman, 2017), as explained above, to engage residents and stakeholders at every stage of the intervention design and development process. Furthermore, to underpin the linkages in the ToC, multiple theories of behaviour change were used: the COM-B Model (Michie et al., 2014), SDT (Wehmeyer and Shogren, 2016, Deci and Ryan, 2004) and SCT (Thojampa and Sarnkhaowkhom, 2019, Bandura, 1986a, Bandura, 1997). Elements of the COM-B Model helped identify how target end users' required change in terms of capability, opportunity and motivation to facilitate the adoption of healthier lifestyles. SCT and SDT (integrated with information from the CBPA) were then used to describe how capacity, opportunity and motivation would be developed in intervention end users.

The CHiPI used awareness raising (through information provision) to build positive outcome expectations for adopting a healthier lifestyle, participants' human capabilities such as forethought about behaviour change, as well as self-reflection to evaluate personal actions, experiences and consequences [all concepts of the SCT] (Thojampa and Sarnkhaowkhom, 2019). Furthermore, CHiPI sought to meet the psychological needs of intervention users, including autonomy/motivation and a sense of capability [from SDT] (Wehmeyer and Shogren, 2016, Legault, 2017). The ToC also included elements of training to provide skills for self-management (goal setting and self-monitoring), hence improving capacity/capability to change behaviour [part of SCT] (Nabi and Prestin, 2017). Opportunity for behaviour change was also provided through encouraging social support to make and sustain behavioural changes [practically implemented through the group-based delivery mode of the intervention to improve relatedness; a concept from

SDT] (Legault, 2017, Ryan and Patrick, 2009). Using complimentary theories of behaviour change acting at the individual and interpersonal levels of intervention, as recommended for multi-level interventions (O'Cathain et al., 2019), further strengthened the linkages in the ToC leading to the target outcomes (Frieden, 2010). Additionally, formalised theories also ensured a comprehensive rationale for selection of behaviour change techniques fit for context, thereby further increasing CHiPI's likely effectiveness (Prestwich et al., 2015).

Unlike most similar studies in SSA that did not describe use of behaviour change theories (Baptiste et al., 2006, Kamanda et al., 2013, Mitchell et al., 2005, Panter-Brick et al., 2006, Pfeiffer, 2013), the current study provided evidence that researchers in the region can successfully engage with multiple theories in designing behaviour change interventions.Being theory driven and with participatory methods used in its development, CHiPI is thus well designed to deliver its immediate outcomes (increased health knowledge, greater motivation and capacity/skills for behaviour change, and improved social opportunities) and intermediate outcomes (adoption of healthier diet [reduced salt intake and oily/fatty foods consumption, and increased fruit and vegetable consumption] and increased physical activity). These changes are key to reducing risk of hypertension among intervention users in the long term.

8.1.3 Church-based interventions

CHiPI was delivered to members of a local church in church premises. Feasibility and acceptability were shown to be high, and the intervention showed good potential effectiveness. Factors relating to the church setting that may have contributed to these promising findings include: leadership involvement and ownership of the programme; the church delivery setting; and the religious belief system.

First, CHiPI drew on the strength of the church leadership in both the development and implementation stages. The church Pastor (host) participated in the fourth co-development workshop, responded to the selection check list (explained in section 6.1.4) and made a commitment to support the delivery of the intervention, including making an announcement in church to advertise and encouraging church members to enrol into the programme. He also attended two sessions to encourage the participants and allowed some to give testimonies during a church service after the fifth week of CHiPI delivery. The Pastor also authorised the use of the church hall for the sessions, assigned one Elder to co-facilitate session delivery and another to support the administrative aspects of the sessions (securing and preparing the church hall and supporting follow ups for those who missed sessions). This level of commitment and intervention ownership (i.e., the leadership valued CHiPI and took responsibility for ensuring successful participant recruitment, retention and smooth delivery of the sessions) played a key role in the success of the intervention.

The current study demonstrated that involvement of the church leadership in participant recruitment can contribute to good initial participant engagement. The moral authority of pastors and church leaders, especially in well organised hierarchical churches (Churches, 2020) like the CHiPI host church, is instrumental to participant recruitment and compliance, as evidence from other church-based interventions shows (Derose and Rodriguez, 2020). A desire to conform to requests from church leaders is therefore likely to have led to the good uptake of CHiPI from the congregation when they encouraged members to enrol. Furthermore, involvement of a Church Elder in delivering the intervention, as well as following up non-attendees immediately after each session, potentially contributed to the high retention rates. Despite not having been specifically investigated in the qualitative interviews, this study may have also harnessed church members' desire to follow the guidance provided by their leaders to support initial

adoption of the goal setting and self-monitoring behaviour change techniques, which were new to all participants. To give new insights about the use of churches as a intervention delivery sites to reach communities in the USA, Tuggle (1995) indicated that clergy can be useful to health promotion activities and lifestyle changes because of the respect they command among congregants. Later, participants appeared to continue to engage with the content of the programme, because they started enjoying it and became motivated to keep going with the changes they had made because they experienced the benefits as they adopted healthier diets and exercised more. This suggests that interventions can build on external drivers (e.g., encouragement by leaders) to develop intrinsic self-regulation (intrinsic motivation) among participants to facilitate adoption and maintenance of healthier lifestyles. (Bandura, 1997, Nabi and Prestin, 2017) However, despite these apparent benefits of leadership involvement, one potential issue is that there are reported instances of African church pastors influencing members due to exaggerated authority and control (Mokhoathi and Rembe, 2017). Exploring this in future research would help appreciate fully the role of leadership in faith-based interventions.

In addition, as shown by aspects that worked well in the Health through Faith lifestyle intervention delivered to low income black South Africans in urban and rural churches (Draper et al., 2019), involvement of church pastors has benefits to intervention delivery. In the Health through Faith lifestyle intervention, pastors and church leaders were involved in participant recruitment as well as encouraging attendance. In the current study, the resident pastor and the two church elders did not only participate in participant recruitment as well as attend two of the eight sessions to encourage participants to be consistent, but also followed up on those who missed a session. The involvement with following up session absentees demonstrated an added indication for ownership by the church leadership and encouraged adherence and retention. Evidence elsewhere shows

that involvement of church leaders can also support sustenance of elements of the intervention beyond its delivery period (Peterson et al., 2002). This is because when religious leaders endorse public health interventions, they create a positive influence on lifestyle changes among congregants that lasts beyond the intervention (Campbell et al., 2000b).

Second, the church setting provided a conducive environment for delivering the intervention to people from the same congregation with pre-existing relationships. This, together with meeting in a familiar venue (the Church Hall), may have contributed to group cohesion and an atmosphere conducive for improved participation in discussions. For example, several women participants were members of the church choir and were immediately comfortable with each other from the outset of the programme and were able to share their experiences and progress with each other outwith sessions and also with other choir members. A lifestyle group-based intervention to promote diabetes self-management among Black Americans in the US similarly reported good interaction among participants as a result of pre-existing relationships (Baig et al., 2015). Here, the researchers suggested that pre-existing relationships may have allowed participants to be open in sharing their challenges and shortcomings with each other, and thereby enlist support from their fellow participants. This interconnectedness also gives more credence to group-based delivery of sessions as suitable for the church setting where most programmes are usually conducted in groups of people with a common faith and interconnected in relationships (Nguyen et al., 2019). The connectedness is likely to have offered interpersonal and social support for behaviour change as it builds a sense of relatedness among participants (Lancaster et al., 2014, Peterson et al., 2002, Derose and Rodriguez, 2020).

Third, CHiPI sessions were designed to be situated within the host church's religious belief system. Each started with a prayer and a bible scripture/game and ended with another prayer; an approach that drew on previous church-based lifestyle interventions (Baig et al., 2015, Dornelas et al., 2007, Arredondo et al., 2014). The current study, therefore, supports suggestions that linking a church-based intervention to a person's religious belief system may help them succeed in making (and potentially maintaining) lifestyle changes (Yanek et al., 2016, Baig et al., 2015). Campbell et al. (2007) consider belief systems to be part of the deep structure that enhances cultural sensitivity in church-based interventions and contribute to programme effectiveness. Developing a religious ethos within the intervention may positively influence participant adherence to the intervention, and encourage them to implement the lessons learnt (Derose and Rodriguez, 2020). However, some studies have found no difference in effectiveness between interventions that incorporated religious attributes and those that did not (Newlin et al., 2012). This finding suggests that religious content alone is insufficient to determine lifestyle intervention effectiveness. Other factors such as co-created ToC, carefully selected BCTs, the intervention materials and messages, where the intervention is delivered from (delivery channels) and modes (e.g., group-based) that influence intervention feasibility and acceptability play key roles (Campbell et al., 2007, Simons-Morton et al., 1997).

