

**EVALUATION OF A NUTRITION AND HEALTH EDUCATION  
PROGRAM ON COMPONENTS OF METABOLIC HEALTH ON  
WOMEN FROM UNDER-RESOURCED SOUTH AFRICAN  
COMMUNITIES**

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# ABSTRACT

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**Background:** Diet-related non-communicable diseases (NCDs) pose a substantial burden in terms of financial cost, morbidity, and mortality. In South Africa there is currently a double burden of infectious diseases and NCDs. Overconsumption of sugar, refined carbohydrates, and poor-quality fats, increases the risk for developing chronic diseases. Families from poor communities are often forced to eat these harmful foods due to a lack of nutrition education, or because they cannot afford or don't know how to access healthy foods. While poverty is an important barrier to health and education for both men and women, it tends to yield a higher burden in women. There is evidence that low-carbohydrate high-fat (LCHF) diets can improve metabolic health in well-controlled clinical trials where quality food is either provided or where participants have the financial and logistical means to access the foods promoted by this diet. However, one cannot assume that the same nutritional advice will translate to residents of underserved communities, who may not understand the advice nor be able to afford or access the foods promoted by this diet. Women from these communities are often the gatekeepers to healthy food choices for their families, but they are at a particular disadvantage. Eat Better South Africa (EBSA) runs nutrition education programs to teach – predominately women – how to choose affordable healthier foods that are lower in refined carbohydrates and higher in healthy fats to prevent or manage metabolic conditions.

**Aims:** This research aims to optimise the EBSA program for women from under-resourced communities and to evaluate its effectiveness for changing dietary behaviour and improving metabolic health. The objectives were: 1) to explore women's perceptions of the EBSA program and the barriers and facilitators that they faced to change their dietary habits and adhere to the EBSA recommended diet; 2) to conduct community assessments in the under-resourced communities that EBSA planned to run programs, better address women's needs and explore their willingness to participate in a nutrition and health education program; 3) to assess the effects of the EBSA program on women's metabolic health and wellbeing through

mixed-methods and to explore EBSA's team perceptions of the program, and 4) to explore health practitioners' perceptions of the health and nutritional advice recommended by EBSA.

**Methods:** The first part of this project consisted of a qualitative study through focus group discussions (FGDs) with women from previous EBSA programs (n=18) and naïve EBSA participants (n=60). The second part of the project consisted of a mixed-method evaluation (n=32) of a pilot study on an EBSA intervention to assess health status changes. These methods included qualitative methods (in-depth individual (IDIs) interviews with both EBSA participants and EBSA team members and FGDs with the EBSA participants), and quantitative methods (diet assessment, metabolic health markers and physical activity behaviour) to assess changes before and after the pilot intervention program. The last part of this project consisted of a qualitative IDI study on health practitioners' perceptions and understanding of a LCHF diet (n=16). Thematic analysis of the qualitative data was conducted using NVivo 12 software. Descriptive and statistical analysis of the quantitative data was done using Stata 16 and Jamovi.

**Results:** The first formative study indicated that the EBSA participants' greatest facilitators and barriers revolved around understanding the educational content and on how to implement the dietary advice. The mixed methods results of the second study, the pilot, indicated that, overall, the women experienced improvements in dietary behaviours and biomarkers related to inflammation, lipids, and glycaemic profiles. Furthermore, the participants waist circumference, weight, blood pressure, triglycerides and HbA1c were significantly reduced, and those changes were sustained six months after the EBSA intervention. Women's carbohydrate intake was significantly reduced, and their health markers improved despite a slight increase in sedentary behaviour. The qualitative results found that the major reason women enrolled in the program was because they suffered from NCDs. Most women found that the EBSA diet made them feel less hungry, more energetic and they felt that their health had improved. Most women spoke of socioeconomic challenges which made it difficult for them to follow EBSA's recommendations, such as employment status, safety issues in the community, and lack of support from relatives. Women felt that

some health practitioners were not supportive of the diet, but that they became more positive after observing the related health outcomes. Quantitative results converged with qualitative results except for physical activity behaviour. EBSA's team perceptions of the program and participants' challenges matched participants' experiences. The final qualitative study indicated that health practitioners' approaches to LCHF diets seemed to be supportive but not advocating.

**Conclusion:** Although, currently, some international food guidelines endorse LCHF diets, there is still a considerable amount of confusion and lack of knowledge regarding this diet. This study provided data on the dietary intake and health risk status of women from under-resourced South African communities, and the facilitators and challenges of a LCHF education program to change their dietary behaviour. Results suggested that most participants followed EBSA's dietary recommendations and experienced health improvements as a result. Follow up data at six months suggested that those changes could be sustainable. For people with diet-related chronic diseases, LCHF diets should be supported by experienced health care professionals who can facilitate optimal nutritional intake. This is the same for any other diet; the evidence for long-term compliance and the sustainability of carbohydrate restriction is currently not yet established. In the absence of this evidence, existing data suggest that it is a legitimate and potentially effective treatment to adopt a LCHF diet as an option for patients to manage and prevent NCDs in under-resourced communities.



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# LIST OF ABBREVIATIONS

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|          |                                                   |
|----------|---------------------------------------------------|
| ABF      | Anna Bach Faig                                    |
| ATP      | Adult Treatment Program                           |
| BMI      | Body Mass Index                                   |
| CDC      | Centre for Disease Control and Prevention         |
| CCW      | Christopher C. Webster                            |
| COPD     | Chronic Obstructive Pulmonary Disease             |
| COVUD-19 | Coronavirus disease 2019                          |
| CVD      | Cardiovascular Disease                            |
| DALY     | Disability-Adjusted Life Year                     |
| EBSA     | Eat Better South Africa                           |
| FFQ      | Food Frequency Questionnaire                      |
| FGD      | Focus Group Discussion                            |
| GII      | Gender Inequality Index                           |
| GPB      | Georgina Pujol-Busquets                           |
| HDI      | Human Development Index                           |
| HDL      | High-Density Lipoprotein                          |
| HIV      | Human Immunodeficiency Virus                      |
| HPCSA    | Health Professions Council of South Africa        |
| IDI      | In-Depth Interview                                |
| JS       | James Smith                                       |
| KL       | Kate Larmuth                                      |
| LCHF     | Low-Carbohydrate High-Fat                         |
| LDL      | Low-Density Lipoprotein                           |
| MetS     | Metabolic Syndrome                                |
| NCD      | Non-Communicable Disease                          |
| NICE     | National Institute for Health and Care Excellence |
| PCOS     | Polycystic Ovary Syndrome                         |
| SDG      | Sustainable Development Goal                      |
| SF       | Sergi Fàbregues                                   |

|      |                           |
|------|---------------------------|
| SSB  | Sugar Sweetened Beverage  |
| TB   | Tuberculosis              |
| T2DM | Type 2 Diabetes Mellitus  |
| TNF  | The Noakes Foundation     |
| UN   | United Nations            |
| USA  | United States of America  |
| VAT  | Value-Added Tax           |
| WHO  | World Health Organization |

# CHAPTER ONE: INTRODUCTION

---

Throughout my career I have always had a keen interest in health and how people can strive to lead healthier lives. This has inspired me to travel and work in my native country, Spain and abroad (France, Kenya, India, Peru, and the USA) as a pharmacist. In April 2017, I felt I needed to delve deeper into the public health field after studying and working in Barcelona. The opportunity arose through an internship at The Noakes Foundation (TNF) in Cape Town, South Africa, a non-profit organisation promoting low-carbohydrate high-fat (LCHF) diets to prevent or manage chronic metabolic conditions. As my background is in pharmacy, public health and nutrition, I was placed in the TNF's community nutrition education program called Eat Better South Africa (EBSA). EBSA had a community-based intervention scheduled and needed field workers to assist. Before I came to South Africa, I was unaware of LCHF diets and how prevalent they were in the country and worldwide. Shortly after working with EBSA and on encouragement by the participants, I altered my diet and started to eat the program's recommended foods.

Modifying my diet to an LCHF eating model, I removed high carbohydrate foods and ingredients (i.e., bread, flour, pasta, rice, and most processed and packaged foods). I increased the intake of green leafy vegetables, nuts, seeds, and full-fat foods such as dairy, coconut oil, olive oil, seafood, meat, and poultry. By default, my diet changed to one based on whole foods, which were minimally processed and packaged. This way of eating appealed to me for several reasons, one of which was that I felt satiated by the foods I was consuming. The resultant feeling of fullness created a reduction in the amount of food I desired overall, which eventually made me eat only two meals a day. As I embarked on my dietary experiment, I observed how women from the EBSA program, with various metabolic conditions, were embarking on a personal health journey.

Although I acknowledge the potential for personal bias due to my past involvement with EBSA, the results from this study may improve our understanding regarding the barriers to and facilitators of healthy food choices and dietary behaviours

in low-income, disadvantaged communities and implications for public health. While my relationship with EBSA provided me access to the women who had participated in the EBSA programs, it is also important to recognise that this may have impacted what was shared with me during the study interviews since it is possible that women could potentially be more hesitant to share critical thoughts. It is also vital to acknowledge how my personal identity may have affected my fieldwork experience. As a Catalan Spanish woman in South Africa, many of the women I met wanted to know what I thought of the country and why I was here. As a young Hispanic European woman, I feel that my identity as a foreigner may have allowed women to be more open with me. When women shared stories about their past and how their current situations have been shaped by it, I felt they were trying to educate me on the difficult history of South Africa and its current manifestations in their communities. Surprisingly, I found so many similarities between cultures which I think made my experience very unique and offered me the opportunity to connect with women at a very personal level.

The under-resourced communities studied in this project were established as a result of the Group Areas Act of the Apartheid Government for mixed-race populations who were forcibly removed from their homes in surrounding areas that were given to whites (1-3). These communities face high rates of violence, theft, and crime, and a high percentage of the population experience direct or indirect consequences of alcohol and drug abuse (1). Nevertheless, these communities are much more than what the media often portrayed them. It is vital to consider how this portrayal creates stigmatising effects for community residents and reinforces the idea that these communities are inadequate social environments (1,2,4-7). It is also necessary to recognise that the community struggles have been linked previously with the traumatic experiences of forced removals (8,9).

The research and the review of current literature will bridge the significant research gap in the barriers and motivators to adherence to the LCHF dietary approach and the community-based interventions in the target population. Findings may inform the development, implementation, and evaluation of future research in this field. This thesis is presented in chapters that include a combination of original research and associated literature. The current chapter, Chapter 1, serves to give the reader a brief

background to my Ph.D. and a description of its content. Chapter 2 comprises a literature review to provide a necessary context and present the research project's overall aims. The review describes the factors leading to the increasing prevalence of non-communicable diseases and the health disparities associated with women from under-resourced South African communities. It also gives background on the value of nutrition education programs, LCHF diets, and its evidence to improve health outcomes. Moreover, it explores women's roles within community engagement and the importance of gender-focused research.

Chapter 3 comprises two qualitative studies, that were conducted to optimize the program for potential new sites. One included past EBSA participants and aimed to explore their program's experiences and the facilitators and challenges they faced. The other study included EBSA-naïve participants to explore their willingness to participate in a program. A part of this chapter (section 3.3.1) regarding past EBSA participants' experiences was published in March 2020 in the *Nutrients Journal* (10). Chapter 4 describes a longitudinal pilot study in Ocean View, and its 6-month follow up. This pilot study's mixed-methodology involved health assessments, questionnaires, focus group discussions, and in-depth interviews. The first section of Chapter 4 provides the participants' demographics, health history and risk factors, household characteristics as an indicator of wealth, and food security before the EBSA program. The results consist of data from participants' diet assessment before and after the EBSA program and the 6-month follow-up. Furthermore, it explores the changes in health outcomes through blood tests, blood pressure, body measurements and accelerometers. Interviews with EBSA providers are also included in this Chapter to explore their perceptions of participant's experiences with the program.

Chapter 5 explores health practitioners' perceptions of the EBSA program and which aspects they may support. Through one-on-one interviews with medical doctors, nurses, and dietitians who work with patients from under-resourced communities, this qualitative study provides their perceptions of health and nutrition. Lastly, the discussion in Chapter 6 provides an interpretation and a summary of previous chapters and includes recommendations for further research. This chapter explores the theory that a LCHF diet

may be an appropriate option for women from under-resourced South African communities to improve metabolic health. Furthermore, it investigates additional concepts arising from the research that could further impact adherence to and acceptability of the LCHF approach.

# CHAPTER TWO: LITERATURE REVIEW

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## 2.1. Introduction

A non-communicable disease (NCD) is a medical condition or disease that is non-infectious and non-transmissible among people. The main types of NCDs are cardiovascular diseases (such as heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma) and diabetes. NCDs kill 41 million people each year, equivalent to 71% of all deaths globally. The NCD epidemic is one of the 21st century's major challenges regarding global development (11,12). As such, NCDs remain one of the challenges on the United Nations 2030 Agenda for sustainable development. In addition to being a leading cause of death worldwide, NCDs impose years of disability not only on those afflicted, but also their families. Improving the health of populations, including preventing and controlling NCDs, is essential to ensuring progress in terms of economic growth, social equity, and environmental protection, with the ultimate goal of achieving sustainable development (13–15). NCDs disproportionately affect people in low- and middle-income countries where more than three quarters of global NCD deaths – 31.4 million – occur (16–23).

Addressing NCDs and sustainable development depends on also addressing the inequities that keep people in poverty and hinder economic improvements. Social determinants, such as poor education and low income, influence vulnerability to NCDs and increase exposure to their modifiable risk factors (24–28). For example, people from under-resourced communities are often forced to eat unhealthy foods. Overconsumption of simple sugars, refined carbohydrates, and poor-quality refined oils increases the risk of developing diet-related chronic diseases. While poverty is an important barrier to health and education for both men and women, it tends to place a greater burden on women because of gender disparities that remain prevalent (29–32).

The United Nations (UN) has set various targets for nations to reach their Sustainable Development Goal (SDG). Target number 3.4 on the list is to reduce global premature mortality caused by NCDs by one third by 2030. Target number 5 aims to empower women and promote gender equity. These goals are crucial to accelerating sustainable development according to the UN. The fifth SDG further states that ending all forms of discrimination against women and girls has a multiplier effect across all other areas of development (33,34). In South Africa, many health sector interventions were introduced to reduce morbidity and mortality rates from NCDs over the past two decades. Moreover, discriminatory laws were replaced by several new laws specifically aimed at addressing gender discrimination. However, inequality persists in many forms and in various sectors of South Africa's socioeconomic context, despite the achievements of agencies such as the Commission for Gender Equality (34). There are many aspects to gender, including equitable access and use of resources, equitable participation in relationships, the household, the community, political arenas, and safety or freedom from violence (35–39).

In the case of diet-related NCDs in South Africa, community-based nutrition education programs targeting women to improve metabolic conditions have shown some measure of success (40–43). Eat Better South Africa (EBSA) is a non-profit organization that runs programs to teach people, mostly women, about healthy, affordable foods that are less processed, lower in simple sugars and refined carbohydrates and higher in healthy fats, to treat or prevent diet-related NCDs (44).

## **2.2. COVID-19 highlights an existing NCD pandemic**

In March 2020, the World Health Organization (WHO) declared COVID-19 – otherwise known as severe respiratory syndrome coronavirus 2 (SARS-CoV-2) - a global pandemic (45). Even though COVID-19 is currently one of the leading causes of mortality worldwide, the exclusive focus on it by political, regulatory, health service, and public health agencies has concealed another epidemic (46). NCDs such as obesity, diabetes, cardiovascular disease (CVD), cancer, chronic respiratory diseases, and mental health



disorders have caused many times more premature deaths and greater suffering than COVID-19, year on year (18,20,21,47). People of all ages with existing metabolic comorbidities have been more at risk of becoming severely ill if they get COVID-19. According to the Centre for Disease Control and Prevention (CDC), the top five COVID-19 comorbidities are cardiovascular conditions (e.g. hypertension, coronary heart disease, congenital heart disease and heart failure); obesity; chronic lung conditions (e.g. such as tuberculosis (TB), chronic obstructive pulmonary disease (COPD), asthma and cystic fibrosis); and diabetes (21). Globally, hypertension is the most common COVID-19 comorbidity and often coexists with other underlying conditions such as diabetes, obesity, and other cardiovascular complications (16,48).

The exact mechanisms of NCD aggravation elicited by COVID-19 are not completely clear. Known mechanisms of severe COVID-19 infections include damage to the lungs, which then causes the blood oxygen levels to drop (18,20,21,47). Severe infection induces an excessive inflammatory response, which is more likely to cause blood clots (increasing stroke risk) and to cause blood pressure to drop. When this occurs, the heart must pump faster and harder to circulate oxygen and this can put strain on a weak heart. Cardiovascular disease includes uncontrolled blood pressure (hyper- and hypotension). In patients with COVID-19, untreated hypertension is associated with an approximately two-fold increase in mortality compared to treated hypertension (17,47). Hypertension is linked to obesity and diabetes, this synergistic disease state is known as metabolic syndrome (MetS) – which cause more severe COVID-19 infections. The pathophysiology of obesity, T2DM (Type 2 Diabetes Mellitus) and CVD are complex. However, they appear to share common metabolic conditions, including insulin resistance, systemic inflammation, and abdominal obesity (49). The Adult Treatment Program III (ATP III) diagnoses MetS based on the presence of three of the following risk factors: elevated waist circumference, elevated blood triglycerides, elevated blood pressure, elevated blood glucose, and reduced high-density lipoprotein (HDL) cholesterol (50,51) (Table 1). The International Diabetes Federation (51) diagnoses MetS as increased waist circumference (Men  $\geq 90$  cm, Women  $\geq 80$  cm) along with any 2 of previous features (50). Impaired glucose tolerance may impact on the immune response

to viral infection and potential secondary bacterial infection in the lungs (45). The severity of COVID-19 infection can be further increased by diabetes complications such as kidney disease and other organ failures (45).

Table 1. Diagnostic criteria of MetS (50).

| Parameters                   | ATP III                                                                                                             | IDF                                                                                                              |
|------------------------------|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Definition                   | Any three of the following five features.                                                                           | Increased waist circumference men $\geq$ 90 cm, women $\geq$ 80 cm along with any 2 of following features below. |
| Elevated waist circumference | $\geq$ 102 cm in men<br>$\geq$ 88 cm in women                                                                       |                                                                                                                  |
| Triglycerides                | $\geq$ 1.7 mmol/l or treatment                                                                                      |                                                                                                                  |
| Cholesterol HDL              | $<$ 1.03 mmol/l in men or $<$ 1.29 mmol/l in women or treatment                                                     |                                                                                                                  |
| Blood pressure               | Systolic $\geq$ 130 mmHg or Diastolic $\geq$ 85 mmHg or hypertension treatment or previously diagnosed hypertension |                                                                                                                  |
| Fasting blood glucose        | $\geq$ 5.6 mmol/l or treatment for elevated glucose or previously diagnosed T2DM                                    |                                                                                                                  |

ATP: Adult Treatment Program III; IDF: International Diabetes Federation; T2DM: Type 2 Diabetes Miletus; HDL: High Density Lipoprotein

As a further potential exacerbation, many patients with Type-2 Diabetes Mellitus (T2DM) are obese, and obesity is also a risk factor for severe infection. Obesity causes a chronic inflammatory state which is exacerbated by COVID-19. This chronic obese inflammation also affects immunity, which means that overweight people are more

susceptible to infections (18,47,49). The burden of NCDs contributes to mortality across the globe, and it is considered the leading cause of death worldwide and hence a significant public health threat (52). Almost three quarters of NCD deaths occur in low- and middle-income countries. Sixteen million NCD deaths occur before the age of 70, and 82% of these 'premature' deaths occur in low- and middle-income countries (52).