The success of the CHiPI delivery in a church setting was in keeping with previous research. Church based lifestyle interventions in other settings, such as among black Americans targeting obesity control (Lancaster et al., 2014) and physical activity (Bopp et al., 2012, Parra et al., 2018), as well as in the Health through Faith weight loss, diet and physical activity intervention in South African churches (Draper et al., 2019), have reported similar promising outcomes. Despite the church being identified as an effective delivery settings for public health interventions (Resnicow et al., 2000, Wimberly, 2001),

majority of existing evidence is from Black American and Latino churches in the US (Bopp et al., 2012, Parra et al., 2018, Lancaster et al., 2014, Baig et al., 2015, Campbell et al., 2007, Derose and Rodriguez, 2020, Dornelas et al., 2007). The current study, therefore, extends the limited evidence on church-based interventions in SSA (Draper et al., 2019), to show that behaviour change interventions can be successfully delivered in a church setting in Zambia, South Africa as well as in the rest of SSA. Considering the majority of SSA countries are predominantly religious (Ola, 2020), delivering effective interventions through churches is likely to have a wide reach and thus has potential to have a major impact on public health across the region.

Despite the advantages associated with church-based interventions, there are also challenges that must be addressed. For example, as observed in the current study, the church setting can inhibit discourses on some topics that may be viewed as potentially contentious within the religious belief system. For instance, participation in discussions around the effect of hypertension on libido during CHiPI sessions was limited. This may have reflected the fact that sex among Christians is considered a sin (if outside marriage), or that the topic is only considered suitable for discussion in special contexts (Adimora et al., 2019), for example, where the discussants are of the same age (e.g., youth groups) or it is viewed as an appropriate and sanctioned topic (e.g., during couples' fellowship meetings). Future intervention development may consider including activities to support reflexivity for intervention users (Dodgson, 2019) to minimise the influence of their religion on their engagement with certain topics that may be considered inappropriate by the church and yet important to the intervention.

8.1.4 Key characteristics of delivery facilitators and their motivation

Some evidence suggests that church-based lifestyle interventions facilitated by lay people may be less effective than those led by researchers and experts in respective

subjects (Lancaster et al., 2014). However, CHiPI had promising outcomes despite being delivered by a Church Elder and CHW, both essentially lay people (although CHWs do have some technical health knowledge). As such, the success of the CHiPI delivery was possibly in part, due to the attributes of the carefully selected lay facilitators.

The CHW's 20 years' experience of delivering primary health care services to local communities likely contributed to the intervention's success. Of particular importance were their skills and experience in engaging people effectively. Additionally, their pre-existing knowledge of health conditions, including hypertension, is likely to have contributed to effective delivery of the health information within CHiPI. Although one South African study of maternal and child health services questioned community trust of CHWs [particularly in relation to confidentiality] (Grant et al., 2017), CHWs have been used in various effective health promotion interventions, both church-based (Pengpid et al., 2014) and community-based (Gilmore and McAuliffe, 2013, Nagi et al., 2020, Schroeder et al., 2018). The Church Elder was a professional teacher, with over eight years teaching experience, and these skills supported delivery of the CHiPI content to participants. Moreover, as explained above, being a leader in the host church may have influenced CHiPI participants' engagement in the intervention as a result of a sense of loyalty to their leader. The current study, therefore, drew on previous evidence on the use of significant others in the community to deliver behaviour change interventions which has previously been found to be effective in producing positive outcomes in SSA settings (Baptiste et al., 2006). The CHiPI, however, went further to show that conducting a careful consideration of skills and previous experience in the selection of facilitators can lead to improved quality of facilitation which is likely to contribute to the success of the interventions.

Another potential contributor to the smooth implementation of the CHiPI intervention were the high levels of commitment shown by both facilitators throughout 6-week delivery period. Unlike the Health through Faith study in South Africa, which reported facilitation challenges because those delivering the programme were unpaid volunteers (Draper et al., 2019), this current study provided a minimal incentive (ZMW100 [US$4.8] per hour - as recommended by the Eres Converge Ethics Review Committee in Zambia). Despite the researcher not exploring the payments in the qualitative interviews, it is likely that they motivated facilitators to show good commitment and consistency throughout the study.

The current study, therefore, suggests that selection of facilitators should be based on appropriate knowledge, skills and experience. Synergies between practical knowledge of health conditions (CHW) and learning skills (Church Elder) were key to the effective delivery of CHiPI sessions and providing financial compensation for their time appears to have ensured high levels of commitment. Future intervention development research, therefore, needs to pay attention to key attributes, such as practical experience in similar roles, when selecting facilitators to improve intervention delivery success. Besides, this study suggests that paid facilitation can improve motivation, dedication and commitment among those delivering the interventions. Despite evidence, from the current study and elsewhere, showing that incentives can improve participant recruitment (Chen et al., 2015) and adherence to interventions (Voils et al., 2021, Wurst et al., 2020), more research is required to explore the role of incentivisation for behaviour change facilitators.

8.1.5 Strengths and Limitations

This study had several strengths. The use of the 6SQuID Model (Wight et al., 2014) provided a robust framework for intervention development; the use of multiple

formalised behaviour change theories anchored CHiPI theoretically, thereby increasing its potential effectiveness; and involving target users in the development process improved the intervention's context sensitivity. Another strength was the use of a CHW (who already had some health knowledge and experience working on health programmes in the community) to deliver the intervention, as CHWs can be supported (through provision of appropriate information) to handle most of the questions that may arise during session delivery. Finally, involvement of church leaders during intervention development, selection of facilitators, participant recruitment and intervention delivery supported the success of CHiPI in relation to its feasibility, acceptability and potential effectiveness.

Despite these strengths, the study also had a number of weaknesses which future research may need to address. Although it demonstrated promising results, the Phase Four feasibility study was conducted in a single church setting and had no control group. As such, it is difficult to attribute the observed changes with certainty to the intervention. That said, the findings indicative of the likely effects of CHiPI provide sufficient justification to proceed to a full-scale randomised controlled trial incorporating outcomes, process and health economics evaluations.

A second weakness was the fact that the facilitators took advantage of the researcher attending each session (as an observer) to refer participant questions they perceived as difficult to him. This reliance on the researcher presents an important challenge because if CHiPI is implemented more widely (for example, in a randomised controlled trial), the researcher will not be available to offer support at all the sessions. Therefore, additional information covering the questions the facilitators found difficult will be added to the CHiPI materials (including adding a Frequently Asked Questions section). In addition, the researcher (or a third-party organisation in future post-research implementation) can

support facilitation remotely using current technology, such as WhatsApp and Zoom group conferencing.

A third weakness was that behavioural outcomes such as salt intake and physical activity were self-reported changes. Future studies (including any randomised controlled trial) should endeavour to obtain more objective measurements. For example, urine samples can be used to measure salt reduction and accelerometers can be used to measure changes in physical activity.

A fourth limitation is that context sensitive interventions, like CHiPI, that are co-developed using participatory approaches may not be easily generalisable to other settings (Bauer and Kirchner, 2020). However, core intervention components can be transferrable, with some flexibility to adapt them to different settings (Bauer and Kirchner, 2020). Implementing CHiPI in different settings may therefore require inclusion of a co-development workshop to iron out minor adaptation issues and foster local ownership in line with Community Organisation Model (Glanz et al., 2008).

A fifth limitation was that despite having diversity among study participants/partners in terms of age, gender and life experience, the study did not adequately address the potential power imbalances that could have been introduced in the study considering the researcher and the feasibility study facilitators were all men. This may have led to gender related power imbalances influencing participants' contribution to the intervention sessions and research processes – particularly the post-intervention interviews (Collins 2018). Nonetheless, the majority of the participants in the feasibility study were women; a situation that is likely to have a dilution effect of the male dominance and helped enhance participation by everyone. Despite this gender imbalance not having caused observable negative implications on the study implementation and results, future similar studies may consider balancing gender when selecting facilitators.

Another weakness was that the researcher played a bigger role in the identification of the problem and development of the study protocol than the community owing to time constraints in the academic calendar. The rest of the study stages were, however, co-directed with the community in keeping with CBPR. The dissemination of the results has not yet been done as it awaits authority from the Zambian National Health Research Authority.

Finally, while churches are an excellent delivery setting for people who belong to their local church, non-members may not be able to access the intervention. This approach therefore excludes certain groups of people, such as those of other faiths, those who subscribe to African belief systems, and those who are deemed 'sinful' by churches e.g., Rastas. However, considering the evidence from Phase 2 (local context) and Phase 3 (co-development) in this study that the majority of the community members belong to a church, church-based interventions (particularly where they can be extended to mosques) are still likely to reach most people.

8.2.0 Conclusion

This study demonstrated that it is possible to co-develop a culturally sensitised intervention (CHiPI) to reduce the risk of hypertension in Zambia's urban areas using a CBPA. In a small-scale feasibility study, CHiPI showed high feasibility, acceptability and potential effectiveness in improving participants' health knowledge, salt intake, consumption of fried foods, fruit and vegetables and moderate physical activity. These changes were associated with reductions in blood pressure, body weight and central obesity.

The promising results suggest that in Zambia, and potentially other SSA countries, intervening on malleable risk factors for hypertension co-identified with local community members is likely to produce better targeted interventions with increased effectiveness. Moreover, extending community involvement to intervention co-development, is likely to lead to a context-sensitive, community-owned intervention. The findings also suggest that effective lifestyle interventions targeting diet and physical activity can be successfully delivered in churches facilitated by CHWs and church leaders in Zambia, and that involvement of the church leadership throughout intervention development and delivery is a likely contributor to its success. Finally, despite local residents thinking they simply needed to know more about hypertension (hence build positive outcome expectation and forethought) to lower their risk, the study showed that (following cultural adaptation with community members) BCTs, such as goal setting and self-monitoring, can be applied successfully in this population to support behaviour change.