### **2.3. Non-communicable diseases in South Africa**

South Africa is considered an upper-middle-income country facing a double burden of disease and an epidemiological transition (53). Non-communicable disease rates have rapidly increased in South Africa; meanwhile, communicable diseases (CDs) persist, mostly because of the prevalence of the human immunodeficiency virus (HIV) and tuberculosis (TB) (54,55). Although HIV prevalence has decreased over the past ten years, there is an increase of the risk factors associated with NCDs (56). This situation is referred to as an epidemiological or health transition with the coexistence of a rising prevalence of chronic diseases due to demographic, lifestyle, and behavioural changes, and a persisting prevalence of infectious diseases. Omran defined this health situation in the early 1970s as the third stage of the epidemiological transition called the 'age of degenerative and man-made diseases', mainly driven by lifestyle, diet, occupation, and income (57). Remarkable changes have occurred in recent decades in the way the world's population buys food and eats food, including changes in the food chain system and the forces that drive it (58,59).

Home cooking is becoming less common, and the food consumed by populations is mainly packaged, highly processed food, instead of purchases made at fresh local markets (58,59). Thus, this third pillar of transition of mortality is driven by globalisation, urbanisation, and an international import and export market which makes packaged processed food less expensive to buy. This food market controls food prices and has contributed to gradually reducing farmland and increasing dependence on food purchased in supermarkets (58,59). Today, nutrient-poor, energy-dense, and sugary diets are cheaper and very common worldwide. Access to fast and highly processed food has increased the levels of nutrition-related morbidity, and the prevalence of NCDs such as T2DM, CVD, MetS

and obesity continues to rise (31,60). While obesity was previously associated with rising incomes and industrialised societies, this is no longer the case. There is growing consensus in the developing world that this situation poses significant threats to public health. It impacts the vulnerable poor – and therefore, the most food insecure – to the greatest extent (31,60).

The co-occurrence of HIV and NCDs and the management of complications emanating from these present many challenges. Financially, South Africa is crippled by this dual disease burden affected by HIV and NCDs' premature mortality (61). There are increased health care costs largely due to the complexity of patient management as a result of NCD comorbidity. This leads to high premature mortality rates and to poorer health outcomes (56,62,63). At household level, comorbidity also poses a huge financial and health burden. These trends are especially of concern in low- and middle-income countries, as NCDs' comorbidity patterns may be different to those previously observed in high-income countries, due in part to HIV prevalence (63,64). Moreover, the nutrition transition and the associated double burden of disease exist in parallel to massive rural-urban migration and rapid urbanization (54). In South Africa, 65.4% of women and 40.5% of men are overweight or obese. This figure is higher than the number of South Africans living with HIV, which is approximately 14% among the population (64,65). In South Africa in 2012, the probability of dying between the ages of 30 to 70 years from one of the four main NCDs (cancer, diabetes, CVDs, and chronic respiratory diseases) was around 27% for both men and women (66,67).

The financial burden that diabetes alone places on patients and the public health care system is crippling (68). Diabetes rates are steadily increasing in South African women, from 6.2% in 2013 to 7.1% in 2015, causing it to become the leading underlying cause of death in 2017 (51). When focusing on the risk factors for women, the data becomes even more alarming. In 2018, 35% of women above the age of 25 had raised blood pressure, 12% had raised blood glucose and around 43% of women over the age of 20 were obese (69). The increased prevalence of a high body-mass index (BMI) (27.19%) and a fasting plasma glucose (37.6%) in women were the primary risk factors for mortality. Over the years, numerous causes have been debated as to why South African obesity statistics are so

concerning. One of the most common reasons cited is the westernisation and urbanisation of the South African population in recent decades (53,70,71). Researchers have proposed that this results in a less active lifestyle and greater consumption of fast food, which is high in sugar and fat (71). The WHO's global food guidelines recommend that adults and children reduce their daily intake of free sugars to less than 10% of their total energy intake. Free sugar refers to any sugar added to a food or drink, or the sugar that is already in honey, syrup and fruit juice. The guidelines also recommend that a further reduction to below 5%, or roughly 25 grams (six teaspoons), of sugar per day would provide additional health benefits. These guidelines are based on evidence that maintaining a low free sugar intake reduces the risk of overweight, obesity, and tooth decay (72).

Governments across the globe are taking proactive measures to alleviate the impact of unhealthy lifestyle choices and the resultant NCD epidemic. In 2018, the Department of Health and the National Treasury of South Africa opted to impose a tax on sugar-sweetened beverages (SSBs) as a disincentive for unhealthy choices by decreasing these beverages' affordability (73). Similar taxes are currently in place to influence consumer behaviour in countries such as Denmark, Finland, France, Hungary, Ireland, Mexico, and Norway (73,74). The South African government is planning to introduce nutrition labelling, marketing restrictions on unhealthy foods and beverages to children, fruit and vegetable subsidies, physical activity policies, and social marketing campaigns, but these measures have not been implemented yet (73,74). From a political perspective, having a tax earmarked for spending in a particular area makes it more acceptable for consumers, but only if they feel the tax raised is being used to fund health care or education platforms on healthy eating (75).

There has been no guarantee that these new taxes are ring-fenced to promote interventions as part of the fight against NCDs or for health-related education (76). The potential to improve health could be significant when combining sugar taxes with incentives for healthier food choices. Sadly, this combined effort has not occurred within South African government regulation frameworks (75,77). The tax on SSBs has been called a 'regressive tax', as it can disproportionately affect persons who are socioeconomically disadvantaged. The poor already pay a higher proportion of their income on food and

paying more because of SSBs may mean spending even less on nutritious foods (76). Eventually, despite this tax, unhealthy diets may still cost less, because food policies have focused on producing 'inexpensive, high-volume' commodities that favour sales of highly processed food products for maximal industry profit (78). Moreover, most unhealthy food companies justify themselves by advocating the defence in obesity lawsuits, which states that consumers are free to choose and can refuse to buy these products (79). This statement is not appropriate for everyone, as a large part of the population may be unaware of the personal costs involved in sugar consumption (79). Alternatively, people may be aware of the negative effects of sugar consumption but struggle to reduce consumption because of its addictive nature (80). Providing appropriate interventions to change dietary choices is essential to understand the barriers to and facilitators of healthy and unhealthy dietary behaviours and overall dietary consumption patterns in the population (81,82).

At the individual level, the prevalence of NCDs is higher among groups with low education and low incomes. In under-resourced communities in South Africa, the high consumption of staple foods (mainly maize and bread) is fuelled by the reduced prices because of government subsidies, where no value-added tax (VAT) is paid on these foods. These staple foods cost less per unit of energy than animal products, fruit, and vegetables (66,83,84) and are the preferred food choices of most people in more impoverished communities (85,86). Therefore, it is common to find women selecting these staple foods when shopping for their families within these communities (85). These foods typically contain high quantities of refined starch, with simple sugars and added fats or oil to enhance flavour and improve their levels of satiety (87). All this can lead to 'hidden hunger', when people eat regularly and even gain weight, but lack the necessary nutrients and vitamins, leading to long-term health damage (80).

## **2.4. Social inequalities and the gender gap**

Health should be considered within the broader context of direct and indirect links to wealth. When poverty affects a large proportion of the population, as in South Africa, health is predominantly affected by a lack of access to the basic requirements for life

(88,89). Thus, poverty sets a poor scene for improved health and longevity. Based on the Gini index, a measure of inequality (1 = complete inequality and 0 = complete equality), South Africa has the highest inequality index in the world (8). In terms of the income distribution, consumption and wealth estimated, South Africa has a Gini score of 0.62 and a poverty gap of 0.485, which is the average shortfall of the total population from the poverty line (8,90). Many studies have concluded that inequality alone, regardless of poverty, has a substantial impact on people's lives, including education, risk of mortality, health, and well-being (6,7,91–95). Inequality is a 'societal disease' that can lead to unequally dispersed biological disease (6). A higher ratio between high and low earners within a country is associated with lower life expectancy, higher smoking rates, CVD, and obesity. Beyond the absolute levels of wealth, people's experiences of inequality, such as feelings of injustice, unfairness and envy, lead to elevated stress (96). These experiences may trigger detrimental attitudes to health and education, and cascading psychological and biological reactions, including anxiety, depression, and chronic stress (8).

When inequality is high, irrespective of absolute wealth, genetic heritability is decreased if the experience of inequality is an environmental factor that limits the expression of relevant genetic factors (8). In South Africa, inequality can be visually evidenced in how the population is distributed within the cities and their surroundings (Figure 1). Here townships are in stark contrast to the rest of the urban environments. 'Townships' refer to the informal settlements, often underdeveloped and racially segregated, in urban areas. They were established under the Group Areas Act from 1960 to 1983 by the apartheid government, which mandated residential racial segregation throughout the country (25,96–99). Consequently, black South Africans, those of mixed-race ancestry, and Indians were forcefully removed from the restricted 'white areas' and moved to much smaller areas, frequently far from places of employment in the central cities. This created the countrywide experience of racial inequality, setting up a large portion of the population for poor health outcomes (99).



Figure 1. Aerial pictures of South African townships (100).

Inequality is additive, in South Africa as in the rest of the world. Gender inequality remains a significant barrier to human development, where the disadvantages facing women and girls are a major source of inequality (101). All too often, women and girls have been discriminated against in health, education, political representation, the labour market, etc., crippling their development capabilities and freedom of choice (102). Differential access to educational opportunities has led to low proportions of women in the formal employment sector and their concentration in low-paid production jobs with limited career prospects (97,98,102–104). The Gender Inequality Index (GII) is an inequality index that measures gender inequalities in terms of three critical aspects of human development (105). The first is reproductive health, measured by the maternal mortality ratio and adolescent birth rates. The second is empowerment, measured by the proportion of parliamentary seats occupied by females and the proportion of adult females and males aged 25 years and older with at least some secondary education. The third aspect is economic status, expressed as labour market participation and measured by the participation rate of female and male populations aged 15 years and older. The GII uses the same framework as the Human Development Index (HDI) to better expose the differences in the distribution of achievements between women and men. It measures the human development costs of gender inequality (36,105).



South Africa is a middle-income country and the HDI ranks the country in the 113th position in the world out of 189 countries. The GII yields insights into gender gaps in major areas of human development. The component indicators highlight areas in need of critical policy intervention and stimulate proactive thinking and public policy to overcome the systemic disadvantages of women. The GII ranges between 0 and 1: the higher the GII value, the more the disparities between females and males, and the more loss to human development. South Africa occupies the 97th position in the world with a GII of 0.422 (36,105). Globally, black and brown women experience the greatest social disadvantage (6–8,102,106,107). Vulnerable people from low socio-economic communities in South Africa often remain undiagnosed or untreated, which increases their risk of complications from NCDs. Women living in the townships face the discriminatory double-edged sword of poverty and gender inequality and have higher rates of diet-related NCDs (8,97).

While both men and women can be affected by NCDs, they have different exposures and vulnerabilities to risk factors, as well as differing symptomatology (108). Patriarchy still dominates population thinking and understanding. For example, it is commonly believed that women overstate or exaggerate the side effects of drugs compared to men (108). Indeed, women are between 50% and 75% more likely than men to have an unfavourable response or side effect to their medication. This has nothing to do with overstating or exaggerating actual symptoms. Myths such as these exist due to the prevailing gender bias within the biomedical field (108,109). The truth is that a significant part of our current knowledge base on diseases, and the impact of related medicine, is based on research conducted solely on men. The majority of medical advances originated from male science investigation, including research into cells, animals, and humans. Those discoveries may only apply to men, yet they have been utilised for everyone. This perpetuates the current long-standing cycle of gender bias in research: medicine does not know as much about the female body; thus, it does not know much about female health and dismisses their symptoms as a result (109). Consequently, no further work is done into female health research and their symptoms continue to be dismissed. So the knowledge gap remains. It was not until the early nineties that the

importance and need to incorporate women in clinical trials were realised to understand potential gender drug-effect differences (108–110).

After almost 30 years, despite an increasing amount of evidence from trials including women, there is still a significant knowledge gap on women's health. Furthermore, what is known has not been appropriately integrated into medical education. Today in preclinical research, it is still standard to utilise male animals, tissue samples, and cell lines. Therefore, women are still being judged against a male model, even though it is known that biological differences between women and men can create differences in susceptibility to disease, disease progression, and response to treatment. Consequently, health practitioners may misdiagnose, mistreat, and even define some symptoms as unusual or atypical when seeing female patient (108). For instance, women are 50% more likely to be misdiagnosed following a heart attack and have 30% more chance of being misdiagnosed or having their condition overlooked entirely following a stroke (39).

When considering conditions that mainly or only affect women, things do not look much better. These have not been a research priority and are significantly under-researched, mainly due to a lack of funding. Female-specific conditions, such as endometriosis, adenomyosis, and fibroids, often take ten years or more for accurate identification and diagnosis. There is five times more research into erectile dysfunction, affecting approximately 19% of men, than into premenstrual syndrome, which affects 90% of women (111). Gender bias in academia affects female representation in clinical trials and female scientists, resulting in their under-representation in academic institutions, particularly among higher ranks. Lack of female representation is a documented phenomenon that has had detrimental consequences for women and science quality. Some will point to examples of successful career women or gender-equal homes, schools, and offices. In reality, this is not representative of the majority of women around the world (110). Less than 30% of researchers worldwide are women, and they publish less, are paid less for their research, do not get as much funding, and do not progress as far as men in their careers. With fewer women in medical science research, it is less likely that women's health would be researched (112).

The situation is not changing rapidly, as women will always have varying hormonal states and their health needs differ through the stages of their lifecycle. Unfortunately, research mandates and/or funders within the biomedical field seek statistically significant results. As women's cycles are complex and potentially disruptive to studies, including more women in clinical trials could make these more complicated and costly (108). In addition, there is a scarcity of physiological data on women, and studies that had previously used only women to obtain comparable data are very rare (108). The context in which the evidence basis for medicine is drawn is also questionable, because the factors that contribute to women's health (or lack thereof), such as poverty and social deprivation, will not be the same for men (108,109). These differences can create, maintain, or exacerbate health inequalities and expose women to factors that jeopardise their well-being. At each stage of their careers and in each type of organisation, women face prejudices beyond gender — prejudices that intersect with class, race, ability, religion, economic status, and sexual orientation. These challenges are often compounded for women with disabilities and special needs, transgender women, and those whose genders are nonbinary (110,113).

## **2.5. Women's role within community engagement in relation to health**

Women fulfil many demanding nurturing, family-related, and societal roles (36,114), frequently disregarding their health to address those of people around them (115,116). Women are no less susceptible than other population groups to the confusion and debate around effective and sustainable health improvement strategies. A population's health refers to a state of complete physical, mental, and social well-being and not merely the absence of disease (117). With this in mind, we must consider the social determinants which influence women's health and well-being (117). These include diversity (ethnicity, geographic location, disability, sexuality), stages of life, hormonal cycles, and last but not least, access to resources. These resources include income, health care, education, employment, social connections, safety, and security.

Women's social connectedness, which is key to overcoming many gender-based barriers, can be interrupted by various factors, such as violence, perceptions of safety, and geographical isolation (118). Health outcomes are closely related to the number of years spent in formal education and more girls and women worldwide have access to education than ever before (119). However, around 70 million girls are not in school every day, and more than half a billion females worldwide are illiterate—about twice the number of illiterate males (119). The challenges these women face range from a lifetime of lower income to poorer health outcomes – include a higher risk of infectious diseases (especially HIV and tuberculosis) and NCDs – and higher rates of mental illness compared to men (97,101). Female education affects family health and nutrition, agricultural productivity, and fertility, yet there is a wide gender gap in education participation (119,120).

Women have collectively made significant advances in gaining access to tertiary education, although educational choices remain highly segregated based on gender. While women have improved their earnings relative to men in recent years, a sizable gap remains. The global gender gap is predicted to close in approximately 100 years, based on these improved earnings. In all countries, at all levels of income, health and illness follow a social gradient—the lower the socio-economic position, the worse the health. Women are almost always on the lower rungs of each level (101,112,119). Furthermore, women with all types of disabilities and special needs are more likely to have more significant financial stress, to have greater difficulty accessing health services, and to spend a greater proportion of their income on medical care. The discrimination, violence, and marginalisation associated with misogyny, homophobia, and heteronormativity significantly impact women's health and well-being, creating high rates of depression and risky behaviour (119–121).

Lack of resources and pressures on time and energies put enormous constraints on women's ability to maintain their health and nutrition and that of their children's behaviour (119–121). As a result, women are less equipped than men to take advantage of better income-earning opportunities in South Africa. However, as elsewhere in the developing world, things are slowly changing for women in South Africa. Women are joining the formal sector of the economy. More girls are continuing to higher education

and joining technical courses. More women are in the management hierarchy, more are moving into professions dominated by men, and more are becoming self-employed. At the same time, there are significant issues that South African women still face, such as parenting, domestic violence, sexual harassment in the workplace, unequal pay, and schooling for all girls (119–121).

Worldwide, women are more likely to be responsible for choosing and preparing food in the household (122–124). Complex nutritional labelling contributes, along with the lack of education, to women's difficulties in choosing healthy food (125). Studies have also found that identities and gender expectations play an essential part in women's food choices. It is common for women to feel stressed because of guilt, tiredness, and lack of time while providing food for their families (86,126–128). Food security and nutrition impact the prevalence of chronic diseases, and improvements in both through advances in modern medicine and safety practices can enhance life quality (52). The majority of the food insecurity-obesity research has indicated a positive association among women, especially minority women (38). Endeavours to promote health and forestall disease must be directed not to individuals exclusively, but also to the environments in which people live. Research on the social-class gradient suggests a significant improvement in the well-being of people who can control their destinies and have the option to participate in the social factors that impact their lives (28,30,79).

All over the world, studies have indicated that women's participation in community initiatives can have long-lasting benefits for the entire community (101,129). Women who are empowered to take action have a positive influence on the lives of other people. Increasing women's engagement in education and access to assets and resources improves their families' education and health (101,119,121). Although regulations, policies, guidelines, and price control are necessary elements for nutritional change, education, counselling, and other means of support are also required. Eradicating NCDs may be a daunting prospect, however, the situation will likely only deteriorate further if no action is taken to ensure women's engagement and empowerment (51).

## **2.6. Low-carbohydrate, high-fat diets**

Disease prevention requires interventions to promote healthy behaviours and reduce risk factors for NCDs. To do this governments need to take steps to overcome economic, socio-cultural health inequalities and geographic barriers. In terms of diet, overconsumption of ultra-processed foods rich in added sugar, refined carbohydrates, and highly processed vegetable oils play a predominant role in the development of NCDs (130,131,132). There is growing consensus on how to improve MetS through diet, particularly with regard to dietary sugar intake. The WHO published new global guidelines recommending that adults and children reduce their daily intake of free sugars to less than 10% of their total energy intake (72). They also recommended that a further reduction to below 5%, or roughly 25 grams (six teaspoons) per day, would provide additional health benefits. These guidelines are based on the evidence that keeping the intake of free sugars below 10% of total energy intake reduces the risk of overweight, obesity, and tooth decay (51,72).

There is considerable evidence from multiple randomised control trials (133–140), meta-analyses (141–145), and narrative reviews (146–148) that reducing consumption of carbohydrates (mainly simple sugars and refined carbohydrates) and increasing consumption of healthy fats can improve all components of MetS and T2DM. In particular, and compared to control diets, low-carbohydrate, high-fat (LCHF) diets consistently reduce body weight, body fat, blood triglycerides, fasting insulin, fasting glucose, and HbA1c, and increase HDL cholesterol and LDL cholesterol particle size (148–154). It is well documented that overconsumption of processed foods, rich in added sugar, refined carbohydrates, and highly processed vegetable oils, plays a predominant role in developing NCDs (29,68,130,155,156). LCHF diets emphasize consuming unprocessed whole foods, non-starchy vegetables and low-sugar fruits, animal proteins and fats (and excluding margarine and limiting vegetable oils), and excluding or limiting consumption of added simple sugars and whole grains, with satiety guiding overall intake (146). An understandable concern with any increased dietary fat intake on the LCHF diet is the increased risk of future cardiovascular disease (132, 148, 150, 163). Consuming fats have very little direct effect on blood glucose levels, and as a

result does not lead to an increase in insulin levels. The principle of LCHF diet is to replace carbohydrate intake with fat, thus reducing insulin levels and increase the body's ability to utilise its own fat stores for energy (152-154) .

LCHF diets restrict dietary carbohydrates, which can lead insulin secretion to stabilize at lower levels (145, 147). Restricting carbohydrates drives fat metabolism over glucose metabolism for energy and when insulin levels are low, stored fat in adipose tissue undergoes lipolysis via hormone sensitive lipase (145, 147). Once liberated, free fatty acids undergo beta-oxidation in hepatic mitochondria to produce acetyl coenzyme A (acetyl-CoA) (145, 148). Excessive production of acetyl-CoA and oxidation of fatty acids leads to the production of ketone bodies. The acetyl-CoA molecule can be utilized in the Krebs cycle or to produce acetoacetate, which is then spontaneously converted to acetone or 3- $\beta$ -hydroxybutyrate by 3- $\beta$ -hydroxybutyrate dehydrogenase (145, 148, 153). The ketones then enter the bloodstream and can be utilized by the brain, heart, and muscle, where they produce cellular energy in mitochondria. This process can induce a state of nutritional ketosis when decreased insulin levels promotes a metabolic shift toward lipid oxidation and utilization of fatty acids and ketones for energy (145, 148, 153, 154). Thus, ketosis signifies a shift from an insulin-mediated glucose dependent state to an increased ability to use dietary fat and adipose stores for fuel. These conditions promote a breakdown of excess fat stores, sparing of lean muscle, and improvement in insulin sensitivity (137, 140, 144, 147, 148, 153). Ketones also play a newly discovered role to reduce oxidative stress and inflammation, both of which are key underlying causes of MetS, T2DM and CVDs. Nutritional ketosis is clinically proven to directly reduce blood sugar (as measured by HbA1c), improve insulin sensitivity (as measured by HOMA-IR) and reduce inflammation (as measured by white blood cell count and CRP). Moreover, nutritional ketosis has proven to reduce visceral fat, which is visible around the stomach area, but it's also stored in those organs close by such as the liver, pancreas and intestines (145, 148, 153, 154). As type 2 diabetes is a disease of visceral fat, high blood sugar, insulin resistance, and inflammation, nutritional ketosis is an effective diabetes reversal tool because it can improve all four (145, 148, 153, 154).

In South Africa, LCHF diets, commonly known as 'Banting' diets, have become very popular. The name 'Banting' comes from William Banting, a well-known Englishman who was obese and lost weight during the 19th century, following a LCHF diet recommended by a doctor named William Harvey (157). This diet was then rediscovered in 1974 by Dr Robert Atkins, who then popularized it as a means to lose weight (158). In 2012, Professor Timothy Noakes, spurred on by his own diabetic diagnosis, started researching the effects of carbohydrates, proteins, and fats on metabolic health. His research convinced him that a LCHF diet was the healthiest option for many, and especially for diabetics. In November 2013, he published his book, *The Real Meal Revolution*, with co-authors Sally-Ann Creed, Jonno Proudfoot, and David Grier, which had a tremendous impact on the South African eating culture. The book was the fastest-selling cookbook in South African history and was number one on the bestseller list for 12 weeks. The Banting diet became very popular among South Africans, mostly because of the rapid weight loss and appetite reduction experienced (159,160). In this context, the term 'Banting' refers to a LCHF lifestyle that has carbohydrate restriction as its core principle, but also restricts industrially produced seed oils, and promotes consumption of fats that are considered healthy by proponents of this diet, including olive oil, coconut oil and animal fat. Total calorie intake is often determined by eating to satiety and not beyond, rather than actively restricting calories. Indeed, the diet is mostly promoted as one which increases control of eating and satiety (81,161,162).

However, according to Sboros, the diet is considered very controversial (163). There have been many opposing voices, especially from the Dietetics Association of South Africa, which laid charges of unprofessional conduct against Professor Noakes with the Health Professions Council of South Africa (HPCSA) over remarks he made on Twitter in 2014. After a three-year battle with the HPCSA, Noakes was cleared of misconduct. The latest controversy stems from an appeal that the HPCSA then lodged with its appeal committee in 2018 (163). The Banting revolution in South Africa has prompted many restaurants to offer Banting-friendly breakfasts, pizzas, and desserts. Since 2014, well-known pizza outlets offer low-carbohydrate pizzas, made with pumpkin or zucchini pizza bases. Other chains have introduced cauliflower rice to accompany



meals. A well-known supermarket offers a 'Carb Clever' range, which includes prepared meals with conventional starches replaced by cauliflower or other vegetables. This range also includes cauliflower wraps, Banting crackers, and low-carbohydrate pizzas (160,164).

A major motivating factor for women to turn to this lifestyle is to lose excess body fat. Carbohydrate restriction increases fat metabolism, decreases hunger-promoting hormones such as insulin and promotes optimal liver function (147-150). It is well-recognised that aging in women is associated with a predisposition to weight gain (165). Weight gain *per se* cannot be attributed to the onset of menopause. An increase in body fat and central adiposity is associated with a decrease in hormonal activity (166). Women with abdominal obesity are at high risk of cardiovascular and metabolic disease (167). This relationship holds for middle-aged women, with women classified as overweight or obese exhibiting higher rates of metabolic irregularities, including hypertension and diabetes, as well as reduced mental health and energy levels (165). Many of the metabolic disorders attributable to reduced oestrogen can be alleviated by weight loss (167). Dietary guidelines in South Africa equate to promoting a diet with a macronutrient profile comprising high carbohydrate levels, moderate amounts of protein, and few fats. While nutritional weight-loss interventions are primarily based on these guidelines and are fundamentally built on calorie or energy restriction, there is no consensus on the optimal ratio of dietary macronutrient composition for enhancing long-term weight loss (168). This restricted calorie approach may result in short-term weight loss. However, most people find it difficult to sustain and as such it has had little impact on global overweight and obesity prevalence (168).

An alternative nutrition paradigm for weight loss, that is, the LCHF way of eating, is founded on the hypothesis that a significant contributor to obesity and overweight is the distribution of energy internally and a defect in the hormonal response which thereby limits fat metabolism (152,169). As such, the LCHF way of eating has been suggested as an equally effective and safe weight-loss strategy compared to traditional fat-restricted diet (152). A LCHF diet may suppress appetite and positively impact adherence to weight-loss interventions (153,170). Furthermore, it has become apparent that dietary fat has a satiating

effect on women (161). Research also indicates that LCHF diets may improve physical function, increase energy levels, and decrease food cravings in women with polycystic ovary syndrome (PCOS) (171–173). This lifestyle has demonstrated health improvements when used as a treatment alongside standard treatments such as chemotherapy for cancers (174).

Although there are an increasing number of trials which include female participants, as explained before, more effort is required to include women in clinical trials and narrow the massive gender gap in research to improve women's health. There is evidence that a LCHF diet can improve metabolic health in well-controlled clinical trials where quality food is either provided or where participants have the financial and logistical means to access the foods promoted by this diet (175). However, one cannot assume that the same nutritional advice will translate to residents of underserved communities, who may not understand the advice nor be able to afford or access the foods promoted by this diet. Women from these communities are often the gatekeepers to healthy food choices for their families, but they are at a particular disadvantage. With limited access to education or employment opportunities and high illiteracy rates, it is exceedingly tricky for under-resourced women to make healthy lifestyle choices for themselves and their families (176).

## **2.7. Eat Better South Africa program**

The nature of delivery and design of interventions to improve metabolic health, and the suitability to the target population, contribute to their success (177). In an attempt to reduce the burden of NCDs, many nutritional education programs operate in low socio-economic settings in South Africa. Eat Better South Africa (EBSA) is an organization which was founded in 2015 by the Noakes Foundation to address health-related inequality issues (44). The Noakes Foundation (TNF) is a non-profit corporation founded for public benefit, which aims to advance medical science's understanding of the benefits of a LCHF diet. EBSA has run several dietary education programs in under-resourced, predominantly mixed-race townships. EBSA aims to empower people—particularly women—to improve their health by making the best dietary choices available. They believe in the power of education to change peoples' health behaviours and, consequently, their overall health. It has consistently been shown that women have are key to successful community programs

and are the most likely to change and improve not only their own health, but the health of those around them (178). EBSA's community-based program runs nutrition and health education, targeting South Africa's under-resourced communities.

These programs aim to provide accessible tools and knowledge to prevent and treat NCDs in these communities. Women have had higher rates of participation in these programs. The role of women in community engagement has been essential for EBSA to address the root cause of NCDs. Women have been revealed to be critical assets for community engagement, and there is a considerable need to understand their needs better (44). EBSA advocates for more equal and equitable communities by providing education to empower communities. Regarding food, sometimes it is not about the budget but about the capacity to make the right decisions. Those who have a stronger perception that a food is healthy are more likely to consume that food than those who do not, and those with a stronger perception that a food is unhealthy are more likely to avoid that food than those who do not (179). Before embarking on this research study, EBSA ran six-week extended dietary education programs in 13 historically under-resourced and predominantly mixed-race communities in the Western Cape. The EBSA program comprised a two-hour educational session, every week for six weeks, at a program venue that was central within each community. Sessions included educational lectures that collectively covered a range of topics. The sessions included information about basic nutrition and diet-related diseases, as well as a sugar demonstration, in relation to these conditions. Women learned how to access affordable healthy foods in their communities; adapt to a new diet; shop on a budget; and plan meals, while the sessions also included cooking demonstrations. Physical activity, sleep, and managing stress were among other topics covered.

EBSA's recommended diet is based on LCHF principles. The primary focus is to reduce consumption of simple sugars, refined carbohydrates, refined vegetable oils, and ultra-processed food. EBSA encourages the consumption of vegetables, fish, and foods containing healthy fats. These education sessions were run by the EBSA educator – an EBSA team member from TNF with nutrition education training – with the help of an EBSA ambassador, women hired from the local communities as 'coaches', and local doctors and nurses. EBSA ambassadors are usually public figures who can provide

motivation to improve health during the program. EBSA coaches are women hired from the local communities to manage the participants' WhatsApp group and to organize follow-up meetings, as a means to encourage the sustainability of the diet. After the six-week program, the coaches were encouraged to organise follow-up meetings and manage a participant WhatsApp group. The WhatsApp groups are created at the beginning of the EBSA program, and are used as a tool to maintain engagement and group support. Women use the group to share tips, recipes, motivation quotes and to talk about challenges they face during and after the program (44,180).

## **2.8. Rationale and Ph.D. purpose**

Anecdotal data from previous EBSA interventions seemed to support that a diet low in carbohydrates and simple sugars could improve diabetes, hypertension, and obesity. In the EBSA program held in 2017, out of 25 participants, 78% lost weight, and 66% demonstrated improvements in blood pressure, with two of the participants discontinuing their insulin use at their doctors' advice. Participants reported an overall sense of improvement in their physical, mental, and emotional well-being. According to most participants, positive health changes, satiety and group support were great motivators to follow the diet. Evidence suggests that participants in structured programs accomplish improved health outcomes compared to those trying to do it independently. Therefore, adherence to programs is often higher during supervised research and monitored interventions (180).

Anecdotally, the EBSA program appeared to have made a positive impact on participants' body weight and health. Moreover, previous evidence suggests that fat has a more significant satiating effect in women compared to carbohydrates (161). This impact on satiety may indicate that, from an adherence point of view, a LCHF diet could be an equal or more effective strategy compared to the current dietary guidelines which recommend a lower fat intake and overall caloric restriction to improve metabolic health (181). There is a considerable amount of scientific evidence suggesting that LCHF diets are an effective strategy for improving metabolic health (145, 148, 153, 154, 182, 183). However,

there is a lack of evidence-based scientific knowledge about how people, especially women, from under-resourced communities – where there are high rates of NCDs – could benefit from a nutritional education program (184), and this diet in particular (10). Recognizing the gender bias within the biomedical field (109,185), and that most of the EBSA participants were women in 2018, this led to my Ph.D. project.

Further research is warranted to investigate the barriers to and motivators of women of under-resourced communities making the lifestyle changes required to improve metabolic health. This includes particular focus on the adherence to and acceptability of a low-carbohydrate diet as an option to improve metabolic health for women. This thesis investigates factors affecting women when modifying and maintaining dietary behaviours in the context of a LCHF diet with the aim of improving metabolic health. By employing a mixed-methods approach, drawing from multiple data sources and research methods, the study provides a detailed account of factors that may impact the acceptability of, and adherence to, and effectiveness of a LCHF lifestyle. To date no study has investigated participants' perceptions of and experiences in a LCHF dietary intervention in South African communities where socio-economic challenges such as poverty, unemployment, and crime are prevalent. This dissertation will address important gaps in knowledge about how people, especially women, from under-resourced communities, where high NCD rates are prevalent, may benefit from this diet. Moreover, evaluation of such community-based programs will provide insight into how to improve implementation and sustainability going forward.

The results of this study may be used to optimize the EBSA program's design to better meet the needs of South African women from low-income communities, by assessing barriers to healthy eating and behaviour change within the community setting. This thesis has been designed to evaluate the EBSA program's effectiveness for women using a qualitative approach and a mixed-methods pilot study. Furthermore, this thesis explores the perceptions and understanding of LCHFs by health professionals in the public sector, persons who are or will be engaged with providing clinical supervision, guidance and lifestyle recommendations for persons at risk for NCDs. This research study has two overarching aims:

- to gain insights into the acceptability, degree of understanding and ease of adoption of various components of program design of the EBSA intervention for women from low socio-economic communities; and
- to pilot an evaluation of the effectiveness and sustainability of the EBSA intervention in terms of behavioural changes and improvements in metabolic health.

The following specific objectives were conducted to achieve the above aims, and are explained in detail in the following chapters:

- to interview women from previous EBSA interventions about their experience of the educational sessions and with implementing dietary changes;
- to undertake community assessments and to interview women from these sites about their perceptions around food;
- to conduct dietary assessments, health assessments, and qualitative interviews before, immediately after and six months after participants have completed an intervention; and
- to explore health practitioners' perceptions of nutrition, the health system, LCHF diets, and the EBSA program for under-resourced communities.

# CHAPTER THREE: OPTIMISATION OF THE EBSA PROGRAM

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## 3.1. Introduction

While individual behaviours contribute significantly to the growing burden of NCDs, in underserved communities, education and healthcare access, food insecurity, and poor-quality food limit certain healthy lifestyle choices (178,186). The prevention and mitigation of NCDs in these communities may be positively supported by engagement in community-based nutrition education programs (178). Essential elements for a successful community-based program include a good understanding of the community, close collaboration with various community organizations, and the full participation of the people themselves (187). With these elements in place, nutritional education program providers can map out a course for health improvement by creating strategies to make positive and sustainable changes in communities (186). Qualitative methods have increasingly been used to assess the needs and preferences of target groups and to evaluate given education programs (188–190). Focus group discussions (FGDs) in particular have been used successfully to develop or adapt self-management interventions for NCDs, especially in low-income populations and minority groups (190). The informal style of a focus group is conducive to identifying barriers to care, exploring health beliefs, identifying education needs, and gathering information to improve intervention programs (188–190). The synergy promoted by the group interaction produces ideas and statements which could not be generated by other methods (188).

EBSA has been running six-week nutritional education programs consisting of weekly education sessions for people – mostly women – from under-resourced South African communities since 2015. These education sessions have been run by EBSA staff, with the help of women hired from the local communities as ‘coaches’ as well as local doctors and nurses. After the six-week program, the coaches are encouraged to organise follow-up meetings and manage a participant WhatsApp group. EBSA has based its nutritional

recommendations on LCHF diets to treat or prevent metabolic health conditions. Initially, LCHF diets became popular in South Africa as a means to lose weight and to improve metabolic health (148,160,191). Today, however, a much wider public is interested in LCHF or Banting diets (159,160). There is a general perception that the foods included in a LCHF diet are expensive and that most of the people in South Africa who decide to follow this lifestyle are reasonably affluent (192). This is consistent with the perception that LCHF diets are too expensive for people living in under-resourced communities (79). However, it is people from disadvantaged communities that suffer the highest rates of illness from NCDs, due to limited access to education and health care (28,30). As such, arguably, it is these individuals that could benefit the most from such diets as they suffer the highest rates of illness from NCDs, which often remain undiagnosed and/or untreated, which increases their risk of complications (28,30).

The EBSA programs have been very popular amongst previous participants, who often report that it has made a positive impact on their body composition and health. The EBSA program (see Appendix A) conducted in the under-resourced community of Atlantis, in March 2015, was particularly successful and is still active today, despite minimal input from EBSA staff after the program ended. Its success appears to be due primarily to its growing WhatsApp group and the highly motivated coach, who organises meetings every two weeks. Both the WhatsApp group and these meetings are attended by many of the original program participants, as well as additional members of the community who joined after the program ended. At each meeting, weight and blood pressure are measured and a diet-related topic is discussed. These accounts suggest that the EBSA programs are effective and sustainable. However, it is often only those who liked the program who remain/ sustain better- it is possible that the EBSA program did not suite all participants. As such, EBSA has not been rigorously evaluated. It is unknown what facilitators and barriers women from previous EBSA programs faced in attending and understanding the sessions and implementing the advice. Furthermore, it is not known whether EBSA participants can in fact change their eating behaviours or if whether their health and well-being are improved compared to controls who did not take part in the program.