8.2.1 Recommendations and implications

Having been evaluated on a small-scale, taking the optimized version of CHiPI to a larger scale evaluation (e.g., a fully powered, multi-site randomized controlled trial) to obtain evidence of effectiveness, cost-effectiveness and process is required. Such research would inform future hypertension prevention interventions in Zambia and other SSA countries, thereby contributing to the reduction in the prevalence of hypertension in the region. Intervention researchers in Zambia and elsewhere in SSA should also consider using of participatory approaches to develop public health interventions. Furthermore, the development, evaluation and implementation of church- (and mosque-) based health promotion interventions should be considered as a priority in SSA where most people are either Christian or Muslim.

Having tested CHiPI in one church, scaling it up to other churches may be difficult due to differences in context. However, a short local consultation workshop as a starting point for any intervention roll out, should support the delivery of the core intervention components with and (small) adaptations required for the local context. Considering CBPA is a relatively new approach to the development of public health interventions in Zambia, the current study forms a springboard to community involvement in future health promotion (and lifestyle change) intervention research. Researchers can draw on its findings to intervene on hypertension and other NCDs in Zambia's urban areas. Another important aspect for consideration in future research is the use of paid facilitation, which led to better commitment by those who delivered the intervention than voluntary facilitation in similar church-based lifestyle interventions elsewhere. Intervention designers should also consider involving leaders (like the church leadership in the CHiPI) closely in the development, participant recruitment, encouragement and delivery of lifestyle interventions.

Lastly, going by the promising outcomes from the current study, dissemination of the findings to the policy makers need to consider emphasizing on rolling out of lifestyle interventions to communities through church- or mosque-based delivery modes.

GLOSSARY

Change delivery channels: Refers to settings where interventions can be delivered to bring about the desired behaviour change

Co-development: The participation of end-users in the development of an intervention

Complex intervention: Interventions with multiple interacting components, and non-linear causal pathways

Hypertension: Blood pressure readings above 140mmHg and 90mmHg for systolic and diastolic blood pressures, respectively

Malleability: Refers to the likelihood of change

Theory of change: depicting how interventions are supposed to work

Foetal programming: the concept of epigenetics which proposes that early life exposures (intra-uterine and early childhood) can increase the risk for chronic diseases in adulthood such as cardiovascular diseases and diabetes

Self-efficacy: Refers to an individual's belief and confidence in their capacity to execute desired or targeted behaviors

Autonomy: Individuals' level of power/authority to make their own decisions and choices

Competence: A psychological a sense of ability to adopt and execute a behaviour satisfactorily

Relatedness: This refers to a sense of shared experience, connectedness and meaningful relationships with others such as fellow intervention users

Critical Consciousness: When communities intuitively and consciously analyse their own problems and decide on what should be changed.

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APPENDICES

Appendix 1 - Details of the 90 papers included in the scoping review

Author(s)	Country(ies) of Study and study location	Study Population
Abebe, S. M., et al. (2015)	Dabat district and Gondar town , Ethiopia	2141 participants, with a median age of 47years (generally above 35 years of age), were enrolled into the study. About 1050 (49%) of these were urban dwellers and 53.7% were women.
Abegunde, K. and E. Owoaje (2013	Nigeria, Iseyin (urban) and Ilua (Rural) communities of Oyo State in South West Nigeria. These two communities are close enough to Ibadan to be influenced by the on-going modernization process, yet far enough to retain certain traditional ways of living.	Participants in the study were household members who were aged 60 years and above up to a sample size of 630.
Achie, L. N., et al. (2012)	Zaria (urban), Nigeria	165 Nigerian women resident in Zaria. 88 of the women were postmenopausal aged between 40-65 years, while 77 of the women were pre-menopausal (15-35 year). Postmenopausal women selected were at least 1 year amenorrhoeic due to a natural cause and were aged 40-64 years. Women who were diabetics, hypertensive, who smoke cigarette, drink alcohol, amenorrhoeic due to hysterectomy or cessation of periods other than by a natural cause were identified and excluded from the study.
Adeboye, B., et al. (2012)	Multi-centre (Studies in Africa), Multisites in Africa	Studies involving adults 17 years and older with mean body mass index (BMI) >= 28 . The toal sample size from the included articles was 16730
Afoakwah, A. N. and W. B. Owusu (2011)	Obuasi municipality in the Ashanti Region of Ghana	320 underground male miners
Afrifa-Anane, E., et al. (2015)	Accra (James Town and Ussher Town in Ga Mashie and Agbogbloshie urban areas), Ghana	201 youths between ages of 15-24
Agaba, E. I., et al. (2017)	University of Jos, Nigeria	Employees of the University of Jos aged 18 and above. The minimum sample size (380) was calculated out of the total workforce of 2 603, from the Kish formula, using the prevalence of hypertension (as this is the NCD with the highest prevalence) and a precision of 5%.

Author(s)	Country(ies) of Study and study location	Study Population
Agyemang, C. (2006)	The study was conducted from the regional capital city (Kumasi) and four villages in the Ashanti region of Ghana. In the city, six churches with different denominations, seven schools and two banks (one bank with four branches) were selected randomly from the lists of churches, schools and banks. In each village, the elders fixed an appropriate date for the community and reminded them prior to the data collection date. Ghana	There were 1431 participants (644 males and 787 females). Of these, 578 were from the rural setting (237 males and 341 females) and 853 from the urban setting (407 males and 446 females)
Ajayi, I. O., et al. (2017)	The study was carried out in Mokola, in Ibadan North Local Government areas (IBNLGA) of Oyo State., Nigeria	5733 respondents aged between 3-78 yrs resident in Mokola, Ibadan (The minimum sample size was 3 548 for adults over 18 years and 1 145 for children below 18 years old) - Urban
Akintunde, A. A. (2010)	Patients at Ladoke Akintola University Teaching Hospital (LAUTECH) in Osogbo, Nigeria	120 hypertensive patients and 80 normotensive controls at LEUTECH in Nigeria
Albert, U. K. and J. H. Effiong (2015)	Patients at University of Uyo Teaching Hospital, Akwa Ibom State (urban area). Nigeria	151 young people (18-44 years) diagnosed with essential hypertension (new cases) over a one year period January to December 2013
Alemayehu, B. and B. Haftu (2012)	Tigray, Northern Ethiopia	The study populations were both elder men and women (age >=40) residing in Tigray region. The sample size for controls was 110 and for cases 110 and a total of 220 study participants.
Arku, R. E., et al. (2018)	Multisite national level data (Albania, Armenia, Azerbaijan, Bangladesh, Benin, Ghana, Kyrgyzstan, Lesotho, Namibia, and Peru)	77,605 largely premenopausal women (aged 15-49) from ten resource-poor countries.
Arrey, W. T., et al. (2016)	Rural Cameroun (Moliwe Health Area). Moliwe Health Area(MHA), found in the Limbe Health District of the South West Region of Cameroon.	329 participants (Adults aged 21 years and above) recruited from Bonadikombo, 113 from Wotutu, 112 from Moliwe, 96 from Ewongo, and 83 from Tomatal.
Aryeetey, R. and J. Ansong (2011)	College of Health Sciences (CHS), University of Ghana in Accra (urban). Study was conducted on the Korle-Bu and Legon Campuses of the University , Ghana	Staff and faculty of the College of Health Sciences at the Universty of Ghana in Accra. The total 142 study participants were selected
Asresahegn, H., et al. (2017)	Jigjiga city of eastern Ethiopia (Somali region of Ethiopia) (Urban area)	adults aged 25-65 years who lived in Jigjiga city . 492 Participants were permanent residents of the area aged 25 to 65 years

Author(s)	Country(ies) of Study and study location	Study Population
Awoke, A., et al. (2012)	Gonder City in North-West Ethiopia	Adults aged 35 years and above resident in Gonder City (679 permanent residents (who lived in the area at least for 6 months))
Azinge, E. C., et al (2011)	The study was performed at the Department of Clinical Pathology, College of Medicine, Idi-Arabia in Lagos, Nigeria	40 subjects; 14 men and 26 women, aged 19–70 years (18 normotensive and 22 hypertensive), recruited from Idi-Arabia, a suburb located close to the Lagos University Teaching Hospital
Basu, S. and C. Millett (2013)	National level (6 middle-income countries (China, Ghana, India, Mexico, Russia, and South Africa))	Included participants aged ≥18 years who were surveyed between 2007 and 2010 (Wave 1, used to study health status and social/epidemiological risk factors to poor health) from households within China, Ghana, India, Mexico, Russia, and South Africa. The total sample size was 47 443
Bello, B. T., et al. (2016)	Lagos, Nigeria	526 adult Nigerians, aged 18 years and above, residing in three local government areas in Lagos were included
BeLue, R., et al. (2009)	Multi-site studies from SSA. Specific areas not included	Only indicated that 126 articles were included (126 articles that reported prevalence and incidence data on CVD risk and/or articles that report on CVD risk-related beliefs and behaviors.)
Bosu, W. K. (2010)	The studies included in the systematic review were conducted 4 regions - Greater Accra (10), Ashanti (4), Upper East (2) and Volta Regions (1). Nine of the studies were conducted in urban populations, five in rural populations and three in mixed populations, Ghana	15 Studies included were those relating to adult nonpregnant human subjects aged 13 years and older published in English between January 1970 and August 2009, and 2 unpublished MPH papers from the university of Ghana. The total sample size involved from all the papers reviewed was not stated. A total of 26,649 different adults were involved in the reviewed studies
Chin, J. H., et al. (2017)	Participants recruited form sites of religious worship in central Kampala: Rubaga Cathedral (Catholic), Namirembe Cathedral (Protestant) and the Old Kampala National Mosque (Muslim). , Uganda	450 cases (148 on antihypertensive and 302 not treated) and 412 controls. These were residents of Kampala, the capital of Uganda, aged ≥18 years.
De Ramirez, S. S., et al (2010)	Three Millenium Villages of Mwandama (Malawi), Mayange (Rwanda) and Mbola (Tanzania)	Study participants (N = 1485), 18 years and above, that participated in the Millennium Villages Project and were recruited from residents of 300 households in each village.
Doll, S., et al (2002)	The main Seychelles island (Mahe) and two Swiss regions (Vaud-Fribourg and Ticino), Seychelles compared with Switzerland	Three thousand one hundred and sixteen adults (age range 35-64) untreated for hypertension