To date no study has investigated participants' perceptions of and experiences in a LCHF dietary intervention in communities where socio-economic challenges such as poverty, unemployment, and crime are prevalent. These same communities suffer from a high prevalence of obesity and a disproportionate burden of NCDs. Without evidence-based information, organizations that provide LCHF education in these communities may lack important insights to evaluate and improve future programs. Therefore, the aim of this chapter was to understand participants' needs and to identify ways to improve the acceptance of, compliance with, and sustainability of future EBSA programs. The first section describes a qualitative focus group study in the communities of Ocean View and Atlantis with past EBSA participants. The objective was to explore participants' experiences of the program; by inference, the participants had attempted to follow a LCHF diet and the research seeks to understand whether this was accessible and affordable, and what facilitators or barriers were experienced. Therefore, this section aims to understand the facilitators of and barriers to participants during and after the EBSA program. The second section describes a community assessment in the form of a qualitative focus group study in the communities of Ocean View and Cloeteville with women not familiar with the EBSA program, to explore their willingness to participate in an EBSA program.

## **3.2. Methods**

### ***3.2.1. Study design and ethical approval***

This was a cross-sectional qualitative study of women who had previously taken part in a community-based LCHF dietary and lifestyle intervention called EBSA. The study sample also included EBSA-naïve women from similar socio-economic situations as part of a community assessment. Ethical approval (HREC REF 391/2018) was granted by the Faculty of Health Science Human Research Ethics Committee of the University of Cape Town and written informed consent was obtained from all participants. The study was conducted in accordance with the Declaration of Helsinki (2013, Fortaleza, Brazil).

### **3.2.2. Study settings**

The study took place in economically disadvantaged communities in the Western Cape Province of South Africa (see Appendix B), situated approximately 50 km from the province's major city of Cape Town. These communities emerged and originated in terms of the Group Areas Act under the apartheid government (193). Women who had previously taken part in the EBSA program came from Ocean View (O15, from June 2015 intervention) and Atlantis (A16 and A17, from June 2016 and June 2017 interventions, respectively). The EBSA-naïve cohort of women were recruited from Ocean View and Cloetesville in 2018 (193).

Ocean View has a population of nearly 14,000 people, with approximately 3,083 households. Just over half (51%) of the community are women, and 91% are from mixed-raced ancestry. Afrikaans is the most widely spoken language and is the first language for 57% of the population, followed by English at 39% (194,195). The Ocean View program of 2015 was led by the EBSA educator, a well-known South African actress. All of the women who took part in this program were already part of an existing wellness group that met weekly to exercise at a multi-purpose hall.

Atlantis was established as an industrial centre and residential area for persons of mixed-race ancestry. There are currently close to 68,000 people living in Atlantis, with around 15,565 households. Approximately 51% of the community are women, and 85% are from mixed-race ancestry. Afrikaans is also the most commonly spoken language and is the first language for 80% of the population, followed by English at 9% (194,195). In 2016, the Atlantis EBSA program was led by the same EBSA educator who led the Ocean View program, but in 2017, another EBSA educator led the 2017 Atlantis program. The 2017 Atlantis EBSA coach was appointed after taking part in the 2016 Atlantis intervention and demonstrating the potential for this role.

Cloetesville was founded in 1964, and is a community located adjacent to the township called Kayamandi in Stellenbosch. It is surrounded by the Cape Winelands' vineyards and the mountainous nature reserves of Jonkershoek and Simonsberg. The

community has 16,000 inhabitants and is served by one public health clinic. Approximately 52% of the community are women and 88% are from mixed-race ancestry. Afrikaans is the most widely used language and is the first language for 94% of the population, followed by English at 3%. Cloetesville was developed as a farmworkers' settlement area, close to the farms. In essence, the development served to provide labour for farms and the town (194,195).

### ***3.2.3. Participants***

The coach and the ambassador from previous EBSA programs in Ocean View and Atlantis helped to recruit eligible EBSA or EBSA-naïve participants for this study, using either the EBSA WhatsApp group, telephonic communication or one of EBSA's follow-up meetings. EBSA-naïve participants were considered women who had not been part of an EBSA program before. Women from Cloetesville were recruited at a community meeting with the help of a non-profit organization currently working with some members of the community. Purposive criteria sampling (196) was used to select participants fulfilling the following eligibility criteria: women; 18 years or older; capable of providing informed consent; able to understand and speak English or Afrikaans; able to attend the focus group meeting; and those who had participated in an EBSA program, had to have attended at least two sessions of the program. Women who were interested in taking part in the study were given a participant information sheet (see Appendixes C1 and C2) and those who met the eligibility criteria were recruited as part of the study sample.

### ***3.2.4. Procedures***

Focus group discussions were conducted between September and October of 2018. EBSA participants' FGDs included between five and seven women and EBSA-naïve participants included between six and 11 women. The discussions lasted, on average, 1 h and 50 min. In accordance with the recommendations in the literature, our relatively

homogeneous sample was large enough to identify 90% of the common themes (197,198). The group discussions were held in a venue within the community. Upon arrival, each participant reviewed and signed an informed consent (see Appendix D) and completed a sociodemographic questionnaire (see Appendixes E1 and E2) in the presence of a member of the research team who was fluent in the participant's preferred language (English or Afrikaans). A bilingual (Afrikaans and English) woman, who was independent of EBSA, was the focus group discussion moderator. Participants were asked to express themselves in the language they felt most comfortable in, which was predominantly Afrikaans. The moderator encouraged conversation among participants using ten open-ended questions, which were developed by the researchers for this study and were not necessarily asked verbatim (see Appendixes F1 and F2). Prompts and probes were used when necessary, to elicit further information. During the focus group, a researcher who assisted the moderator took notes, which were used to create a context and give clear and consistent details of the discussion. Refreshments were provided at each focus group and participants were reimbursed as compensation for their time.

### **3.2.5. Data analysis**

The focus group discussions were audio-recorded and translated and transcribed the audio from the original language (mostly Afrikaans) into English by Cyber Transcription (South Africa). Using NVivo 12, a thematic analysis (199–202) of the translated transcripts was conducted. The thematic analysis involved six phases recommended by Braun and Clarke (199). In the first phase, the author Georgina Pujol-Busquets (GPB) read the transcripts several times and identified patterns in the data. In the second phase, a first draft of the codebook was developed by GPB through inductive coding, based on the previous readings. Inductive coding is a data-driven analysis of coding the data without trying to fit into a coding frame or analytic preconception (199). Subsequently, Anna Bach-Faig (ABF) and Sergi Fàbregues (SF) revised and abbreviated the codebook. The third phase involved GPB searching for themes by dividing each code into several sub-themes. In the fourth phase, sub-themes were reviewed by ABF and SF, and subsequently displayed by GPB as thematic maps (see Appendixes G1 and G2). The fifth phase involved naming the

themes and defining the main concepts of each theme. The analysis yielded six themes for the EBSA participants and four for the EBSA-naïve participants. The last phase, mainly carried out by GPB, Kate Larmuth (KL), and James Smith (JS), consisted of producing a report which was shared with the EBSA, with recommendations on how to optimize the program for future interventions. Although only GPB did the coding, which has the potential to introduce personal bias, all the researchers reviewed the original transcripts and coded data and agreed on the final themes and their interpretation.

### 3.3. Results

A total of 78 women took part in nine FGDs. Three FGDs were held for women who had previously taken part in an EBSA program – these FGDs included a total of 18 women (55.6% of whom had attended two to three EBSA sessions and 44.4% of whom had attended four to six sessions). The remainder were EBSA-naïve women who participated in one of six FGDs. The mean age of all the participants was 56.6 years,  $\pm$  12.9 years (Table 2) and a mean body mass index (BMI) of 30.9,  $\pm$  6.7 kg/m<sup>2</sup>. Table 1 lists all participants' characteristics, as reported in the study questionnaire.

Table 2. EBSA and EBSA-naïve women participants' characteristics (n = 78).

| Characteristics                             | n (%)      |
|---------------------------------------------|------------|
| <b>EBSA participants</b>                    |            |
| Atlantis 2017 (A17)                         | 11 (14.1%) |
| Ocean View 2015 (O15)                       | 5 (6.4%)   |
| Atlantis 2016 (A16)                         | 2 (2.6%)   |
| <b>EBSA-naïve participants</b>              |            |
| Cloetesville                                | 54 (69.2%) |
| Ocean View                                  | 6 (7.7%)   |
| <b>Highest level of education completed</b> |            |
| High School                                 | 33 (42.3%) |
| Primary School                              | 21 (26.9%) |
| Certificate                                 | 6 (7.7%)   |
| Degree                                      | 5 (6.4%)   |
| Diploma                                     | 3 (3.8%)   |
| <b>Work status</b>                          |            |
| Unemployed                                  | 47 (60.2%) |
| Employed                                    | 24 (30.8%) |
| Retired                                     | 6 (7.7%)   |
| <b>Reported medical conditions</b>          |            |

|                          |            |
|--------------------------|------------|
| High blood pressure      | 40 (51.3%) |
| None                     | 22 (28.2%) |
| High cholesterol         | 20 (25.6%) |
| Type 2 Diabetes Mellitus | 9 (11.5%)  |
| Obesity                  | 7 (8.9%)   |
| Hypothyroidism           | 4 (5.1%)   |
| Arthritis                | 4 (5.1%)   |
| Osteoporosis             | 2 (2.6%)   |
| Heart problems           | 1 (1.3%)   |
| Asthma                   | 1 (1.3%)   |
| Glaucoma                 | 1 (1.3%)   |
| Psoriasis                | 1 (1.3%)   |
| Depression               | 1 (1.3%)   |

### 3.3.1. Cross-sectional focus group study

Six themes were developed from the FDG analysis: (i) motivations to enrol in the EBSA program; (ii) perceptions of the EBSA program structure; (iii) experiences with the recommended diet; (iv) EBSA's influences on participants' lives; (v) challenges during and after the EBSA program; and (vi) suggested improvements to the EBSA program. Table 3 lists the themes, sub-themes, and the definitions of the themes.

Table 3. Themes developed from the focus groups with EBSA participants (n=18).

| Theme                                              | Definition of The Theme                                                         | Sub-Theme                                                                                                                                                   |
|----------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theme 1: Motivations to enrol in the EBSA program  | Participants' intentions after deciding to take part in the EBSA program        | 1.1. Conscious about health problems<br>1.2. Desire to be healthier<br>1.3. Worrying about family health history<br>1.4. Influenced by something or someone |
| Theme 2: Perceptions of the EBSA program structure | Participants' opinions about the EBSA program's structure, sessions, and format | 2.1. Group support<br>2.2. Participant's attendance<br>2.3. WhatsApp group<br>2.4. Coach's support<br>2.5. Educational sessions                             |

|                                                       |                                                                                                    |                                                                                                                                                          |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theme 3: Experiences with the recommended diet        | Participants' opinions of the LCHF diet and its recommended foods                                  | 3.1. Meal plans<br>3.2. Feelings around diet<br>3.3. Common foods<br>3.4. Foods disliked<br>3.5. Foods missed<br>3.6. Affordability<br>3.7. Availability |
| Theme 4: EBSA's influences on participants' lives     | EBSA's impacts on participants' lives during and after the program                                 | 4.1. Health benefits<br>4.2. Nutritional knowledge<br>4.3. Encouraging other people                                                                      |
| Theme 5: Challenges during and after the EBSA program | The difficulties that EBSA participants encountered during and after the program                   | 5.1. Lack of support<br>5.2. Safety issues<br>5.3. Unexpected expenses<br>5.4. Weather conditions                                                        |
| Theme 6: Suggested improvements to the EBSA program   | Participants' thoughts on how to optimize the program and spread the word in broader the community | 6.1. Lack of follow-ups<br>6.2. Weight maintenance<br>6.3. Program frequency<br>6.4. Broader community                                                   |

### 3.3.1.1. Theme 1: Motivations to enrol in the EBSA program

The major driver for enrolment into the EBSA program was the expressed wish by participants to improve their health. Most of the women said they had pre-existing metabolic conditions, and many mentioned that they wanted to lose weight. Women acknowledged concerns around their health problems and anxiety that their unhealthy eating habits would lead to their premature death. Overall, the participants voiced a great desire to change their lives and become healthier.

*'I was very fat and a diabetic. I had high blood pressure and cholesterol.'* (A16)

*'I cannot die before [my] time by not eating right.'* (O15)

*'I decided that I am also going to join because I want to make a change in my life.'* (A17)

This was further emphasized by the participants' references to their family health history as their reason to take part in the program, as some had relatives who were dying or had died from metabolic conditions.

*'We have a family history of diabetes. I was told that I needed monitoring. [...] I decided to start Banting.'* (A17)

Participants from A17 mentioned that they were encouraged by other women from the community who had participated in EBSA programs the year before. Participants from O15 and A16 said that they joined EBSA because it was offered to their wellness

group for free. Some women said that they were influenced by groups on social media that promoted a LCHF lifestyle. Participants were particularly motivated by people's before and after testimonials and photos after following the Banting diet.

*'One of my friends joined [the EBSA program]. She experienced an improvement in her health and weight, and that is the reason why I joined.'* (A17)

### **3.3.1.2. Theme 2: Perceptions of the EBSA program's structure**

Women said that being part of a cohesive group was the aspect of the program that they valued the most. In fact, it was mentioned that motivation dropped if attendance of the education sessions dropped. In terms of EBSA's team support, women from the A17 program reported being very happy with their coach and her continued support through the WhatsApp group, suggesting she was key to their positive experience.

*'Just to know that there are other people with you [in the EBSA program]. If you are on your own you could easily quit, but if you are with other people you feel more motivated.'* (O15)

*'One thing that put me off was the [lack of] attendance of the people.'* (A17)

*'The coach is very hands-on with the WhatsApp group. Therefore, if we have any questions, we can go to the WhatsApp group and ask her directly.'* (A17)

Generally, participants spoke favourably of the educators. However, participants from A17 complained that the educator did not speak Afrikaans, and they found this was not inclusive enough for the mostly Afrikaans-speaking community. The delivery of the educational sessions was perceived as very informative and helpful by some women; however, there was one complaint about some of the education material being too academic. In addition, some women felt uncomfortable about the lack of privacy when undergoing anthropometric measurements and the competitive nature of the weigh-ins, which were intended to motivate weight loss during the program.

*'The educator could not speak Afrikaans fluently. [...] Many of the people in my area have had a huge problem with English.'* (A17)

*'I found it [the EBSA program] to be very informative and I learned things that I never knew about sugar.'* (A17)

*'They (the EBSA sessions) are academically long with many graphics.'* (A17)

*'I do not like being in a group where we have to compete and the one looks to see how the other*



*one looks.’ (A17)*

Different views were expressed about whether the total number and frequency of the sessions were appropriate: some women mentioned that they were happy with the six sessions, some would have liked more sessions, while others would have preferred a larger gap between the sessions, as they found the six sessions in a row were too much of a commitment.

*‘We had the six meetings, which means it was six Saturdays consecutively and I feel that there should have been a gap.’ (A17)*

### **3.3.1.3. Theme 3: Experiences with the recommended diet**

According to almost all of the women, the meal plans provided during the programs were easy to follow and very helpful. One woman mentioned that this diet reminded her of how her ancestors used to eat. In general, women said that the diet made them feel more energetic, satiated for longer and that they could eat without feeling guilty.

*‘What makes more sense for me regarding the program is how our ancestors ate and how my grandmother prepared food. [...] Everything was full cream. There weren’t low-fat products and skimmed milk.’ (A16)*

*‘I felt energetic and I did not feel sleepy. My thoughts were sharper. I was more alive.’ (A16)*

*‘It [the LCHF diet] keeps you full for longer.’ (O15)*

*‘You can now eat without feeling guilty.’ (A16)*

Foods that many participants reported eating included eggs, cream, coconut oil, non-starchy vegetables, and chicken. Eggs in particular were highly regarded by most participants as an important and versatile food. Participants expressed an appreciation that eating certain fats such as butter and animal fat was permitted more freely with the EBSA diet and said that this improved the taste of their food. Adding coconut oil or butter to coffee (‘bulletproof coffee’) as a meal substitute was reported quite often.

*‘I think eggs are the most versatile out of the whole diet.’ (O15)*

*‘It is so nice to buy a piece of fat and put it over the vegetables.’ (A17)*

*‘About a teaspoon of coconut oil, a dash of cream, a dash of milk. [...] That is the bulletproof coffee.’ (O15)*

Participants were specifically asked about foods that EBSA had recommended that they disliked. Most participants were not dissatisfied with any of the foods, except the taste of coconut and a seed-based flour product which was promoted as a substitute for grain-based flour.

*'The porridge [low-carbohydrate version] I don't really like, it does not have a great taste [laughing], it puts you completely off, huh.'* (A17)

Participants admitted that it was quite difficult to give up certain foods that were excluded from the EBSA diet, particularly processed foods such as chips, chocolate, and sugar-sweetened beverages.

*'I love chocolate ... [laughing] Yes, that was actually difficult for me to get rid of.'* (O15)

Many participants said that they could afford to follow the EBSA diet during the program and that it was not too expensive for them. There were some participants who said that they struggled to afford the recommended foods after the program, particularly those who were unemployed or who had recently been retrenched.

Another unexpected factor that some women experienced around food was that certain food items that would ordinarily be available in local shops were difficult to get hold of. Some participants felt that these items were selling out quickly, due to the increased demand by EBSA participants who were following the same meal plans. In terms of grain substitutes, women stated that the coach played an intermediary role by supplying Banting products promoted by EBSA, which were not usually available in their communities.

*'It wasn't a problem [the diet]. I could make anything, and I did not spend a lot of money because it was natural stuff. Vegetables, eggs and chicken.'* (O15)

*'I wanted to carry on [Banting], but then I was retrenched. There was no money to carry on.'* (O15)

*'Sometimes the shop does not have butter or double-cream yogurt, because everybody wants to be on Banting.'* (A16)

*'The coach provides Banting food [products labelled as Banting], people can order from her.'* (A17)

#### **3.3.1.4. Theme 4: EBSA's influences on participants' lives**

Overall, it appears as though the EBSA program had a positive impact on participants' lives, as they said it provided many health benefits. Some participants stated that they became more active and started to exercise as a direct result of the program. Women reported that they felt healthier and they were no longer using some medications (e.g. antihypertensives).

*'The more I go, the more educated I am going to become and the more [weight] I am going to lose.'* (O15)

*'When I started with the program, I didn't really like to exercise. When the Banting program started, SC motivated me to walk the first 10 km. From then on, I do every walk that there is.'* (O15)

*'I no longer needed my high blood pressure pills.'* (A17)

According to some of the participants, the factor which made the greatest impact was the nutritional knowledge they gained from the program. Understanding the harmful consequences of sugar and refined carbohydrate consumption was something they said they will never forget. In addition, women mentioned that there were other people who would benefit from having this knowledge and they were encouraging these people to join new programs or to try the diet.

*'When you go shopping, you will always be checking the ingredients [...]. Subconsciously you know what you are allowed to and what you are not. You would always have that in the back of your mind [...]. So, there is always that filter.'* (O15)

*'When you look at people that are terribly overweight, or people eat things that they are not supposed to, then you intervene immediately.'* (A17)

#### **3.3.1.5. Theme 5: Challenges during and after the EBSA program**

When asked about some of the challenges participants faced with regard to participating in the EBSA program, the most notable one was the lack of support from people they interacted with. Many participants complained that they were not supported by the medical practitioners they saw, because the practitioners did not agree with the EBSA-recommended diet. In addition, participants felt a lack of support from friends,

relatives, and work colleagues during the early stages of the program. However, some participants reported that they received more support from their doctors and peers when these people saw their health improvements.