Author(s)	Country(ies) of Study and study location	Study Population
Fikadu, G. and S. Lemma (2016)	51 Schools and Banks in Addis Ababa, Ethiopia participated.	A total of 1866 study subjects (1124 men and 742 women). These were permanent employees of the Commercial Bank of Ethiopia and teachers in government schools in Addis Ababa
Goma, F. M., et al. (2011)	Lusaka, Zambia	1928 study participants, aged 25 years and above.
Grace, J. and S. Semple (2012)	Participants drawn from five South African collieries situated in Mpumalanga and Gauteng Provinces, South Africa	143 (non-randomised sample) Caucasian male executives (upper to top management level) aged 26–58
Griffiths, P. L., et al. (2012)	Multisite national level data, South Africa	358 black adolescent participants aged 16 years
Gueye, N. F. N., et al. (2017)	The study was conducted at the Ambulatory Treatment Center (CTA), which is a national reference center for ambulatory follow-up of patients living with HIV (PLHIV) in Dakar, Senegal.	1184 patients followed up during the study period (1998-2014) were included in the survey.
Guwatudde, D., et al. (2015)	The survey covered the whole country, Uganda	4900 subjects were household members aged 18 to 69 years, who had resided in the sampled households for at least six months preceding the date of interview
Guwatudde, D., et al. (2015)	conducted in four sub-Saharan countries, including Tanzania(18 randomly selected public schools in Dar es Salaam), South Africa(school teachers were enrolled from government schools in Cape Town Metropolitan area), Uganda(a peri-urban community in the Wakiso District 10 miles north of Kampala city, and from a rural community in Bushenyi District 200 miles west of Kampala city) and Nigeria(two urban hospitals; one located in Abuja city and another in a semi-urban setting 1.5 h outside of Abuja city).	1269 (163 nurses in Nigeria, 477 school teachers in South Africa, 167 school teachers in Tanzania, and from Uganda 297 peri-urban and 165 rural residents) participants' data was used in the analysis. Participants were aged 18 years and older, enrolled from 5 different population groups, three defined by occupation, and two by degree of urbanization. Tanzania and South Africa enrolled school teachers, Nigeria enrolled nurses, whereas Uganda enrolled rural and peri-urban residents.
Helelo, T. P., et al. (2014)	Durame town administration, located 350 Kilo- meters south of Addis Ababa, the Ethiopian capital	A sample size of 536, drawn from the households in Durame

Author(s)	Country(ies) of Study and study location	Study Population
Ibrahim, M. M. and A. Damasceno (2012)	National level survey data used, Developing countries	Not indicated
Kingue, S., et al. (2015)	Nationwide, carried out in 63 urban sites of the 10 regions of Cameroon	A total of 15,470 participants (51.7% being men) aged 16 to 94 years were included. These had to be permanent resident in the survey sights or for at least 1 month, or who intend to stay longer, and gave informed consent were included, excluding pregnant women.
Kramer, B., et al. (2012)	Nigeria, Kenya, amibia and Tanzania	The target sample size was 1500 households in Nigeria, 1200 households in Kenya, 800 households in Tanzania and 2000 households in Namibia (total – 5500). 7,568 respondents ≥18 years were included in the analysis
Mkhonto, S. S., et al. (2012)	The Dikgale Demographic Surveillance System (DDSS) site, located in the Central Region in Mankweng district, about 40–50 km northeast of Polokwane, the capital city of Limpopo Province in South Africa. It is rural	532 participants (396 women and 136 men) between 20 and 95 years of age were included in the study analysis, excluding pregnant women.
Mosha, N. R., et al. (2017)	Six villages about 20 km east of Mwanza city in North West Tanzania	A total of 9742 individuals were enrolled in the study, but 64 (0.6%) of participants were excluded with missing blood pressure data, so 9678 individuals, with a median age of 29 years, were analyzed.
Mtabaji, J. P., et al. (1990)	Dar es Salaam, (Handeni and Monduli areas), Tanzania	An urban Bantu population, and included subjects between 34 and 54 years of age. A total sample of 570 participants were included
Mulenga, D. and S. Siziya (2013)	conducted at the two campuses of the University of Zambia, namely: Great East Rood Campus and the Ridgeway Campus in the Capital city of Zambia- Lusaka	Fulltime UNZA academic staff drawn from different schools within the University of Zambia. A total of 100 participants took part in the survey of which 25% were females, with a mean age of 43 years.
Mundan, V., et al (2013)	Study site was the military medical clinic in Armed Forces Memorial Hospital (AFMH), Nairobi, Kenya	340 (170 hypertensive and 170 normotensive) Kenyan Defense Forces.
Nahimana, M. R., et al. (2017)	National level data, Rwanda	Over seven thousand (7116) participants aged 15–64 years were extracted from the STEPS database and enrolled into the study. Four thousand (4466) study participants (62.8%) were females. The mean age of respondents was 35.3 years (SD 12.5), and a third of the respondents were between 25 to 34 years old

Author(s)	Country(ies) of Study and study location	Study Population
Oelke, N. D., et al. (2015)	Mongu and Limulunga Districts, Western Province, Zambia	eligible if they lived in the community and were 18 years of age and older. 203 adults completed the survey and 50 community members participated in 2 focus Group discussions.
Ogah, O. S., et al (2013)	Sites included randomly selected communities in Abia State of Nigeria.	The study sample comprised 2,983 adult men and women aged 18 years and above, who lived in the state.
Owolabi, E. O., et al. (2017)	The study selected three largest outpatient clinics serving the residents of Buffalo City Municipality, South Africa. These included the family medicine outpatient clinic of Cecilia Makiwane Hospital and Nontyatyambo Community Health Centre and the Empilweni-Gompo Community Health Centre.	1107 participants, aged 18 years and above, across the three study sites (369 per site) were included. All ambulatory individuals (patients and their family members) who fulfilled the inclusion criteria and were attending the study settings during the period of study were recruited into the study.
Owusu, I. K., et al.(2015)	Kumasi metropolis, Ghana	241 participants, aged 22-87 years, were involved in this study. Criteria for cases group were patients diagnosed with hypertension that were not suffering from diabetes and were of consent age.
Oyeyemi, A. L. and O. Adeyemi (2013	Study was conducted from 6 federal or state government funded facilities in Maiduguri, North Eastern Nigeria.	Six workplaces (2 each in the health sector, education sector and government ministry) with more than 100 employees were purposively recruited. All workers in the selected workplaces who met the eligibility criteria of being between 18 and 65 years old, not having any disability that prevents independent walking and able to complete questionnaire in English language were invited to participate in a cross-sectional study. 308 participants that completed the survey, 292 workers that comprise 102 (35.0%) women and 190 (65.0%) men, aged 44.9 ± 8.5 years provided usable physical activity data and were included in the analysis
Pessinaba, S., et al (2013)	The study was conducted in the city of Saint Louis (north Senegal, 250 km from the capital Dakar)	The study 1 424 participants (983 female, 69%). Mean age was 43.4 years (SD: 17.8), (range 15–96 years); 70.8% were < 55 years and 87.5% were < 65 years.
Pires, J., et al (2013)	The study was conducted in Bengo Province, Northern Angola in CISA's DSS study area, which includes three communes (Caxito, Mabubas and Úcua) of the Dande municipality. Located 60 km north of Luanda	There were 1,464 participants in this survey; 611 women aged 18–40, 255 women aged 41–64; 449 men aged 18–40, 149 men aged 41–64 estimated to be living in an urban setting.

Author(s)	Country(ies) of Study and study location	Study Population
Schutte, A. E., et al. (2012)	North Western Province South Africa	Included 1994 Black South African volunteers (aged 430 years)
Scotch, N. A (1963)	Rural and urban Zulu negro sites and Georgia, South Africa	Random samples of 548 persons in the rural area, and 505 in the urban area were used.
Siervo, M., et al. (2014)	Asia; Europe; America; North Africa; Australasia and Pacific Islands; and Sub-Saharan Africa	National level data
Siziya, S., et al. (2012)	The study was conducted in Kitwe district in Copperbelt province of Zambia	1627 adults aged 25-64 years participated in the survey of which 57.7% were females.
Steyn, K., et al. (1997)	Townships of the Cape Peninsula in 1990, South Africa	The study sample comprised 986 adults, (442 men and 544 women), all black persons aged 15-64 years. These were predominantly Xhosa speaking people of African descent.
Zack, R. M., et al. (2016)	Ukonga ward (Mwembe Madafu and Markazi neighbourhoods), in the peri-urban area of Dar es Salaam, Tanzania	A cohort of adults living in the Ukonga ward who had been registered in the Dar es Salaam Health and Demographic Surveillance System (HDSS) in 2011. 2,290 participants aged at least 40 years were enrolled in the DUCS HTN study. Of the participants enrolled at baseline, 1,752 (77%) participated in the follow-up study in 2015.
Amira, C. O., et al. (2012)	Data was collected in Ikeja, the administrative capital of Lagos state in south-west Nigeria.	All volunteer participants above the age of 18 years were included, forming a sample of 1368
Bovet, P., et al. (2002)	The study area consisted of five branches of Temeke District (urban area) in Dar es Salaam. These are five of eight branches that are part of a National Sentinel Surveillance system for monitoring burden of disease that is being developed by the Adult Morbidity and Mortality Project (AMMP), a project of the Tanzania Ministry of Health, funded by the UK Department for International Development and implemented in partnership with the University of Newcastle upon Tyne	The study involved 9254 participants (39% men, 61% women), aged 25-64 years, 98.4% of which were black, 66.5% Moslem and 30.9% born in Dar es Salaam, Tanzania

Author(s)	Country(ies) of Study and study location	Study Population
Bushara, S. O., et al (2016)	River Nile State (RNS) lies in North Sudan, bordering Khartoum from South and extending to the Northern Sudan borders with Egypt., North Sudan	954 individuals from 384 houses/families living in urban areas of RNS were included in the study. Their age range was 18–90 years
Cois, A. and R. Ehrlich (2014)	National wide survey, South Africa	The target population was private households and residents in workers' hostels, convents and monasteries, excluding other collective living quarters such as old age homes, hospitals, prisons and boarding schools. The sample size was 15574 subjects 15 years and over
Egbi, O. G., et al. (2015)	It was conducted in the Federal Medical Center, Yenagoa, the largest hospital in Bayelsa State. (urban). Nigeria	A total of 255 hospital employees, aged 18 years old and above, took part in the study, but of these, 231 (90.6%) had analyzable data.
Gebreselassie, K. Z. and M. Padyab (2015)	South Africa and Ghana, National level data	The SAGE study included nationally representative sample of persons aged 50 years and sample from younger adults aged 18–49 years as comparison which were also selected from both countries. The total sample size of the study was 8939, (3974 from South Africa and 4965 from Ghana).
Hendriks, M. E., et al. (2012)	Kwara State, Nigeria; Nandi district, Kenya; Dar es Salaam, Tanzania and Greater Windhoek, Namibia	7,568 respondents >=18 years were included, (2678 in Nigeria,2111 in Kenya, 1046 in Tanzania and 1733 in Namibia). All study populations consisted of private households eligible for the insurance program and similar control populations.
Hult, M., et al. (2010)	All shops at the six major market places of Enugu, the former Biafran capital, were systematically covered., Nigeria	A cohort of 1,339 subjects, belonging to the ethnic group Igbo and born in the southeast of Nigeria between 1965 and 1973, i.e., before, during and after the Biafran famine.
Kandala, N. B., et al. (2012)	National level data, South Africa	a random probability sample of 13,596 women and men aged 15 and over were selected in this cross-sectional survey. The data used came from the 1998 Adult health module of the 1998 South Africa Demographic and Health Survey data (SADHS)
Babalola, D. A., et al. (2011)	The study was carried out in Ikenne Local Government Area of Ogun State. It is a semi- urban area and predominantly a farming community., Nigeria	192 farming household heads
Baldo, M. P., et al. (2017)	Universidade Agostinho Neto (UAN), in Luanda, the Angolan capital	A total of 609 participants, ranging from 20 to 69 years were enrolled in the study. Of the whole sample, 318 (52%) were female, 401 (65.8%) were between 20 and 49 years.
Baragou, S., et al. (2012)	Town of Lome, capital of Togo, which is subdivided into five districts	The total number of subjects included in the study was 2 000 (898 men and 1 102 women), aged 18 years and above

Author(s)	Country(ies) of Study and study location	Study Population
Zhou, J., et al. (2012)	The study was located in Hlabisa sub-district, one of the five sub-districts in rural Umkhanyakude in northern KwaZulu-Natal, South Africa. The area is predominantly rural but contains an urban township (where the socio-economic status is higher) and high-density settlements located along the national road running along its eastern boundary	Valid BMI and blood pressure measurements were obtained from 2298 and 2307 participants respectively. All female residents aged 15–49 years and all male residents aged 15–54 years living in the surveillance area on June 18th, 2003 were considered for sampling.
Yayehd, K., et al. (2013)	Lomé Municipality residents, Togo	This survey included 2002 volunteers residing in Lome apparently healthy or known HTAs aged 15 and over.
Wu, F., et al. (2015)	China, Ghana, India, Mexico, Russian Federation and South Africa, National level study	The study population was drawn from the SAGE Wave 1, which is a longitudinal cohort survey of ageing and older adults in six low- and middle income countries. A total of 34,114 individuals aged 50 and older in the six countries were considered in this analysis.
Kayima, J., et al. (2015)	Wakiso district, Central Uganda. Wakiso district encircles Kampala, the capital of Uganda, and is the most populous district in the country and undergoing rapid urbanization due to its proximity to the city	The study included adults >18 years in Wakiso district, Central Uganda. A total of 3920 participants aged between 18 and 40 years were screened but a complete set of data was obtained from 3685 (94 %) participants who were included in the analysis.
Lambert, E. V., et al. (1999)	The sample was obtained from a peri-urban community of Mamre, 45 km from central Cape Town., South Africa	974 participants aged between 15 and 64 years.
Lategan, R., et al. (2014)	The study was conducted in six areas in Mangaung, South Africa, namely Freedom Square, Turflaagte, Namibia, Kagisanong, Chris Hani and Rocklands. (Urban), South Africa	339 adults aged between 25 and 64 years.
Mufunda, T., et al.(2000)	Dombotombo township in Marondera, Zimbabwe	Adults aged 25 years and older who had lived in Marondera over 3 years were sampled. 959 people were interviewed, 804 came to the measurement site for blood pressure and anthropometric measurements. Upon subsequent examination of the records, 775 people met the study's eligibility criterion and were included in the analysis
Murthy, G. V. S., et al.2013)	The sample covered all 36 states of Nigeria	Adults aged 40 years or older, who were normal residents (defined as being continually resident for at least the last three months). A total of 13 591 people took part in the study, 13 504 (99.4%) of whom had a valid blood pressure measurement and included in the analysis.

Author(s)	Country(ies) of Study and study location	Study Population
Njelekela, M., et al. (2003)	The study participants were drawn from Dar es Salaam (urban), Handeni (rural) and Monduli (pastoral) in Tanzania	445 adults aged 30 and above were included in this analysis, 160 from Dar es Salaam (urban) (81 men and 79 women), 184 from Handeni (rural) (93 men, 91 women) and 101 from Monduli (pastoral) (40 men, 61 women).
Owolabi, A. O., et al.2012)	The study was carried out in the workplace and the subjects were the health workers of the Baptist Medical Centre, Ogbomoso, Oyo State. , Nigeria	Out of the 351 health workers of the institution, 324 health workers (143 (44.1%) male and 181 (55.9%) female) subjects were included in the study. ere was a lower representation at the extreme age ranges. The majority of the subjects were from the Yoruba ethnic group (94.1%).
Phillips, J. S. and J. Banyangiriki (2015)	A University in Kigali, Rwanda	100 participants were employees at a university in Kigali, Rwanda.
Pisa, P. T., et al. (2010)	North West Province, South Africa (urban and rural). The rural community was identified 450 km west of Potchefstroom on the highway to Botswana. A deep rural community, 35 km east from Potchefstroom and only accessible by gravel road, was also included. The urban communities were chosen near the University in Potchefstroom	A total of 2 000 apparently healthy African volunteers (35 years and older) were recruited from a sample of 6 000 randomly selected households from all four communities.
Pisa, P. T., et al. (2018)	Soweto, Johannesburg (urban), South Africa	Black South African men (n = 1026) and women (n = 982), totalling 2008 participants
Rodriguez-Arboli, E., et al. (2016)	Chronic Diseases Clinic of Ifakara within the Saint Francis Referral Hospital (SFRH). The SFRH is the major healthcare facility in the Kilombero and Ulanga districts of the Morogoro region in southern Tanzania,	955 HIV-infected patients ≥ 15 years-old enrolled in KIULARCO between January 1, 2013 and March 2, 2015 were eligible for inclusion in this study
Sande, M. A. B. v. d., et al. (2000)	The study was conducted from Gambia's capital Banjul and a rural area around Farafenni. This included an urban community (the capital Banjul) and a rural community (Farafenni area, approx. 150 km inland).	A total of 5389 adults (≥15 years) were included, Gambia
Seedat, Y. K., et al. (1982)	Conducted in Durban (urban) and Ubombo, Kwazulu (rural), South Africa	2000 Zulus (1000 from urban Durban and 1000 from rural Ubombo)