*'When I went to see my physician [...] I told her I am Banting. She said I must not do this because it is a lot of fat and I must stop it immediately. When I went to her again after three months, I sat there all quiet and I did not say to her I am still on Banting. However, she said to me, whatever you are doing, just go ahead.'* (A17)

*'I absolutely got no support. Not from my husband, not my mother, from nobody in the beginning. [...] When they saw what the program did to me and how I was [...], they began to support me.'* (A17)

A major challenge experienced by participants from O15 was the gang violence in the area. Women mentioned that lack of safety prevented them from being more active and made them feel stressed and anxious.

*'Another problem is the gunfire in surrounding areas. The most lovable thing to do was to go for a walk after we were finished with the Banting program. We were a very motivated group, but when the shooting started in Ocean View, our walks and running became less and less. We are human beings and we are scared for our lives.'* (O15)

Some women who had lost a great deal of weight during the program complained of an unexpected expense because they had to buy new clothes.

*'I think that the disadvantages were my clothes, it did take a lot of money. My clothes immediately were bigger.'* (A17)

Poor weather conditions appeared to be a challenge for some women and prevented them from engaging in activities and being motivated.

*'It was winter [during the EBSA program] and it rained. Believe me, the weather does play a role.'* (A16)

### **3.3.1.6. Theme 6: Suggested improvements to the EBSA program**

When asked about ways in which the EBSA program could be improved or optimized, the women made many suggestions. A major suggestion was that the follow-up sessions required a more structured schedule, as follow-up attendance was seen as an important facilitator of diet adherence. Also, participants mentioned that they did not

know what to do once they had reached their weight goals, so they proposed that EBSA should monitor them and provide weight maintenance plans. Some women even suggested that EBSA should run more than one program within the same year in the same community.

*'For instance, there are no fixed dates [for the follow-up sessions]; [...] However, if we could come together and put fixed dates, then we know I need to make time to attend, because support is very important.'* (A17)

*'We want to maintain [weight]. [...] They need to provide a session on maintenance.'* (A17)

*'It [the EBSA program] should be twice a year [laughing]. [...] With a gap in between. [...] And during that big gap, you start the monitoring.'* (A16)

Women felt that EBSA's message would be better spread to the wider community if EBSA would make use of the local newspaper or radio station. Moreover, they mentioned that providing before and after pictures of participants who took part in the program would be a good motivator for women interested in the EBSA program. Participants also suggested that EBSA should run similar educational programs within school environments or hospitals, as they felt these groups would benefit from the nutritional knowledge.

*'We have a radio station, [...] we can get somebody to talk about healthy eating.'* (A17)

*'The children are young, and they are supposed to learn the right way of eating. This could have a ripple effect and all these chronic diseases. [...] If we can do some awareness about it, especially among children, it will also help.'* (A17)

*'You will see all the people sitting there at the day hospital. They, young and old, are diabetics, they are obese and have high blood pressure. I have been taught the do's and don'ts in terms of eating. [...] However, this is something new and this needs to be introduced to the broader community.'* (A17)

### **3.3.2. Community assessment – naïve focus groups**

Four themes were developed from the analysis of the EBSA-naïve participant FGDs: (i) women's role within their households; (ii) women's dietary patterns; (iii)

women's perceptions of health; and (iv) interest in participating in a LCHF program. Table 4 lists the themes, sub-themes, and the definitions of the themes.

Table 4. Themes developed from the focus groups with EBSA-naïve participants (n=70).

| Theme                                                 | Definition of The Theme                                                                          | Sub-Theme                                                                                                              |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Theme 1: Role within their household                  | Women's roles and responsibilities as the caregivers. Priorities when shopping for groceries.    | 1.1. Women's responsibilities<br>1.2. Factors influencing shopping                                                     |
| Theme 2: Dietary behaviour                            | Descriptions of current diets and feelings around foods.                                         | 2.1. Current diet<br>2.2. Feelings around food                                                                         |
| Theme 3: Health perceptions                           | Understanding of being healthy and unhealthy.                                                    | 3.1. Definitions of healthy lifestyle<br>3.2. Understanding of unhealthy lifestyle<br>3.3. What women do to be healthy |
| Theme 4: Willingness to participate in a LCHF program | Willingness to participate in the EBSA program. Socio economic challenges to adhere to the diet. | 4.1. Desire to be healthy<br>4.2. Knowledge of LCHF diets<br>4.3. Barriers to adhering to dietary recommendations      |

### 3.3.2.1. Theme 1: Role within the household

Women described their roles within their households and in the community as that of caregivers. Women mentioned that it is their duty to take care of both children and husbands, which often entailed different roles.

*'I am a mother and a wife and the men do not think the way that I think. They do not worry. I always think about what my children and husband are going to eat.'* (Ocean View)

Tradition was something that women mentioned quite often when describing cooking roles and their roles in their households. They reported that it was expected of them, as the caregivers, to cook for the family, because that is how they were raised and what they saw when growing up. Although the women themselves said they were doing most of the cooking in their homes, sometimes they shared their cooking duties with other women in the household. Many women mentioned that it is expected of them to cook large meals to feed everyone in the family.

*'To prepare a complete cooked meal for your children or family is tradition. We grew up*

*with that and that is how your mother taught you.'* (Cloetesville)

Participants reported that they added starches, such as potatoes, rice and bread, to their family meals, to increase the volume, particularly in food-insecure households, and when there were men living in the home.

*'Sometimes when the food is not enough, then you have to stretch the food. [...] We make use of potatoes and rice; it is relatively cheap and we have big families.'* (Ocean View)

Even though cooking seems to be women's responsibility, women mentioned that most of the time men are the ones deciding about the type of food to buy. In addition, struggles with money were also mentioned by some women, since some depend on the men's budgets to buy and prepare their meals.

*'I have three men in the house and my children are big and they eat a lot. My husband lost his leg because of sugar. He was the breadwinner and the problem is that there is no money.'* (Ocean View)

When shopping, women considered money and distance to their home as their priorities. They chose where to buy their groceries depending on the amount of money they could spend. Moreover, they mentioned that they buy food that is faster and easier to cook, because of lack of time due to work schedules.

*'The food that I prepare at home must be fast dishes, because of a person's working circumstances. Moreover, quick things because it is easy.'* (Ocean View)

### **3.3.2.2. Theme 2: Dietary behaviour**

At most of the discussions, participants said that they ate three meals per day. In the morning, they ate cereal or oats or mielie meal with sugar and milk, and tea or coffee. A common lunch reported by participants was a sandwich with cheese, Marmite, peanut butter or jam. Some participants said that they ate whatever was in their cupboards, which meant that they sometimes only had bread at all three mealtimes. Dinner was the main meal and usually consisted of rice and potatoes and sometimes chicken. A few participants said that they enjoyed *koeksisters* (sweet doughnuts) over weekends; others said that they baked cake every weekend and one participant said that she enjoyed eating biscuits. Some participants said that they drink alcohol (beer, red wine and whiskey) over

weekends and others said that they drink sugar-sweetened drinks. They also said that they had *braais* (barbecues) which they all felt was a very healthy way of preparing food.

*'Mine [diet] consists of bread. In the morning, I will have porridge, such as Jungle Oats and Weet-Bix.'* (Ocean View)

They said that since they usually have to cook for many people, they avoid cooking meat, as it can be very expensive. Some talked about their cravings and downfalls, usually with regard to sweets and chips. Women mentioned that they get triggered by stress and anxiety, and that was what usually led them to eat those foods. In addition, not being of control of their eating habits was something the women repeatedly mentioned when being asked about their dietary choices and preferences around food.

*'Late in the evening when everyone is sleeping, then you go on a hunting trip to find something to eat, chips or something else that you know is going to make your joints pain or make you sick. I feel that I have a psychological problem.'* (Cloetesville)

When talking about their 'must have' food items, the women mentioned several things but mostly starchy foods. Participants identified their food choices as crispy chips, potatoes, bread (toast with butter and jam, cheese, Marmite or butter, margarine, and peanut butter), rice and potatoes, and some vegetables such as sweet potatoes, cabbage, and pumpkin with their dinners. In terms of drinks preferences, women mentioned a variety of drinks, especially coffee. Some felt that water was not something that they enjoyed and said that they were satisfied with getting water in the form of tea or coffee.

*'I am obsessed with coffee. [...] I drink up to nine cups of coffee a day. I can stay without food for the whole day as long as I have my coffee.'* (Ocean View)

### **3.3.2.3. Theme 3: Health perceptions**

When asking the women what they understood by being healthy, some mentioned aspects related to diet and the types of foods considered healthy. Others mentioned that healthy living means making healthy choices, which depend on each individual. They also mentioned eating with restraint or portion control, and focusing on healthy food preparation.



*'I think that a healthy lifestyle includes that you have to eat healthy every day; you need to exercise and eat a green salad.'* (Ocean View)

When describing what they thought was healthy for them, one participant mentioned that she uses the brand *Futurelife*, while some mentioned that they used low-fat products. *Futurelife* (Durban, South Africa) is a South African food company that sells cereals, drinks and snacks high in carbohydrate and low in fats, marketed as healthy options for the general public (<https://futurelife.com>). Most of the participants understood a healthy lifestyle to mean three meals per day; drinking a lot of water, especially first thing in the morning; cutting down on oils; eating fresh fruit and vegetables; incorporating exercise into their daily routine; and getting enough sleep. Some participants felt that inner joy was important for one's health.

*'It [healthy living] comes down to correct eating habits, enough exercise, to drink enough water and to stay calm.'* (Cloetesville)

*'For me it is important that you get enough sleep, your stress levels need to decrease, and you have to develop balanced eating habits.'* (Ocean View)

When the women were asked what an unhealthy diet meant to them, they mentioned foods high in dietary fats, starchy foods, and takeaways. Participants associated chronic illness such as diabetes, heart disease, arthritis, gout and high blood pressure with unhealthy eating, such as cooking with a lot of oil and lack of exercise.

*'Can I say everything that is white? [laughter] Rice, sugar, potatoes, even mielie meal and sweet potato.'* (Cloetesville)

Moreover, some mentioned that eating too much of a certain type of food is considered to be unhealthy and that alcohol can also be harmful.

*'Too much of one thing is unhealthy. [...] I also think that alcohol plays a role. It is not wrong to drink, but a certain percentage of alcohol can be unhealthy.'* (Ocean View)

In terms of ways of improving their health, they said that incorporating fresh vegetables and fruit into their meals was good for their health and that steaming and grilling their food was healthier than cooking with a lot of oil and fat, and that cutting down or reducing sugar in sauces was healthy.

*'At the moment I try to reduce the carbs and sugars, I really try hard. It is tough, but I try because you always go back to your bad habits. I try every day.'* (Ocean View)

Some mentioned that physical activity is important for them to have a healthy lifestyle and that they try to maintain an active lifestyle. They understood that by doing exercise, they could eat whatever they wanted.

*'The reason that I joined the gym is because I want to eat what I want to eat. If I want to have biryani today, then I will have biryani, because tomorrow I will burn it out in the gym.'* (Cloetesville)

#### **3.3.2.4. Theme 4: Willingness to participate in a LCHF program**

Most of the participants felt that their current lifestyle and eating habits were not healthy and they were all keen to change to a healthier lifestyle. They acknowledged that this meant changing their current eating habits and incorporating more exercise into their routine.

*'Just one word, healthy lifestyle, healthy eating. That is my mindset change for myself to have a lifestyle change. I want to have a healthy life.'* (Ocean View)

*'I think everyone sitting here this morning does not really lead a healthy lifestyle. Our eating habits are not healthy, but we try.'* (Cloetesville)

As mentioned previously, the women indicated a desire to become healthier, and a willingness to be enrolled in a program where they could receive education about nutrition and healthy eating habits. Two or three participants added that they were already following a low-carbohydrate eating plan that was much like Banting, as advised by their doctors. Women stated that they wanted to enrol in the program for themselves, but also to be a good example for their families, especially for their children.

*'I also think that it will be good for myself, so that I can instil it in my children and especially my husband, who is a diabetic.'* (Cloetesville)

Participants from Cloetesville mentioned that most likely the community would not be interested in a Banting/low-carbohydrate nutritional program, although they would consider it. Some women in Ocean View knew about the EBSA program because they knew others who had taken part in the program previously. They said that others' experiences made them want to enrol in the EBSA program.

*'For myself I need to make a dramatic change. Last year they treated me for organ failure, I almost died. [...] Therefore, for me this is important, this time I need it. It worked for my sister. She is still on Banting and she is very healthy.'* (Ocean View)

Women agreed that their communities needed nutrition education and community-based interventions. Only a few participants had heard about the Banting/low-carbohydrate eating plan, but did not know much about it and thought that it might be expensive to follow such a program. Some voiced concerns about the recommended foods on the LCHF diets, such as the amount of dietary fats and the contradiction with what doctors had told them.

*'I also say that the Banting diet is a little bit expensive, and I am not fond of it. According to what I have read, it is a lot of greasy food, because I can now eat bacon and eggs.'* (Cloeteville)

*'For me it was also shocking. The diet with the amounts of fat that we always think we need to cut out of a diet [...] We always believe what doctors tell us.'* (Ocean View)

There was a general desire in the whole group to become healthy and women reflected on their life's struggles and challenges to do so. Many could identify stress, poverty and unemployment as reasons for their unhealthy food choices. They said that gang violence and safety were things they had to deal with daily. However, they mentioned that the situation had improved and that only in some areas there were still safety issues.

Women also mentioned that some of the challenges that they are facing would make it difficult to be able to change their habits, not only for them but also for their families. Mental health was also something participants were concerned about, and some mentioned that they felt they were not ready for such a significant dietary behaviour change.

*'Mentally I am not ready to participate in any program. In the past few months, I had a setback where I lost heavily. [...] I was just in the house and I took it out on food, I just wanted to eat everything that I craved. [...] I am still dealing with my losses, so I am not mentally right to participate.'* (Ocean View)

As stated before, women mentioned that if they were about to change their food habits, their families' habits would have to change as well, so some said this could create

a huge burden in their budgets. Tradition and culture were seen by the women as potential challenges as well.

*'I am not willing to make two dishes; hell, no, it is too expensive. Therefore, if something can work it out, how to keep everyone in the family happy.'* (Cloetesville)

### **3.4. Discussion**

This study explored the experiences of a sample of women who had participated in an EBSA education program that promoted a LCHF diet as a sustainable lifestyle to prevent and, and manage, metabolic health conditions. The study also investigated the needs and preferences of women who had never taken part in an EBSA program. These participants were from three under-resourced South African communities, where residents have limited access to education, employment, and health care. Alcohol and drug abuse and violent crime are also prevalent within these communities (1). To our knowledge, this is the first study to document women's experiences with a LCHF diet in a challenging socio-economic environment in South Africa and to assess women's needs before enrolling in a nutritional program promoting LCHF diets. Given that LCHF diets are perceived as expensive and in conflict with current dietary guidelines (81,203), one purpose of this study was to understand whether LCHF diets would be considered culturally acceptable and affordable among women from these communities. Another purpose was to identify ways to improve the EBSA program, by exploring the factors that may impact the program, as well as perceived barriers, and facilitators of dietary compliance. Hence, the aim was to optimise the program and elicit recommendations for content and preferred intervention approaches for the EBSA providers.

Based on the group discussions with EBSA participants, a significant finding was that the program and its recommended diet were well understood and well received by these participants. It is important to note that the recruitment of participants to this study would likely have favoured those that had an overall positive experience with the EBSA program. Any participants who were very dissatisfied with EBSA or a LCHF diet would probably have been more challenging to reach and less likely to enrol in the study. It is

also unknown whether participants followed a LCHF diet or whether their body composition and health had improved. Nevertheless, the very positive attitude of these participants toward a LCHF diet is encouraging. An interesting finding is that participants favorably related a LCHF diet to the way that their ancestors ate. This is similar to findings reported in a study with Māori participants from New Zealand suggesting that a LCHF diet is readily accepted by these individuals (203).

As is typical with other dietary intervention studies (175,192,204–208), the desire to improve their health and lose weight was crucial to these participants' wish to enrol in the EBSA program. Experiencing health and weight improvements during the program and achieving this while experiencing less hunger and more energy than expected were likely decisive motivating factors for participants. LCHF diets have been demonstrated to increase control over eating by reducing hunger and cravings (175,192,208). As evidenced in the discussions with the EBSA-naïve participants, most women seemed aware of their unhealthy dietary habits. These women also indicated that they wanted to make the appropriate dietary changes to improve their health.

Being part of a cohesive and supportive group, where all participants were following the same diet, was a factor that motivated these participants to attend sessions and adhere to dietary changes. This has been documented in other studies (209,210). The use of an online group messaging application, in this case WhatsApp, appeared to be instrumental in facilitating group support outside of the scheduled sessions. Indeed, internet-based communication technology is becoming more valued as a tool for modifying behaviour in nutritional interventions, as it allows on-demand communication with a large number of participants (175,210–212).

Family support is believed to aid adherence to a range of dietary and health interventions (213–217). By contrast, participants in this study identified the lack of support from family and peers as a significant challenge during the EBSA program, making eating in social situations difficult. This is a valid concern, as, similarly, diabetic patients often struggle to cope with their illness due to the absence of support in the social environment (218). Adding to this challenge, family dietary behaviour was seen as an obstacle when family food preferences, food selection, and preparation conflicted with

the EBSA recommendations. Most of the EBSA-naïve participants anticipated reluctance by family members to make dietary changes. This result is similar to that of other studies conducted in different cultures (204,205). Similarly, the lack of support and conflicting advice from doctors caused confusion and frustration among participants. These experiences are remarkably similar to those of a group of individuals with type 2 diabetes who followed a LCHF diet (192). In both studies, family, peers, or doctors became more supportive of the participants' efforts after observing improvements in their health and weight.

LCHF diets remain highly controversial, mainly because of the health concerns related to increased fat consumption and reduced whole-grain consumption (203,219). This was also seen as something that would worry women when thinking about enrolling in the EBSA program, since they thought it would be a potential challenge. An important avenue for future research is understanding how community doctors perceive a LCHF diet. It appears essential for LCHF dietary interventions to engage with community doctors to provide consistent messages to participants.

A qualitative study conducted in New Zealand reported that financial constraints prevented participants from adhering to a LCHF diet for an extended period (203). While this was the case for some participants in our study, most of the EBSA participants said they could afford the foods on the program's meal plan. A limitation of our study was that neither diet nor socioeconomic status was evaluated quantitatively in these participants. Therefore, it is not clear to what degree this sample represents the financial status of all EBSA participants and their wider communities. However, although they all lived in low-income communities, they may have represented a more affluent part of the community. It is also possible that financial constraints may have prevented other women from joining the EBSA program or following the diet. Nevertheless, these findings suggest that cost-effective LCHF meal plans are affordable, at least by some residents of low-income communities.

The physical environment could be seen as a barrier to the accessibility and availability of healthy foods. It relates to the distant location of supermarkets or grocery stores and the high cost of healthy foods in the local shops (220,221). This is an essential

finding, since neighbourhood food environments can influence the target audience's ability to implement the nutrition messages received (222). In congruence with other studies in low-income communities, social factors such as gang violence were reported as a major challenge to following a healthy lifestyle (67,89,203). Unfortunately, gangsterism, drug abuse, and violent crime are endemic to the townships around Cape Town (1,223). While dietary intervention programs are unlikely to change these social issues directly, organizations should be aware of the limitations they place on participants. These include high social stress levels and a challenging environment in which to conduct physical activity, as identified in both EBSA and EBSA-naïve participants.

Regarding the discussions with EBSA-naïve participants, the results on barriers to following dietary recommendations reveal personal and environmental factors that make it challenging for participants to make dietary changes or to adhere to dietary recommendations. Women strongly emphasized financial problems, food insecurity, and the cost of healthy foods. It was an expected result, as the majority of the participants are unemployed. The findings on financial constraints and food cost are in line with those of previous studies (204,205).

Support and knowledge emerged in the group's discussions as facilitators of following dietary recommendations and have been reported in other studies; this finding indicates that participants in this study value education. A positive relationship between social support and chronic disease self-management has been previously reported (224): there is room for greater social support in these communities. Dietary behaviour patterns were demonstrated to be susceptible to social influences (224). Moreover, other studies have indicated a positive relationship between social support and self-care behaviours (225). Overall, families were identified both as a barrier to and facilitator of dietary self-management by the two groups of participants, a result also identified previously (226). The primary finding of this qualitative study is that the EBSA program and its recommended LCHF diet are generally well understood and well received by the participants. In addition, participants believe that their dietary changes have led to health improvements. This study highlighted some aspects of the program that participants felt were essential to its success,

such as the cohesive support group and some challenges that need to be addressed, such as more structured follow-up support. This finding could be attributed to the fact that the participants perceived themselves as more deficient in knowledge about their chronic diseases than about the diet. The results obtained from this study provided insights that were used to plan an EBSA program tailored to the needs and abilities of women from under-resourced communities. The gap between dietary recommendations and the awareness and practices reported by the participants indicates the need for constant identification of barriers to self-care by EBSA providers in order to offer appropriate support. A surprising finding concerning the nutritional education program is that most participants strongly emphasized the topics related to non-communicable diseases. At the same time, they were not explicit about topics to do with diet, as indicated by other studies (227,228).

The use of EBSA participants and EBSA-naïve participants is an important strength of this study, since their similar views add weight to the issues at hand. The divergent information also helps to create a platform for further exploration of participants' experiences and perceptions. However, the small and convenient sample used in this study may not represent the population, which may limit the generalisability of the results. In the exploration of dietary practices, the reported dietary changes were not quantitatively verified. The reporting on dietary intake mainly concerned the types of foods and frequency of consumption, and not the exact amounts of foods or drinks consumed. Thus, the reported reduction in sugar intake, fats and salt, and the reduction of portion sizes could be subjective. However, since the study's objective was to gain insight into the nutritional issues that warrant intervention, qualitative analysis of dietary practices was deemed sufficient. The numerous barriers identified in this study are likely to be major contributing factors to the gap between awareness and practice. These barriers are mainly in the personal, socioeconomic, and physical environment domains. Social support was the principal facilitator of following dietary recommendations, with family support being seen as both a barrier and a facilitator.

While the EBSA program addressed knowledge gaps and dietary practice problems, and included strategies to address the barriers, it should also incorporate



suggestions concerning facilitators of dietary adherence. This chapter explores perceptions of the EBSA program by women from Ocean View and Atlantis. However, EBSA has run other programs in various other communities that could have resulted in a completely different analysis. The results were interpreted, and a report was written with some suggestions for the EBSA team. The recommendations were divided into four main topics, namely recruitment, program, follow-ups, and publicity in the community, as presented in Table 5. These suggestions are aimed at the re-design of the EBSA intervention to be offered in a new community or a past community, that is, Ocean View. For this reason, a community assessment with women from Ocean View and Cloeteville who had never taken part in an EBSA program was conducted to complement the findings of the group discussions with women from previous EBSA programs.

### **3.5. Conclusions**

The EBSA program was eventually redesigned for a pilot study in Ocean View, as explained in the following Chapter 4. The recommendations shown on Table 5 can be applied to community-based programs that introduce LCHF diets to low-income communities and diets that target a reduction in highly processed foods and simple sugar.

Table 5. Recommendations for EBSA to optimise the nutrition education program.

|                         |                                    |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Participant recruitment | Previous participants' experiences | Previous EBSA participants reported having improved their health, so the potential health benefits could be used to advertise and recruit participants.                                                                                                                                                                                                                                                         |
|                         | Clinics                            | EBSA should consider contacting clinics and private practitioners to find potential participants for future programs.                                                                                                                                                                                                                                                                                           |
|                         | Existing physical activity groups  | Previously, some of the programs were offered to women who were already taking part in a physical activity group, which was free. EBSA could look for those groups and recruit women from there.                                                                                                                                                                                                                |
| Program's structure     | Interactive sessions               | The EBSA educator in Ocean View, who was an actress, was seen as someone very approachable, and this suggests that the sessions should be interactive and engaging for women.                                                                                                                                                                                                                                   |
|                         | More sessions and follow-ups       | The number of sessions created disagreements between the group of women, especially in Atlantis. Instead of providing one session every week, introduce a gap between sessions: for instance, provide two sessions per month.                                                                                                                                                                                   |
|                         | Reduce emphasis on weight loss     | The program gave an award to the participant who lost more weight, and therefore, some women felt that the program's main outcome was to lose weight. It is recommended to encourage women to be healthier while acknowledging participants' success. In that case, more aspects of the program should be considered for awards, such as best food recipes, best health markers, or best adherence to the diet. |
|                         | Privacy                            | Some women felt uncomfortable being measured in front of other participants and having their results visible to everyone. Although this was not the primary concern for the majority of women, EBSA should conduct assessments in a more private manner.                                                                                                                                                        |
|                         | Language used                      | The EBSA sessions should use a language accessible to most of the community. The EBSA educator should speak the languages that most community members can understand.                                                                                                                                                                                                                                           |

|                    |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | Seasons and timing      | As some women mentioned, poor weather conditions are likely to deter them from attending sessions. The sessions should be in the mornings, since women prefer to spend the afternoons with family, and when it is not winter.                                                                                                                                                                                                                                     |
|                    | Brands                  | Participants said that certain low-carbohydrate brands and products were recommended during the program. Women from this study complained that these products were often not available in the local supermarkets, and if they were, they might not be affordable for some women. For these reasons, products in the program's meal plans should be those women can find in their local supermarkets and can afford.                                               |
|                    | Clothing                | One of the challenges that some women faced during the program was that their clothes no longer fit them, and they could not afford to buy new clothes, because they were losing weight rapidly. EBSA should take into consideration that some women might lose weight very quickly and that they need to find places to buy new affordable clothes.                                                                                                              |
|                    | Variety of meal plans   | One of the concerns of food availability is the products' stock. Women explained that since they started the recommended diet simultaneously, and were usually the ones that buy the groceries at home for the whole family, some of the products were out of stock in their local supermarkets.                                                                                                                                                                  |
|                    | Work out exercise plans | Women said they felt more energetic after following the EBSA diet, which leads to a desire to exercise. In communities such as Ocean View, where gang violence has increased in recent years, EBSA could consider providing women with some exercise programs that could be done at home.                                                                                                                                                                         |
|                    | Mind-fulness sessions   | Women mentioned during the community assessment that they felt they were out of control with their dietary habits and that stress sometimes made them eat compulsively, which could mean that because of different life struggles, they use food as a stress relief or a way out. EBSA could create a session related to mindfulness, how to deal with stressful situations, and hunger control to help women deal with these situations.                         |
| Follow-up strategy | EBSA coach              | The coach's role is a necessary tool for EBSA's sustainability within the community. In new communities, EBSA should identify from the group of women, a woman that appears to have the best profile to become the next EBSA coach for the community. Considering that unemployment rates and retrenchment among women in those communities are high, it should be essential to know about women's situations and choose someone with whom they feel comfortable. |

|                       |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       | Scheduled follow-up             | Follow-ups provided by EBSA should be more consistent and planned, perhaps while in the program's development stages. Some of the topics for the EBSA follow-ups can be how to maintain weight, understanding the health markers, how to access Banting resources (social media, EBSA/TNF website), how to 'easily' explain the recommended diet (for them to spread the word in the community). The educator or coach could conduct these sessions. However, more resources would need to be provided.                                                                                                                                                                                  |
| Publicise the program | Invite local doctors and nurses | Some women had been advised not to follow the Banting diet by their doctors. EBSA could invite local practitioners and nurses to one of the EBSA sessions for them to see what the program is about. EBSA should also investigate local health care professionals' perceptions of LCHF, and EBSA.                                                                                                                                                                                                                                                                                                                                                                                        |
|                       | Invite family and friends       | Many women reported that they had little or no support from family, friends, or colleagues at the beginning of the program, although some experienced increased support when these people could see results. Some women also tried to encourage other people to join the program or follow the diet but struggled to convince them. Moreover, women from the community assessment acknowledged that one of their greatest challenges was their families' support. By having a session where participants can invite people that are usually around them, the program and diet can be explained to these people, and by doing this, women might receive more support from their networks. |
|                       | Media                           | EBSA could promote the program and the recommended diet on the local radio and in newspapers (maybe with before and after pictures of previous participants). It could also be an excellent way to follow up with the community. EBSA could provide meal plans once a month to the newspaper and other resources to keep women informed.                                                                                                                                                                                                                                                                                                                                                 |

# CHAPTER FOUR: EVALUATION OF OCEAN VIEW EBSA PROGRAM

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## 4.1. Introduction

It is widely considered that community-based intervention studies are valuable in health, social science, and education to gather evidence to evaluate the effectiveness of innovative and often “real world” interventions (229,230). With the current multiple burden of disease in South Africa, the need to develop effective interventions to prevent and manage NCDs is paramount (40,231–233). Several studies have demonstrated that community-based lifestyle interventions focusing on nutrition, physical activity, and healthy behaviours can benefit different patient subgroups, including those with non-diabetic hyperglycemia, prevalent cardiovascular disease, or established type 2 diabetes (42,224,234–238).

Some dietary guidelines cautiously accept that there might be benefits to the use of low-carbohydrate diets for patients with these metabolic conditions (239). As with many other dietary approaches, there is inconclusive evidence based on long-term compliance and sustainability of carbohydrate restriction. The available data suggest that adopting a low-carbohydrate diet is a valid and potentially effective treatment option for diabetic and obese patients. Although LCHF diets have been popular in South Africa, community-based interventions using these diets in under-resourced communities did not exist until EBSA (240).

In November 2018, data on women’s experiences of EBSA programs were gathered through FGDs. A community assessment was conducted in Ocean View in order to redesign the program (Chapter 3). Several insights resulting from this research were shared with the EBSA team, and some suggestions were eventually implemented in the Ocean View program. In summary, regarding participant recruitment, a community meeting was scheduled for potential participants interested to attend. Local clinics and health practitioners were contacted and informed about the EBSA program, with the aim

that they should encourage their eligible patients to participate. A video of testimonials was shared at the community meeting to motivate women to enrol in the EBSA program (see Table 5).

Concerning the program's structure, sessions were planned to be less academic and more interactive by reducing the amount of lecturing using slide presentations and increasing interactions using activities such as debates and games. There were five sessions in total, of around two hours each, every Saturday morning in spring, starting at the end of August 2019, and followed by an EBSA closing ceremony at the beginning of October 2019. After the EBSA program sessions ended, the EBSA team conducted follow ups once a month for the following three months, and after that every two months. Body measurements were taken privately in a separate room, to ensure that the women were comfortable and did not feel like the program was analogous to a weight-loss competition.

The EBSA program aimed to acknowledge participants' efforts towards better health independently from their health goals. The language primarily used for the sessions was that most widely spoken in the community, in this case Afrikaans, and sometimes English. No specific brands were promoted by the EBSA program as low-carbohydrate substitute products. EBSA provided various meal plans with different recipes but the same nutritional values to the women every week, so not all women were following the same meal plan each week. As part of a follow-up sessions, the women participated in a physical and mindfulness session in January 2020. Women were provided with some easy workout exercises to do at home and some breathing and mindfulness techniques to use during stressful times. As part of EBSA's follow-up sustainability plan, three women were approached after completing the program to take part in training to become EBSA coaches in Ocean View. The EBSA program was introduced to hospitals nearby, and two nurses of Ocean View were hired to work for the program.

The Ocean View program was evaluated using a mixed-methods interventional evaluation with both qualitative and quantitative components (241). Indeed, some researchers have argued that even when submitting a protocol for the funding of

evaluations of interventions, choosing not to use a mixed-methods approach should be justified. Risk factors, multi-faceted causes, and the nature of a specific matter can arguably be better addressed with this mixed-methods approach. In health science, introducing the use of a mixed-methods inquiry allows researchers to gain a more comprehensive understanding of patients' health status, by quantitatively generating an account of their symptoms and qualitatively capturing their individual experiences of illness, barriers to treatment and prevention (241–244). By highlighting the importance of the context of the intervention under study, mixed-methods research can generate evidence of the intervention's effectiveness and implementation fidelity.

This pilot study aimed to provide information that may be used to improve the EBSA program implementation, translation, and sustainability. As a pilot study, it further aimed to provide proof of concept of the program's effectiveness at improving diet and health outcomes. This study's specific objectives were to determine the extent to which the women from Ocean View participated in an EBSA intervention and to evaluate the factors that affected the implementation and translation of an EBSA intervention in the women's lifestyle decisions. Factors included the facilitators of and barriers to attending and understanding the EBSA sessions, and implementing and sustaining dietary changes. Another objective was to evaluate the extent to which the EBSA program impacted participants' lives.

## **4.2. Methods**

### ***4.2.1. Study overview and ethical approval***

This mixed-methods pilot study used health assessments, questionnaires, focus group discussions and in-depth interviews (IDIs) to evaluate an EBSA program with 32 women from Ocean View. A mixed-methods concurrent triangulation study design was used. Consistent with the study aims, we determined that each set of data would be given equal focus. The Human Research Ethics Committee (HREC REF 723/2018) of the University of Cape Town approved the protocol and informed consent procedures. The

study was performed in accordance with the principles of the Declaration of Helsinki (2013, Fortaleza, Brazil), the International Conference on Harmonisation and the South African Good Clinical Practice (GCP) guidelines (245). All participant forms, including the informed consent and the participant information document, were available in English and Afrikaans. All participants received a unique identification code to anonymize their identities. This code was used on all data collection forms, databases, blood samples and in interview transcripts. Only the study investigators had access to information that could be used to identify the participants.

To complete the study, participants attended between nine and 11 sessions of approximately two hours each, at a central location in Ocean View (Figure 2). Participants met four times with an investigator, for about 20 minutes each time, at a convenient time and location for each participant. Visit 0 consisted of a community meeting to recruit women. At the first visit, participants were given the participant information sheet (Appendix J), completed the informed consent (Appendix K) process, and having obtained consent, completed the baseline questionnaires and had their diets (FFQ and 24-hour food recall), weight and metabolic health markers assessed. Accelerometers were worn for eight days to assess participants' device-measured physical activity. Participants met again briefly with an investigator on two occasions, to collect the accelerometer and for a second and third 24-hour food recall.

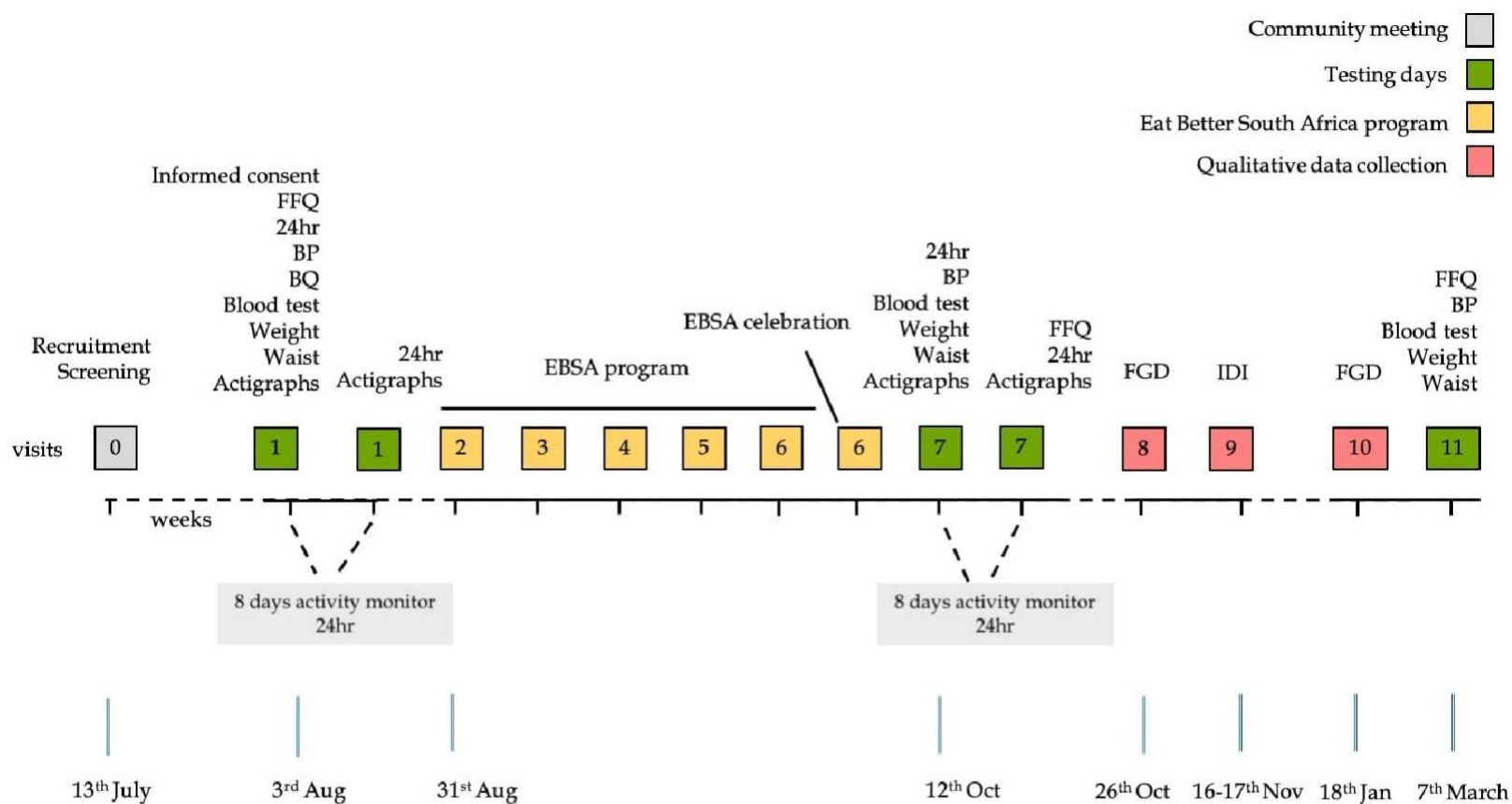
Subsequently, participants took part in an EBSA program involving five nutritional education sessions, held once a week (Visits 2–6). Following those sessions, EBSA participants were invited to attend a ceremony to celebrate the end of the program (Visit 6a). A follow-up testing visit for assessment of diet, weight, physical activity and metabolic health was conducted shortly after the program ended (Visit 7 and subsequent week). Participants then took part in a FGD in which questions about the program were discussed (Visit 8).