Author(s)	Country(ies) of Study and study location	Study Population
Seftel, H. C., et al. (1980)	Johannesburg, South Africa	Blacks resident in Johannesburg and reporting to the municipal Medical Examination Centre attached to the local Labour Bureau. Sample size comprised 5018 men and 5028 women.
Sever, P. S., et al (1980)	domestic staff and clinics of the Groote Schuur Hospital, Cape Town and villages surrounding St. Lucy's Mission Hospital in the Transkei., South Africa	125 urban blacks (volunteers) and 133 rural (volunteers)
Sharaye, K. O., et al. (2014)	Samaru, a suburb of Zaria in Kaduna state, Northern Nigeria	Data from 174 non obese adults (male, 91; female, 83) aged 47.13 ± 8.10 years (male) and 44.96 ± 9.58 years (female) were collected.
Sobngwi, E., et al. (2004)	BiyemAssi, a quarter of Yaoundé, the capital city of Cameroon and Bafut, a rural setting of the highlands of Western Cameroon, from the Cameroon	The study population comprised 999 women and 727 men aged 25–88 years, of whom 37% were residents of Yaoundé (urban)
Solomon Mekonnen, A., et al. (2015)	This study was conducted in Gondar town and Dabat rural kebeles of North Gondar, located 727 km northwest of the capital city of Ethiopia, Addis Ababa.	A sample size of 2140 participated in the study; about 1050 (49%) being urban dwellers and 53.7% were women, with a median age of 47.0 (±12.4) years.
Tibazarwa, K., et al. (2009)	Townships that comprise Soweto within the broader conurbation of Johannesburg, South Africa.	A total of 1691 participants (representing 94% of our target) were screened. The majority of participants (99%) were Black African. Two-thirds of participants were female (65%), and the mean age was 46 ± 13 years.
Tigbe, et al. (2014)	Province level data, South Aftica	13,596 men and women aged 15 years and over. A random probability sample of women and men aged 15 years and older were selected in the 1998 cross-sectional survey.

Appendix 2 - FGDs codes and their counts per focus group

Codes	1st FGD – Mixed group	2nd FGD – Mixed group	3rd FGD – All males	4th FGD-all female	Total count
Alcohol and other substance abuse	0	1	1	2	4
Use of health facilities and services	0	2	0	1	3
Stress	0	2	0	3	5
Socioeconomic factors	4	3	3	3	13
Responsibility for change	3	1	9	0	13
Physical activity	3	3	3	0	9
Personal experiences of hypertension	6	2	5	0	13
Perceptions	9	9	6	3	27
Other	1	1	3	0	5
Mechanisms (Pathophysiology)	1	0	0	1	2
Common diseases/illnesses	5	1	1	1	8
Diet	13	9	6	7	35
Change solutions	15	13	10	10	48
Broad cultural context	2	0	0	0	2
Body weight	0	3	1	2	6
Barriers to change	9	4	6	3	22

Appendix 3 - Stakeholder interview codes and their counts per interview

CODES	Ward Leader	NGO Leader1	NGO leader	HIV_AIDS NGO	Health Worker	HAC member	GRZ Dept Leader1	GRZ dept Leader2	DHO staff	Company Leader	Community Leader	CHW	Church Leader
Alcohol and other substance abuse	0	0	1	1	1	0	0	0	1	3	1	0	0
Barriers to change	1	1	5	0	5	2	2	4	5	1	10	0	3
Body weight	0	0	0	1	1	0	1	0	0	0	0	0	1
Broad cultural context	0	1	0	0	0	0	0	0	0	0	0	0	1
Change delivery through Churches	1	1	1	0	0	1	0	1	1	0	0	1	5
Change delivery through Community groups and their activities	0	1	4	3	1	8	0	1	2	1	2	3	1
Change delivery through Community leaders	0	1	0	1	0	3	0	1	0	1	1	2	3
Change delivery through Engaging the community	1	4	9	2	1	5	1	4	5	5	2	5	0
Change delivery through media	0	1	1	0	0	0	0	0	2	2	0	0	0
Change delivery through Schools	0	0	0	1	0	1	8	2	1	0	1	1	0
Change delivery through Workplaces	0	0	0	0	1	0	0	1	1	0	0	0	0
Change solutions	3	3	6	4	8	8	4	6	4	4	8	3	4
Diet	0	3	2	1	3	0	3	1	3	2	0	2	3
Disconfirming evidence	0	1	2	0	1	2	0	2	3	0	2	0	0
Common diseases/Illnesses	3	1	1	1	2	1	1	1	1	1	1	1	1
Mechanisms (pathophysiology)	0	1	0	0	0	0	0	0	0	0	0	0	1
Other	0	0	3	1	0	0	1	0	0	0	1	0	1
Perceptions	0	4	4	1	1	0	2	1	1	1	1	0	3
Personal experiences of hypertension	0	0	0	1	0	0	0	0	0	0	0	1	0
Physical activity	0	2	1	0	5	1	1	0	1	1	2	2	2
Responsibility for change	1	1	0	0	1	0	1	0	0	0	3	0	1
Socioeconomic factors	1	0	1	1	0	0	0	0	0	0	0	0	0
Stress	1	1	2	2	0	2	1	0	0	3	1	1	2
Use of Health Facilities or Services	2	0	0	0	0	0	2	0	0	0	0	0	0

Appendix 4: Participant Information sheets

University of Glasgow
Institute of Health & Wellbeing

Participant Information Sheet – Workshops

TITLE OF PROJECT: Intervening on hypertension in Zambia; development of a culturally sensitized lifestyle programme to reduce disease incidence in urban areas

Name of Researcher: Dr. Phallon B Mwaba - PhD student

Introduction:

You are being invited to take part in a research study. Before you decide if you want to participate, it is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Thank you for reading this.

1. **What is the purpose of the study?**

The level of high blood pressure (HBP) in Zambia has been on the increase over the recent years. More and more people are being found with HBP, which in turn contributes to ill health and risk for other complications of HBP. With this increase in HBP, there is need for the development of interventions to prevent it.

This study constitutes the second part of a larger study which is aimed at developing an intervention to prevent high blood pressure in Zambia. This is a follow up to the interviews and focus group discussions held last year as part of a larger study aimed at developing a programme to prevent high blood pressure in Zambia's urban areas. During

the workshop, we will work together to create a programme(s)/activities on how we will reduce the things that increase the risk of high blood pressure in our community.

2. **Why have I been chosen?**

You have been chosen because you are a member of/stakeholder in the Maramba Community whose input into this study is very important. Additionally, being a potential user of the programme, you will provide us with what is important for you/this community and how this can be made suitable for our environment and culture.

3. **What will happen to me if I take part?**

If you agree to take part, you will be asked to choose a suitable workshop date from the proposed dates. You will then participate in the workshop of your choice. The workshop will each last up to 4 hours, including breaks. The data will be tape recorded, transcribed coded, analysed and used to create a programme(s) for preventing high blood pressure.

4. **Will my taking part in this study be kept confidential?**

All your contributions will be kept confidential. Your information will only be accessed by the researcher and his supervisors. Computer-based information will be password protected, and paper-based information will be securely locked away. Confidentiality will be respected unless there are compelling and legitimate reasons for this to be breached. If this was the case, I would inform you of any decisions that might limit your confidentiality. Moreover, your name will be anonymised. Any reference to what you say will be by quoting “male/female workshop participant”.

5. **What will happen to the results of the research study?**

The results will be used to develop and refine components of the programme to prevent high blood pressure which will also contribute to my PhD thesis. Additionally, results will be used for presentations in conferences in Zambia and internationally as well as writing articles/scientific papers. A report will also be generated and sent to the Ministry of Health, ERES ethics review Board and the National Health Research Authority in Zambia.

6. **What happens if I feel like withdrawing from the research?**

Should you feel like not responding to any question or withdrawing; you can do so at any point, and you are not obliged to give any reason for doing so. There will be no negative implications on you. However, any information that you would have previously provided will be included in the study.

7. **Who has reviewed the study?**

This research has been reviewed and approved by the University of Glasgow, College of Social Sciences Research Ethics Committee.

8. **What are the risks and benefits of this study?**

There are no anticipated risks for the workshops. You will not be asked to do anything risky. This will, however, provide you with an opportunity to know more about high blood pressure and how to prevent it. Additional benefits will come from the satisfaction of having participated in the study and also at population level in helping to reduce the levels of hypertension once an intervention is developed and implemented.

Contact for Further Information

Should you have any:

1. Questions about the research, kindly contact the researcher (Dr. Mwaba – ,
   or my supervisor (Dr. Cindy Gray -

OR

2. Concerns about the research or its conduct a– kindly contact the Excellence Research Ethics Committee in Zambia ***ERES Converge (Private REB)*** *33 Joseph Mwilwa Road, Rhodes Park, Lusaka. Tel:*

   Email

University of Glasgow
Institute of Health & Wellbeing

Participant Information Sheet – Stakeholder interviews

TITLE OF PROJECT: Reducing high blood pressure in Zambia; developing a lifestyle programme to reduce disease occurrence in urban areas

Name of Researcher: Dr. Phallon B Mwaba - PhD student

Introduction:

You are being invited to take part in a research study. Before you decide if you want to participate, it is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Thank you for reading this.

1. **What is the purpose of the study?**

This is part of a larger study aimed at developing a programme to prevent high blood pressure in Zambia. It will identify prominent lifestyle factors in Maramba (e.g., the things we eat, or the amount of exercise we do) that increase the chance of people developing high blood pressure. It will also help to establish what can be changed, how this change can be brought about and what role the community members feel they can play in bringing about the desired change. This information will be obtained through group discussions.

2. **Why have I been chosen?**

You have been chosen because you are a valued member of the Maramba Community whose input into this study is very important.

3. **What will happen to me if I take part?**

If you agree to take part, the researcher will give you a call to arrange a focus group discussion at a time and place that is convenient for you. The discussion will last for 45 to 60 minutes.

4. **Will my taking part in this study be kept confidential?**

Your details will be kept strictly confidential. Any reference to what you say will be made using random initials/letters e.g. HK. Your information will only be accessed by the researcher and his supervisors. Passwords will be used to protect computer-based information, and paper-based information will be securely locked away.

Confidentiality will be respected unless there are compelling and legitimate reasons for this to be breached. If this was the case, we would inform you of any decisions that might limit your confidentiality.

5. **What will happen to the results of the research study?**

The results of this study will be used to write up a thesis for a PhD. Additionally, results will be used for presentation in conferences in Zambia, Glasgow and internationally, presented to participants and used to write articles/scientific papers. A report will also be generated and sent to the Ministry of Health Headquarters in Zambia.

6. **What happens if I feel like withdrawing from the research?**

Should you feel like not responding to any question or withdrawing from the focus group discussion or interview; you can do so at any point and you are not obliged to give any reason for doing so. This will have no negative implications on you. Any information you have previously provided previously will be included in the study.

7. **Who has reviewed the study?**

This research has been reviewed and approved by the University of Glasgow, College of Social Sciences Research Ethics Committee and the ERES Converge in Zambia.

Contact for Further Information

Should you have any:

3. Questions about the research, kindly contact the researcher (Dr. Mwaba –) or my supervisor (Dr. Cindy Gray -

OR

4. Concerns about the research or its conduct a– kindly contact the Excellence Research Ethics Committee (ERES) in Zambia (or College of Social Sciences Ethics Officer at the University of Glasgow, Dr Muir Houston, email: ,

University of Glasgow
Institute of Health & Wellbeing

Participant Information Sheet – focus group discussions

TITLE OF PROJECT: Reducing high blood pressure in Zambia; developing a lifestyle programme to reduce disease occurrence in urban areas

Name of Researcher: Dr. Phallon B Mwaba - PhD student

Introduction:

You are being invited to take part in a research study. Before you decide if you want to participate, it is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Thank you for reading this.

1. **What is the purpose of the study?**

This is part of a larger study aimed at developing a programme to prevent high blood pressure in Zambia. It will identify prominent lifestyle factors in Maramba (e.g., the things we eat, or the amount of exercise we do) that increase the chance of people developing high blood pressure. It will also help to establish what can be changed, how this change can be brought about and what role the community members feel they can play in bringing about the desired change. This information will be obtained through group discussions.

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3. **What will happen to me if I take part?**

If you agree to take part, the researcher will give you a call to arrange a focus group discussion at a time and place that is convenient for you. The discussion will last for 45 to 60 minutes.

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Confidentiality will be respected unless there are compelling and legitimate reasons for this to be breached. If this was the case, we would inform you of any decisions that might limit your confidentiality.

5. **What will happen to the results of the research study?**

The results of this study will be used to write up a thesis for a PhD. Additionally, results will be used for presentation in conferences in Zambia, Glasgow and internationally, presented to participants and used to write articles/scientific papers. A report will also be generated and sent to the Ministry of Health Headquarters in Zambia.

6. **What happens if I feel like withdrawing from the research?**

Should you feel like not responding to any question or withdrawing from the focus group discussion or interview; you can do so at any point and you are not obliged to give any reason for doing so. This will have no negative implications on you. Any information you have previously provided previously will be included in the study.

7. **Who has reviewed the study?**

This research has been reviewed and approved by the University of Glasgow, College of Social Sciences Research Ethics Committee and the ERES Converge in Zambia.

Contact for Further Information

Should you have any:

5. Questions about the research, kindly contact the researcher (Dr. Mwaba –) or my supervisor (Dr. Cindy Gray -

OR

6. Concerns about the research or its conduct a– kindly contact the Excellence Research Ethics Committee (ERES) in Zambia () or College of Social Sciences Ethics Officer at the University of Glasgow, Dr Muir Houston, email: ,

University of Glasgow
Institute of Health & Wellbeing

Participant Information Sheet – Small-scale evaluation

TITLE OF PROJECT: Intervening on hypertension in Zambia; development of a culturally sensitized lifestyle programme to reduce disease incidence in urban areas

Name of Researcher: Dr. Phallon B Mwaba - PhD student

Introduction:

You are being invited to take part in a research study. Before you decide if you want to participate, it is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Thank you for reading this.

7. What is the purpose of the study?

The level of high blood pressure (HBP) in Zambia has been on the increase over the recent years. More and more people are being found with HBP, which in turn contributes to ill health and risk for other complications of HBP. With this increase in HBP, there is need for the development of interventions to prevent it.

This study constitutes the second part of a larger study which is aimed at developing an intervention to prevent high blood pressure in Zambia. This is a follow up to the interviews and focus group discussions held last year as part of a larger study aimed at developing a programme(s) to prevent high blood pressure in Zambia. The results of the interviews/focus groups have been analysed and a programme(s) suggested through

workshops. The purpose of this part of the study is to test the programmes developed so far to establish if they are suitable for our area and possible to carry out.

8. Why have I been chosen?

You have been chosen because you are a member of the Maramba Community who has indicated willingness to participate. Additionally, you belong to the community who are likely to use this/these programme(s) once developed.

9. What will happen to me if I take part?

You will be enrolled into one of the programmes designed to prevent high blood pressure. This programme will last up to 8 weeks. There are no anticipated risks in this study. However, as a precaution; should we require you to participate in a physical activity programme, you will be screened for HBP. If found to be above 160/100mmHg, you will not be allowed to participate in strenuous physical activity. In addition, as a medical doctor, I will be present to provide first aid and the necessary referrals to the Hospital should there be need. Lastly, you will also be requested to respond to a questionnaire at the beginning and at the end of the 8 weeks. The data will be coded, analysed and used to improve the programme being developed.

10. Will my taking part in this study be kept confidential?

Your identity will be kept confidential. Your personal information will only be accessed by the researcher and his supervisors. Computer-based information will be password-protected, and paper-based information will be securely locked away. Confidentiality will be respected unless there are compelling and legitimate reasons for this to be breached. If this was the case, I would inform you of any decisions that might limit your confidentiality. In the write up, I will refer to you as *male/female participant X;* with X being a number.

11. What will happen to the results of the research study?

The results will be used to improve the programme(s) being developed to prevent high blood pressure which will also contribute to my PhD thesis. Additionally, results will be

used for presentations in conferences in Zambia and internationally and used to write articles/scientific papers. A report will also be generated and sent to the Ministry of Health and National Research Authority in Zambia.

12. What happens if I feel like withdrawing from the research?

Should you feel like not responding to any question or withdrawing; you can do so at any point and you are not obliged to give any reason for doing so. There will be no negative implications on you. However, any information that you would have previously provided will be included in the study.

13. Who has reviewed the study?

This research has been reviewed and approved by the University of Glasgow, Research Ethics Committee in the UK and ***ERES Converge*** ethics review Board in Zambia.

14. What are the risks and benefits of this study?

There are no anticipated risks for the study. You will not be asked to do anything risky. This will, however, provide you with an opportunity to know more about high blood pressure and how to prevent it. You will also be screened for HBP and its risk factors and given personal feedback; which will inform you about your health status. Additionally, you will participate in a draw to win K250 at the end of the small-scale evaluation.

Contact for Further Information

1. Questions about the research, kindly contact the researcher (Dr. Mwaba –) or my supervisor (Professor. Cindy Gray -

OR

2. Concerns about the research or its conduct a– kindly contact the Excellence Research Ethics Committee in Zambia ***ERES Converge (Private REB)*** *33 Joseph Mwilwa Road, Rhodes Park, Lusaka. Tel:*

Email

Appendix 5: Sample of the CHiPI Participants' manual

Church High Blood Pressure Prevention Initiative (CHiPI)

Healthy churches, healthy communities

WEEK 5 – 5 A DAY WEAPON

In week 4, we learnt about the different fruits and vegetables which we have in our environment. Fruits and vegetables are good for your health. They contain chemicals, minerals, vitamins and a high fibre content which are good for the normal functioning of the body:

Vitamin C: Good for maintaining healthy body tissues.

Vitamin A: Important for good vision, healthy skin and an effective immune system.