Participants identified during the FGDs as having more to say about the program were invited for an IDI (Visit 9). After three months, some participants took part in another FGD visit (Visit 10), in which questions about the sustainability of the program were discussed. Participants were then invited for another testing visit (Visit 11), six



months after the EBSA program, to conduct selected diet, health and body-composition assessments.

The EBSA team was also interviewed in IDIs as part of the follow-up evaluation. At the end of the study, participants received written and verbal feedback of all their individual test results and the averages of the study group. Participants who had severe metabolic conditions were identified and referred to the study doctor for further treatment and follow-up. For data collection, participants were reimbursed for their transport and time, but they did not receive remuneration for attending the EBSA sessions.



FFQ: Food Frequency Questionnaire; 24hr: 24-hour Food Recall; BP: Blood Pressure; BQ: Baseline Questionnaire; EBSA: Eat Better South Africa; FGD: Focus Group Discussion; IDI: In-depth Interview.

Figure 2. Ocean View's visits study overview.

#### ***4.2.2. Study design and justification of sample size***

A single-arm investigation was considered suitable to meet the aims and objectives of this pilot study. The sample size was determined largely by the capacity of an EBSA program (32 participants) and the expected availability of participants, based on previous EBSA interventions (20–30 people). The sample size was sufficient to conduct six FGDs in two different sets (with six to eight participants each) and to identify trends in diet and health outcomes after the intervention.

#### ***4.2.3. Participant eligibility***

To be eligible for the study, participants had to have either a body mass index greater than 25 kg/m<sup>2</sup> or a waist circumference greater than 80 cm; be female; between 18 and 69 years old; capable of providing informed consent; able to understand English or Afrikaans; a resident of Ocean View; and be willing and able to attend the program sessions and testing days. Women who reported being pregnant were excluded from the study.

#### ***4.2.4. Participant recruitment and preliminary information***

A female resident of Ocean View was asked to assist with recruitment. Potential candidates for this role were women who had helped recruit participants for the previous study in Ocean View. Study investigators and this local resident recruited eligible participants directly from the community. All interested participants met with a study investigator, either at the time of recruitment, via telephone or at an information session that was organised in Ocean View. During this meeting (Visit 0), the investigator confirmed eligibility (by measuring weight, height, and waist circumference), explained the study as outlined in the full information sheet, and answered any questions. Potential candidates were also given the participant information sheet (in English or Afrikaans). Participants were then given time (two weeks) to consider their participation. Those that were eligible and wanted to participate were then invited to attend the first study visit for the formal informed consent procedure and baseline assessments.

#### ***4.2.5. Visit 1: Informed consent, baseline questionnaires and baseline assessments***

##### ***4.2.5.1. Overview of Visit 1***

Testing took place in a community hall in Ocean View. Participants were asked to arrive in batches of four every half an hour, from 7 a.m. to stagger testing. Participants were asked to arrive after an overnight fast (10–12 hours) and abstain from vigorous physical activity on the morning of and the day before testing. They were also asked not to take any prescribed medication on the morning of the visit and to bring it with them to take after the blood sample was collected. Private, separated stations were set up for all procedures and assessments, and participants were moved from one station to the next. This ensured that answers to questions, health results, and procedures were kept private and confidential. At different stations participants underwent informed consent, had their blood pressure measured, had a blood sample taken, were given a snack and drink, completed a number of interview-based questionnaires, and had their body weight and waist circumferences measured. For eight consecutive days in the week after the testing visit, they wore an accelerometer around their hips to measure physical activity. Details of the procedures conducted are given below.

##### ***4.2.5.2. Informed consent (Visit 1)***

At the start of Visit 1, a study investigator met individually with participants to confirm their eligibility, re-explain the study in a language they understood (Appendix K) and answer any questions they may have had about the study. Specifically, the study investigator explained the purpose, benefits, potential risks of any study procedures and other ethical considerations. Participants were told that taking part in the study was entirely voluntary and that they could withdraw at any time. They were also told that an investigator could withdraw a participant from the study at any time should they believe it was in the participant's best interests to do so. They were told that the study investigators would keep their data confidential and that participants would be asked

not to discuss the FGDs with anyone outside the group. However, they were also told that it was possible that other participants may discuss the FGDs outside of the study. Participants were given a chance to resolve any queries or concerns about their participation in the study and confidentiality arising from the use of personal data. Once both the investigator and the participant were satisfied that all the participant's questions had been answered, they both signed the informed consent form at the end of the information sheet and the participant was enrolled in the study. Prior to the FGDs and IDIs and the long-term follow-up visit, participants were informed again about these visits and they signed a separate consent form before taking part.

#### **4.2.5.3. Blood sampling and blood tests (Visit 1, 7 and 11)**

Participants were asked when they last ate, exercised and took medication to assess whether they had appropriately fasted and rested for the tests. Approximately 20 ml of blood was drawn by a nurse using a needle and syringe. Samples were analysed on the day of testing by a certified pathology laboratory (Lancet, South Africa) for the following blood markers showed in Table 6 with the optimal values for each: Gamma- glutamyl transferase (GGT), alanine aminotransferase (ALT), aspartate transferase (AST), total cholesterol, LDL cholesterol, HDL cholesterol, non-HDL cholesterol, total cholesterol/HDL cholesterol, C-reactive protein (CRP), haemoglobin A1c (HbA1c), fasting glucose, fasting insulin, Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) index, and Quantitative Insulin Sensitivity Check (Quicki) index.

Table 6. Optimal values for blood markers (11).

| Blood marker      | Optimal values                                                            |
|-------------------|---------------------------------------------------------------------------|
| GGT               | GGT < 64 IU/L                                                             |
| ALT               | ALT < 40 IU/L                                                             |
| AST               | AST 15 to 40 IU/L                                                         |
| CRP protein       | CRP < 1.0 mg/L, average risk 1.0 to 5.0 mg/L, and higher risk > 5.0 mg/L. |
| Total cholesterol | Total cholesterol < 5 mmol/L                                              |
| LDL cholesterol   | LDL cholesterol < 3 mmol/L                                                |

|                       |                                                                                                                         |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------|
| HDL cholesterol       | HDL cholesterol > 1.3 mmol/L                                                                                            |
| Non-HDL cholesterol   | non-HDL cholesterol < 3.8 mmol/L                                                                                        |
| Cholesterol/HDL index | Total cholesterol / HDL cholesterol < 4.1, raised 1.8 to 2.2 mmol/L, high 2.3 to 5.6 mmol/L, and very high > 5.7 mmol/L |
| Triglycerides         | Triglyceride optimal < 1.7 mmol/L                                                                                       |
| HbA1c                 | HbA1c 4 - 5.4 %, increased risk for diabetes 5.5-6.4 % and diabetes > 6.5 %                                             |
| Fasting glucose       | Fasting glucose < 5.6 mmol/L, elevated/ prediabetes 5.6 - 6.9 mmol/L, high/and diabetes > 7 mmol/L                      |
| Fasting insulin       | Fasting insulin 2 - 20 mIU/L                                                                                            |
| HOMA index            | HOMA index < 2 and insulin resistance > 2 with other risk factors.                                                      |
| Quicki index          | Quicki index > 0.45, prediabetes 0.45-0.339, diabetes < 0.3.                                                            |

Gamma-glutamyl transferase (GGT), alanine aminotransferase (ALT), aspartate transferase (AST), total cholesterol, LDL cholesterol, HDL cholesterol, non-HDL cholesterol, total cholesterol/HDL cholesterol, C-reactive protein (CRP), haemoglobin A1c (HbA1c), fasting glucose, fasting insulin, Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) index, and Quantitative Insulin Sensitivity Check (Quicki) index.

Liver function enzymes (GGT, ALT, AST) help diagnose metabolic conditions that affect the liver. High readings usually mean that metabolic disease has affected the liver. Elevations of liver enzymes are associated with higher CRP concentrations. CRP can spike if a person is fighting an infection (which is normal), but when a person has poor metabolic health, they may have a constantly elevated level of inflammation and CRP. Hepatic inflammation secondary to liver steatosis (fatty liver) is a potential contributor to the low-grade inflammation associated with MetS (246).

Regarding lipid profile, interpreting blood cholesterol results is complex and controversial, especially for people on a low-carbohydrate, high-fat diet. Having some cholesterol is needed in order to make cells function properly. However, researchers disagree on which cholesterol particles are necessary or potentially harmful. Traditionally, having high total and LDL cholesterol and low HDL cholesterol concentrations constitute dyslipidemia. However, some doctors believe that having higher LDL and total cholesterol with optimal HDL cholesterol is not as harmful as originally thought. High blood triglyceride readings are a unanimous marker of poor metabolic health. For measures of glycemic profile, HbA1c is a marker of how much blood

glucose control over the previous few months. Elevated fasting glucose is similar to HbA1c and reflects the risk for development of diabetes. High fasting insulin concentrations usually reflect insulin resistance, which is associated with poor metabolic health and the progression to Type 2 diabetes mellitus. Considering fasting glucose and fasting insulin together, the HOMA and Quicki indexes are indirect measures for insulin resistance. HOMA is calculated according to the formula:  $\text{fasting insulin (mU/L)} \times \text{fasting glucose (nmol/L)} / 22.5$ . Quicki is calculated according to the formula:  $\text{Quicki} = 1 / (\log [\text{fasting insulin in mU/l}] + \log [\text{fasting glucose in mg/dl}])$ . In principle, HOMA scores below 1.0 reflect insulin sensitivity, whereas HOMA scores above 1.9 suggest early insulin resistance, and above 2.9, significant insulin resistance. Quicki values of 0.45 suggest a more insulin sensitive state, whereas lower scores ( $>0.34$ ) are associated with greater insulin resistance.

#### ***4.2.5.4. Baseline questionnaires***

Participants completed a baseline questionnaire to assess their personal characteristics, health history and risk, household characteristics as an indicator of wealth, and food security (Appendix L). If necessary, a trained investigator helped participants to complete the questionnaire by asking the questions verbally in the participants preferred language (Afrikaans or English). The baseline questionnaire included sections from the three validated questionnaires below. Additional questions were included to ask participants about any other medical conditions they may have and medications they were taking. This was important from a medical point of view, but also for data interpretation. In addition, it was also essential to ask about shopping preferences and cooking practices, which were of interest to the EBSA program.

##### ***4.2.5.4.1. WHO STEP-wise questionnaire:***

Effective prevention of NCDs is possible through the identification of the major common risk factors and their prevention and control. A few common and preventable

risk factors underlie most NCDs. This questionnaire has been validated by the WHO and includes information on education, marital status, employment, housing density, income, disease history, medication, as well as leading behavioural risk factors for NCDs such as tobacco use, harmful alcohol consumption, and physical inactivity (247). Relevant core sections were included in the baseline questionnaire.

#### ***4.2.5.4.2. The Key Indicators Survey (KIS) household questionnaire:***

KIS is a validated questionnaire, which assesses living arrangements and household characteristics (e.g. details of water source, sanitation facilities, household assets, etc.) (248). These data can be used to assess the relative socio-economic status of a household. The KIS series was developed by the Demographic and Health Survey Program and produces data that are comparable to the South Africa Demographic and Health Surveys(249). Selected questions from this survey were included in the baseline questionnaire to get a more accurate description of the socioeconomic status of the participants.

#### ***4.2.5.4.3. The Household Food Insecurity Access Scale (HFIAS):***

This questionnaire provides a simple and user-friendly approach for measuring the access component of household food insecurity (250). The HFIAS is composed of a set of nine questions that have been used in several countries to distinguish food-insecure from food-secure households across different cultural contexts. The HFIAS questions have been refined to address the recommendations of the Nutrition and Consumer Protection Division of the Food and Agriculture Organization of the United Nations (FAO), which carried out HFIAS adaptation work in multiple countries. The information generated by the HFIAS can be used to assess the prevalence of household food insecurity (access component) and to detect changes in the food insecurity situation of a population over time.



#### **4.2.5.5. Diet assessment**

##### **4.2.5.5.1. Food frequency questionnaire (FFQ)**

Participants were asked to report their food consumption by completing a FFQ, which is a list of foods eaten in the previous month (Appendix F), at a baseline (Visit 1), after the EBSA program (Visit 7) and at follow-up (Visit 11). The FFQ was developed for previous projects by investigators in our research group, one of whom is a registered dietician (192). This FFQ was adapted from the South African Medical Research Council (MRC) FFQ to include LCHF foods (for online administration, Appendix M). It also includes standard portion sizes (to increase the accuracy of macronutrient ratio estimation) and options. It underwent a period of pilot testing by volunteers who habitually followed a LCHF diet and was modified accordingly. The FFQ data were used to assess the types of foods eaten (primarily) and macronutrient ratios (secondarily) rather than absolute nutrient quantities. For the FFQ, participants were shown examples of portion sizes in the form of cups, bowls, plates, food models and pictures.

##### **4.2.5.5.2. 24-hour recalls**

Participants also took part in three interview-based 24-hour food recalls at the initial visit before the start of the EBSA program, to estimate baseline nutrient intake, and at Visit 7 to estimate nutrient intake at the end of the program. This information complemented the FFQ data. At each recall, an investigator guided the participant to report all foods and drinks consumed, starting from waking up the previous morning, to waking up on the morning of the visit, using the multiple pass method (251) and the attached recording sheet (Appendix N). The participant was encouraged to report honestly what they actually ate, rather than what they thought they should have eaten. They were told that they should not feel embarrassed about their food intake and were reminded that the data were confidential. The participant was asked to clarify the exact types of foods and drinks consumed, how they were prepared and/or cooked and the

quantities consumed (using visual aids as guides). The first baseline recall occurred at Visit 1. A second and third baseline recall were conducted between Visit 1 and the first EBSA session (Visit 2) at a convenient time for each participant, such that the three recalls would include one weekend day and two weekdays. After the EBSA program, recalls were conducted at Visit 7, and at another two convenient times for each participant.

#### **4.2.5.6. Blood pressure**

The participants were asked to remain seated in a relaxed manner for 10 minutes before the blood pressure measurement. An investigator enquired about factors that may have transiently increased blood pressure prior to testing, such as activity, stress, or smoking. The investigator then measured the participant's blood pressure using an automated blood pressure cuff (Omron HEM-907, Omron HealthCare, Kyoto, Japan) on three occasions and on alternating arms, separated by one minute, where the participant raised and lowered their arm for twenty second intervals. An average of the three readings was used. Systolic/diastolic blood pressure reference ranges are shown on Table 7.

Table 7. Blood pressure categories (252).

| <b>Blood pressure category</b> | <b>Systolic mmHg</b> |        | <b>Diastolic mmHg</b> |
|--------------------------------|----------------------|--------|-----------------------|
| <b>Normal</b>                  | Less than 120        | And    | Less than 80          |
| <b>Elevated</b>                | 120-129              | And    | Less than 80          |
| <b>Hypertension Stage 1</b>    | 130-139              | Or     | 80-89                 |
| <b>Hypertension Stage 2</b>    | 140 or higher        | Or     | 90 or higher          |
| <b>Hypertensive Crisis</b>     | Higher than 180      | And/or | Higher than 120       |

#### **4.2.5.7. Body composition**

Anthropometric measurements, including height, weight, and circumferences (hip and waist) were measured according to the International Standards for Anthropometric Assessment (253). These data were captured to determine eligibility for

the study during the screening at the initial community meeting (Visit 0), before the EBSA program (Visit 1), after the EBSA program (Visit 7) and for the six-month follow-up (Visit 11). The readings were recorded, and participants were asked to wear the same or similar clothes for the subsequent data collection.

#### **4.2.5.7.1. BMI: weight and height**

Body mass index (BMI =  $\text{kg/m}^2$ ) was calculated from weight and height measurements and classified according to WHO criteria (Table 8). Participants removed shoes, heavy clothing and any items in their pockets, before stepping onto the scale (Detecto, UWE BW-150, digital bench scale). The stable reading was recorded, and participants were asked to wear the same or similar clothes for the subsequent data collection. Height was measured using a wooden stadiometer. Participants stood with heels as far back as possible, feet together, head in the Frankfurt plane. Height readings were taken on inhalation.

Table 8. BMI classification according to WHO (253).

|            | <b>Normal Weight</b>    | <b>Overweight</b>     | <b>Obese Class I</b>  | <b>Obese Class II</b> | <b>Obese Class III</b>      |
|------------|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------------|
| <b>BMI</b> | 18.5-25 $\text{kg/m}^2$ | 25-29 $\text{kg/m}^2$ | 30-34 $\text{kg/m}^2$ | 35-39 $\text{kg/m}^2$ | 40 $\text{kg/m}^2$ or above |

BMI: Body mass index

#### **4.2.5.7.2. Waist circumferences**

Waist circumferences were measured in duplicate, using a flexible steel anthropometric measuring tape. Measurements were taken against the skin, after exhalation, at the narrowest circumference around the waist. If it was unclear where the narrowest point was, the measurement was taken 2 cm above the umbilicus. Waist circumference reference ranges for women are optimal below 80 cm, indicate an increased health risk above 80 cm and indicate a high health risk above 88 cm (253).

#### ***4.2.5.8. Sleep, physical activity and sedentary behaviour assessment***

Sleep, physical activity and sedentary behaviours could have profound effects on metabolic health and were therefore measured objectively using accelerometry (activity monitors). For eight consecutive days after a testing visit (Visits 1 and 7), participants wore an Actigraph GTX3+ accelerometer around their hips to measure physical activity. These accelerometers have been extensively used and validated for measuring sleep patterns and sedentary, light, moderate and/or vigorous physical activity behaviour (254–260). The most common brand of accelerometers used in research is the ActiGraph (ActiGraph, LLC, Fort Walton Beach, FL). ActiGraph accelerometers have progressed from the initial ActiGraph model 7164 (uniaxial device, used in the 1990s), to the newer models, including the ActiGraph GT1M, GT3X and GT3X+. The GT3X and GT3X+ are tri-axial accelerometers, and are capable of measuring accelerations in three planes, namely the x-, y- and z-axes.

The Actigraph GT3X+ accelerometer (Actigraph LLC, Pensacola, FL, USA) was chosen to objectively measure physical activity and sedentary behaviour for this study. The GT3X+ is a small and light, red monitor (3.8 cm × 3.7 cm × 1.8 cm) that is not much bigger than a wrist-worn watch. The validity and reliability of the ActiGraph GT3X+ accelerometer has been well established in adults (254,261). The device was fitted to the women's right hips using an elasticated belt. Women were asked to wear the monitors for 24 hours each day over an eight-day period and to only remove the monitors during activities involving water (such as swimming or bathing). A black sticker was stuck onto the device to remind the women how to orient the device (the sticker had to face the sky or 'up'). An instruction sheet, available in English and Afrikaans (Appendix O), explaining what the device was, how it should be worn, where it should be worn, and when it should be worn (and not worn), was distributed to female participants.

#### ***4.2.6. The EBSA program***

The EBSA program was run independently and exclusively by the EBSA team (Appendix H). It involved five education sessions, held weekly at the program venue.

Each session was about two hours long and included nutritional education lectures. The primary focus was on reducing the consumption of simple sugars, refined carbohydrates, refined oils and ultra-processed 'junk' foods, while encouraging the consumption of affordable sources of vegetables, fish, meats, some fruit, some legumes and healthier fats likewise avocado, olive oil and nuts. The dietary advice during the sessions was tailored to the specific goals of the participants.