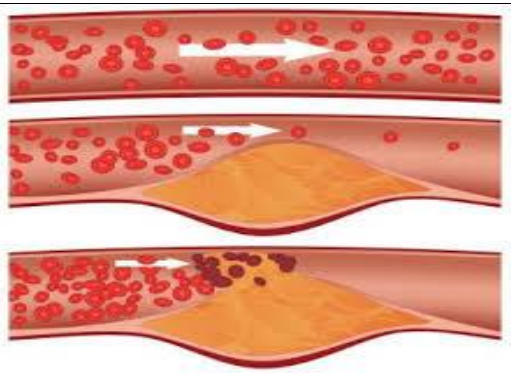
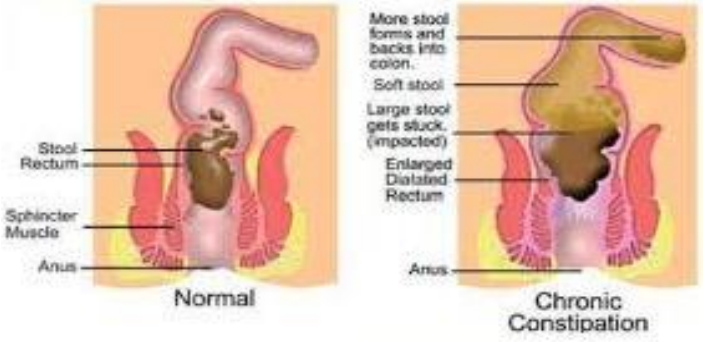
Folate: Good for healthy blood formation.

Fibre: Helps to maintain a healthy gut, preventing constipation and maintenance of a healthy weight.

Potassium: Helps to maintain a healthy blood pressure and is also important for the normal functioning of the nervous system.

Chemicals (e.g., indoles, lycopene, etc): Reduce inflammation, production of oestrogen and other cancer producing chemicals in the body.

All these provide health benefits to your body in the following ways:

Heart and Blood vessels	 Helps decrease cholesterol levels	 Provides protection from heart problems & HBP
GUT	 Relieves and prevents constipation	 Protection from piles

	 Protection from colon cancers	
Body weight	 Helps in reducing body weight	

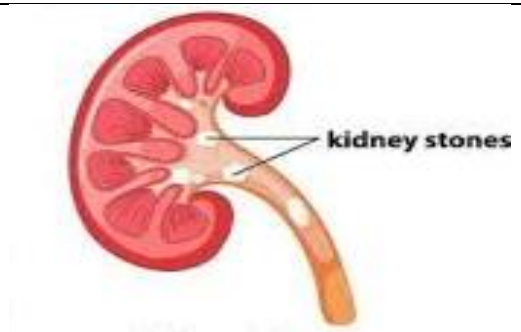
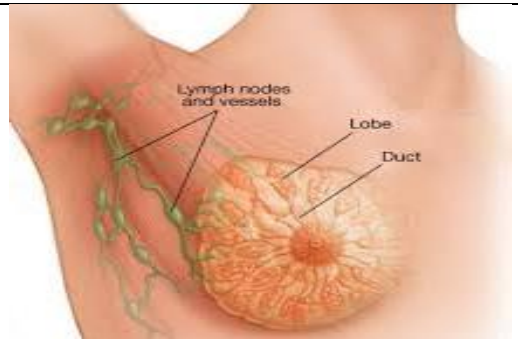
Kidneys	 Reduces risk of kidney stones	
Body protection	 Boosts your immune system	 Protection from Breast cancers

Table 8. The health benefits of Fruits and Vegetables

Among these benefits, our focus is on HBP. Eating a lot of fruits and vegetables reduces the risk of developing HBP through ways such as the reduction of blood cholesterol levels, weight reduction and others. We should, therefore, take stock of our consumption levels of fruits and vegetables so that potential areas of improvement are identified.

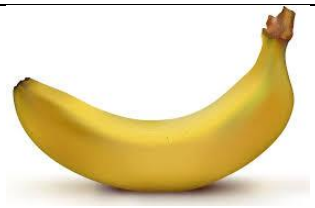
Fruits and vegetables consumption audit

List out the different fruits and vegetables you usually take in a week. You can tell your partner or write them in the table below:

Day	Morning	Mid day	Evening	Irregular
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				
Saturday				
Sunday				

Table 9. Taking stock of fruits and vegetables intake (e.g. Monday morning – guava and rape, or none)

WHO recommends that we eat about 400 to 500g (about 5 portions/servings) of fruits and vegetables each day. One portion is equal to 80g of fruits and vegetables. ***How do you measure 80g portions?***

FRUITS		VEGETABLES
 1 medium size apple	 Half an avocado	 2 broccoli spears
 1 medium sized pear	 1 medium sized orange	 4 heaped tablespoons of raw or cooked vegetables (or 1 cup)
 1 medium sized banana	 7 cherry tomatoes OR 1 medium sized tomato	 1 dessert bowl of salads
 1 medium sized mango	 Half a medium sized sweet potato	 3 tablespoons of carrot (Or 1 large or 6 baby carrots

 2 medium sized guavas	 150mls (medium sized glass) of unsweetened pure juice or smoothie)	 About 16 medium size Okra
 10-12 grapes	 8-10 Masuku fruits (Wild Loquats)	

Table 10. examples of 80g portions of fruits and vegetables

How do you increase consumption of fruits and vegetables?

There are many proposed strategies for increasing consumption of fruits and vegetables in our diet. Some of the ways are suggested below:

1. Attempt to add a portion of the 5 A DAY WEAPON to each of your meals
2. Use fruits and vegetables that are commonest during that season
3. Attempt different recipes (e.g. mash a banana and add it to your porridge to make one portion in the morning)

Using the 5Cs approach, make a "5 A DAY" goal for eating more fruits and vegetables. Monitor this using table 9.

Chotheka - Achievable
Choyeseka – Measurable
Cholinga – What you need to do
Chofunika – What is required
Chochitika munthawi yake – Time bound

Task 5:

Reflect on your progress so far and set one or more '5C' goal on salt intake to focus on in this week.

Day	Portion 1	Portion 2	Portion 3	Portion 4	Portion 5
Monday	E.g., bowl of salads	E.g., Mango			
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					

Table 11. Monitoring daily fruits and vegetable consumption

End of Week 5

Appendix 6: Sample of the Facilitators' guide (week two)

THE CHURCH HIGH BLOOD PRESSURE PREVENTION INITIATIVE (CHiPI)

FACILITATOR'S MANNUAL

Week 2

Welcome to the second week of the CHiPI. This week, we will look at salt intake in detail.

Welcoming participants and introduction

1. Allow participants to come in and let them sit in a semi-circle.
2. Welcome everyone to the session
3. Get a Bible and play a pass the Bible game. The Bible is passed from one person to another. Each time one gets the Bible, they mention their name (preferred name that they should be addressed by) and also a book in the Bible that starts with the same letter as their name. E.g. **H**achinika for **H**abakkuk. Make it interesting to allow participants to open up in readiness for the session. Once everyone has introduced themselves, proceed with the session

What are the objectives for this week?

Objectives for this session include:

1. To learn about what salt is
2. Appreciate the recommended daily intake salt
3. Appreciate the sources of salt in our diet
4. Discuss what a goal is and how to set one with a local context/culturally acceptable language
5. Set a goal to reduce salt intake

What do you need during this session?

1. CHiPI participants' handbooks for week 2 (1/participant).
2. Facilitator's guide
3. Pens, pencils (1 per participant)
4. Name tags
5. Flip chart and 3 markers of different colours
6. Participants' register

What is Salt? – 40 mins

1. Allow the participants to explain what they understand by salt
2. Then explain that salt comes in different forms and the body needs all types in a balanced way. Indicate that for this session, focus will be on the commonly known salt containing sodium. This is the type we add to our food to give it taste (Refer to the Participants' handbook on page 5 for details).
3. Explain the different sources of dietary salt. Do not forget to discuss sources of hidden salt (See page 5 of the participants handbook for details)

Tracking the previous week's salt intake – 10 mins

1. Having discussed what salt is, ask each participant to look at their table for tracking salt intake (task 1 from the previous session). Request up to 4 participants to explain how they tracked their salt intake and what their general impression was i.e., did they think this was too much, normal amount or too little?

What is too much sodium salt?

1. Distribute cut out pieces of serviettes to every participant.
2. Pass around a plate of salt with a teaspoon. Ask each participant to get a teaspoonful of salt and put it onto the serviettes, forming a bundle of salt.
3. After everyone has made a bundle of salt on small pieces of serviettes, explain that that forms the maximum amount of salt our bodies need per day. This means all the food one eats per day put together.
4. Ask participants to compare their salt intake during the preceding week to the bundle in their hands and determine whether their slat intake was above, below or within the recommended quantity (Discuss and allow up to 4 people to explain their situations).

How can we cut down on salt intake? – 10 mins

1. Explain that small steps are required to reduce the amount of salt one takes. Some of the helpful steps include those listed on page 6 of the participants' handbook. Run through these strategies with the participants.
2. So how does one set a goal?
3. Explain that

Task 1: How much salt do we eat?

- Explain to the participants that high salt intake is one of the important causes of HBP. During the next 8 weeks, they will work on reducing salt intake, in addition to any other cause that they will identify as needing change.
- For next week, request the participants to use table 1 on page 5, to track the amount of added salt they take during meals.

End of Week 2