At the first EBSA session, participants were guided to establish their own goals that they wanted to achieve through the program, based on diet and health assessments. These included: losing weight and/or improving health markers in those that had adverse health conditions; improving diet in those who had a poor diet; or simply gaining a better understanding of health and nutrition in those that were already making healthy lifestyle choices. Those with metabolic conditions such as obesity, hypertension and/or diabetes were advised to eat foods reflective of either a very low-carbohydrate diet (less than 10% carbohydrates of total energy intake) or low-carbohydrate diet (10–26% carbohydrates of total energy intake), depending on the severity of their condition and their goals (justified in the introduction of the protocol). Normal-weight participants (BMI < 25 kg/m<sup>2</sup>) with minor or no metabolic conditions were advised to follow a moderate-carbohydrate diet (26–45% carbohydrates of total energy intake). An example of the foods and meals promoted by EBSA can be found in Appendix I. Other topics related to physical activity, sleep and stress were also discussed. Each session was delivered by an EBSA educator and a program doctor was responsible for monitoring participants. Participants had access to a WhatsApp group where they could ask the educators questions and share information, recipes and encouragement with each other. As explained in Chapter 2, the WhatsApp group was created after the baseline testing on Visit 0 to maintain communication between the EBSA team and the participants.

#### ***4.2.7. Follow-up quantitative assessments***

The baseline testing procedures from Visit 1 were repeated (excluding informed consent and baseline questionnaires) the week after the EBSA program ended (Visit 7).

For Visit 11, certain procedures from Visits 1 and 7 were repeated six months after the program ended, including: blood samples for health marker tests; food frequency questionnaires, body composition assessment and blood pressure measurement. Women signed another informed consent for the follow-up testing procedures (Appendix P).

#### ***4.2.8. Focus group discussions and in-depth interviews***

The qualitative methods, including focus group discussions (FGDs) (Visits 8 and 10) and in-depth interviews (IDIs) (Visit 9), were used to better understand the contextual issues surrounding women's perceptions and experiences of the program. FGDs were held soon after the EBSA program with all participants, irrespective of how many EBSA sessions they had attended. Each FGD included six to eight participants and lasted around 90 minutes on average. Women were assigned to groups depending on the number of sessions they attended; therefore, three groups were created. One group included women who had attended all the sessions, another group included women who had attended between three and four sessions; and the last one included women who had attended fewer than three sessions. The IDIs were one-on-one interviews with four key informants who were identified during the FGDs and lasted around 30 minutes. The EBSA team – the manager, educator, medical doctor, and two nurses – were also interviewed in one-on-one interviews. Additional informed consent was obtained prior to FGDs (Appendix Q) and IDIs (Appendix R). Participants were free to express themselves in either English or Afrikaans. A bilingual woman who was hired to moderate the FGDs, and who had training and experience in qualitative research within these communities. The moderator encouraged conversation amongst participants, using a set of open-ended questions and probes where necessary, to cover a predefined set of topics. All the IDIs were conducted by GPB.

The interview questions were used as a guide for the discussion and were not necessarily asked verbatim. The first set of FGDs was conducted in October 2019 after the EBSA program and four key informants were selected in November for IDIs. The first set of FGD open-ended questions with probes focused on the facilitators (factors favouring) and

barriers (challenges) participants experienced in attending the sessions, understanding the educational content of the program and implementing and sustaining the dietary advice (Appendix S1). After the first set of FGDs, four key informants were interviewed in IDIs to explore certain topics that were discussed during the first set of interviews (Appendix S2). Another FGD was conducted in January 2020, three months after the EBSA program. This FGD focused on the sustainability of the nutrition education program and the dietary recommendations offered by the program. Participants were also asked about their perceptions of the testing procedures (Appendix S3). Moreover, the EBSA team members were interviewed to explore how they would describe the program and to relate their own experiences of the Ocean View EBSA intervention (Appendix S4).

#### ***4.2.9. Data analysis***

Raw electronic data were stored in de-identified, coded form in a password-protected Google Drive folder that was shared amongst the primary study investigators. Sub-folders for reading only raw data files, data analysis, results, and study documents were included.

##### ***4.2.9.1. Quantitative data***

Regarding the diet assessment, macronutrient ratios were determined from FFQ data by multiplying the frequency of food items consumed per month, by their respective assigned macronutrient contents. Macronutrient content was derived from the FatSecret database and MRC's SAFOODS database. FatSecret (<https://www.fatsecret.co.za/>) is a website that allows users to track nutrition, exercise and body weight. FatSecret was used because the MRC's SAFOODS database omits many LCHF food choices. A program which generates an automated output for each completed FFQ (pie-chart and percentage contribution of macronutrients to total daily energy intake) was utilised. The serves/week of a number of individual items in a similar food group were summed to provide a total for that food group.

The FFQ had 131 items that were grouped according to average portions per week per person, for the pre-, post- and follow-up interventions. The different groups scored accordingly: if the participant reported one or fewer than one serving per month, the value per week was 0.12 servings. For 2–3 servings per month, the value was 0.58 servings per week. If the participant reported 1–2 servings per week, this was recorded as 1.5 servings per week. This same averaging pattern was followed for estimating intake for a reported 3-4 servings per week, 5-6 servings per week, 7 servings per week and more than 3 serves per day (equals 28 servings per week). Nutrient composition from the 24-hour food recall was estimated using the FatSecret database(262).

A descriptive and statistical analysis protocol was followed for blood pressure, body composition measurements, and blood markers using STATA 12 Software (Texas, USA) and Jamovi (Sydney, Australia). The first step was to check data for obvious mistakes in data entry or analysis and for extreme outliers. According to each optimal value, the data were analysed together and then separated depending on the baseline values as healthy/unhealthy for each outcome. To get a feel for the data, a descriptive analysis consisting of mean, standard deviation, quartile 1, median, quartile 3, interquartile range (iqr), minimum value (min), and maximum value (max) was explored for each outcome. The next step was to check for normality using the Shapiro–Wilk test and for homogeneity of variance using the Levene test. Following that, the statistical analysis was different for the two time points and the three time points. Two analyses were conducted to explore the variability of results and to provide a detailed evaluation of the program's health outcomes and sustainability.

For the two, pre-post, time points, - if the data met assumptions of normal distribution (parametric test) and homogeneity of variance, a paired-samples *t*-test or nonparametric Wilcoxon (significant  $p < 0.05$ ) test plus Cohen's *d* were used. For the three time points (pre, post and follow-up  $n=21$ ), if the data met assumptions of being normally distributed and homogeneity of variance (Mauchly's test of sphericity) a repeated measures analysis of variance (ANOVA) and eta-squared as effect size, followed by a post hoc test, was used (Tukey). If the normality assumption was violated, a Friedman



nonparametric test (like repeated measures ANOVA) was used, followed by a Durbin-Conover test.

The sleep and physical activity data were recorded in 15-second epochs and the ActiLife version 6 software (ActiLife software; Pensacola, FL, USA) was used to clean and manage the accelerometry data. Two different methods were initially compared to determine time to bed and wake-up time, thus determining the waking wear time for each participant. This was performed to maximise the amount of data that could be included in the analyses. One method was through the ActiLife version 6 software, which defined sleeping time as any non-wear time consisting of 20 minutes of consecutive zeros, and was therefore removed from the analysis. There are several validated cut points that identify sedentary behaviour and different intensities of physical activity (from light to vigorous intensity) for the ActiGraph data (263–265). Crouter et al (265) conducted a review of many articles comparing and contrasting the varying cut points. Many articles utilized structured activities and most were only ambulatory activities (walking or running) and not free living activities. Matthews states that “in field-based studies, use of moderate cut points that are too low would be expected to result in an overestimation of time spent in moderate activity”. Matthews also found that the highest cut point of 760 counts per minute provided the most accurate estimate of time spent in moderate intensity activity. The Matthews cut-points were used for the present study: sedentary  $\leq 100$  counts $\cdot$ min $^{-1}$ , light 100 counts $\cdot$ min $^{-1}$ , moderate 760 counts $\cdot$ min $^{-1}$ , and vigorous 5725 counts $\cdot$ min $^{-1}$  (265).

Participants also completed a form on which they wrote down approximately the hour they went to bed, when they woke up and whether they removed the device to shower or bath during the day (Appendix O). The same descriptive and statistical analysis as with the previous quantitative data was followed to analyse sleep and physical activity patterns.

#### **4.2.9.2. Qualitative data**

All the FGDs and IDIs were audio recorded with the participants' prior knowledge and consent. The core investigators listened to the recordings soon after each session in

order to give feedback to the moderator and to refine questions for the next session. Recordings were transcribed verbatim in the original language and then translated into full English transcripts. All transcripts (original and translated) were checked by the interview moderator to ensure that meanings and context were accurate. Using NVivo 12, thematic analysis was conducted on the translated transcripts – this involved six phases (199).

The first phase involved GPB reading the transcripts several times and identifying patterns in the data. In the second phase, a first draft of the codebook was developed, based on the previous readings, and subsequently, KL and ABF revised the codebook. The third phase involved searching for themes by structuring each code into several sub-themes. In the fourth phase, sub-themes were reviewed by KL and ABF, and then displayed by GPB as thematic maps. The fifth phase involved naming the themes and defining the main concepts of each theme. The last phase consisted of producing a report which was shared with the EBSA team to optimize the program for future interventions. Although only the author did the coding, which has the potential to introduce personal bias, all the researchers had reviewed the original transcripts and the coded data, and agreed on the final themes and their interpretation in this paper. When reporting data, both the original language and English translation of phrases were used, but all personal identifiers were removed.

#### ***4.2.9.3. Mixed-methods analysis***

Quantitative and qualitative data sets were analysed separately and then integrated using a joint display to yield a more robust understanding of the datasets than would emerge from individual analyses (266). Data integration at the analytic and interpretation levels was performed in two ways: by writing about the data in a discussion in which the separate results of quantitative and qualitative analyses were discussed, and by presenting the data in the form of a table, a joint display, that simultaneously provides the quantitative and qualitative results. In this design, the

qualitative and quantitative evidence is analysed and presented separately, but integrated using another synthesis method. The integration consists of comparing or juxtaposing the findings of the qualitative and quantitative evidence using tables and matrices or re-analysing evidence in light of the results of both syntheses (Figure 3).

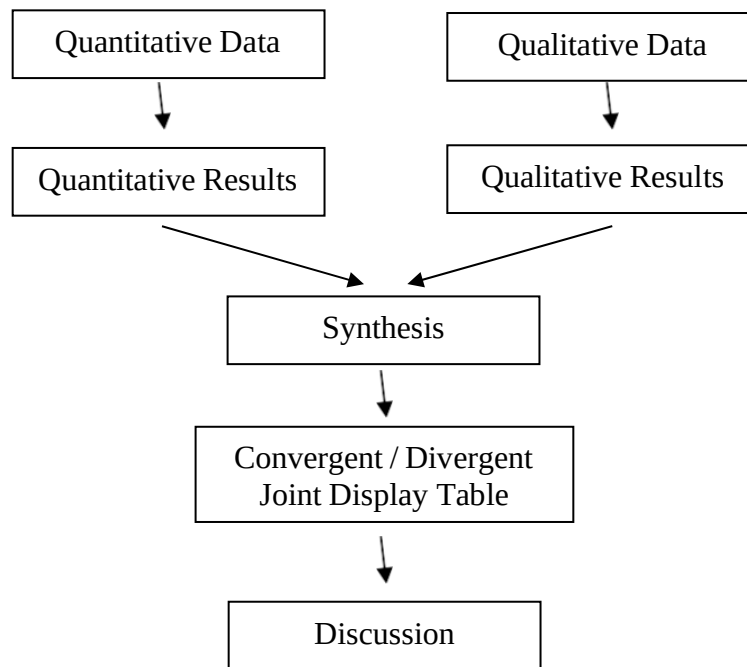


Figure 3. Joint display convergent/divergent mixed-method (266).

A joint display has been described as a way to ‘integrate the data by bringing it together through a visual means, to draw out new insights beyond the information gained from the separate quantitative and qualitative results.’ Although integrating mixed-methods data in a discussion is well established, using joint displays in the process of analysis and interpretation is not common, despite the fact that this is increasingly seen as an area of innovation for advancing integration. Joint displays provide a visual means to both integrate and represent mixed-methods results to generate new inferences. A joint display provides a method and a cognitive framework for integration, which should be an intentional process with a clear rationale (266). Data from the quantitative and qualitative data sets were analysed separately and then integrated using a convergent/divergent, mixed-methods design in a table.

### 4.3. Results

A total of 32 women were recruited for this study. Of the six EBSA sessions, 71.9% attended 5 to 6 sessions, 25% attended 3 to 4 sessions and 3.1% attended only 1 to 2 sessions. A flow of the participants throughout the study is shown in Figure 4. Thirty-two women completed the testing before and after the EBSA program and 21 of these women completed the follow-up testing 6 months later. The remainder of women were scheduled for the following week, but we had to stop testing participants due to the COVID-19 pandemic subsequent lockdown and state of disaster. On 15 March 2020, the President of South Africa, in a national address, declared the COVID-19 pandemic as a 'national disaster'. Since then, many significant consequential announcements have been made, relating to restrictions on movement, meeting in congregate settings, business activity, travel and other matters (23,267,268). The initial set of regulations included a prohibition on gatherings of more than 100 persons, the closing of schools, limitations on the sale, dispensing and transportation of liquor, and a prohibition on the movements of persons testing positive for the Coronavirus or those who had been in contact with someone who tested positive. Further regulations were issued to effect the 'lockdown', which commenced on Friday 27 March 2020. These regulations introduced a new chapter to deal with the impacts of the lockdown, which confined every person to their place of residence, unless strictly for the purposes of performing an essential service, obtaining essential goods or services, collecting social grants or seeking emergency, life-saving or chronic medical attention (23,267,268). The 'lockdown' essentially created a greater imposition on the poor and the already 'confined' people living on or below the poverty line.

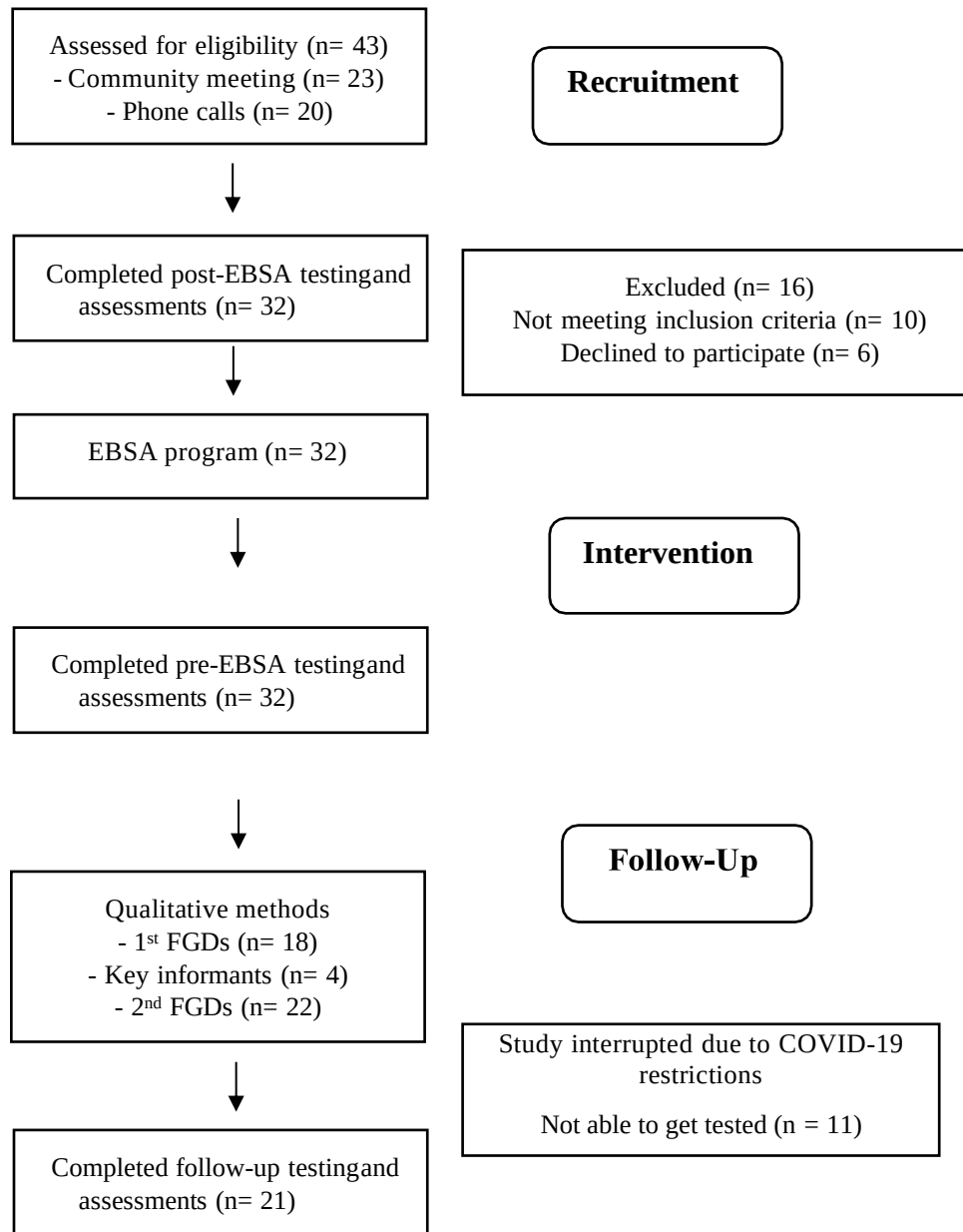


Figure 4. Flow of participants through the study.

#### 4.3.1. Participants' characteristics

All participants reported that they had mixed ethnic ancestry, except one participant who was black African. The mean age of all the participants was  $49.7 \pm 8.8$  years. The employment rate of the sample was 72% and 71.9% of the female participants were married.

Three (9.4%) of the women were smokers and 17 (53.1%) consumed alcohol at least once a month. With regard to medical conditions, 19 (59.4%) of the women had been told by a doctor that they had hypertension and, of those, 11 were taking medication and two were taking herbal or traditional remedies. One woman had type 1 diabetes and three had type 2 diabetes. Thirteen (40.6%) had been told by a doctor that they had high cholesterol and seven were currently on medication. Nearly 22% of the women had known heart disease with six taking aspirin and nine taking statins. Other conditions mentioned were gout, asthma, kidney failure, low blood pressure, hernias, depression, osteoarthritis and kidney stones. There were 12 (37.5%) women who were not taking any medication at the time of recruitment. After the EBSA program, two participants had their blood pressure medication reduced from 10 mg of Ciplavasc to 5 mg. The women with Type 1 diabetes reduced insulin by 2 units for each dose.

On average, the women lived in households with  $4.3 \pm 1.9$  people, and, of those,  $3 \pm 1.2$  were adults. The majority of the households' characteristics were described as follows: freestanding (68.7%), with 4.6 rooms, and, of those, 2.2 were bedrooms. Drinking water was majority piped (59.3%), and the house floors were constructed of bricks (87.5%). All the women had electricity, televisions, washing machines, stoves and beds. All of the participants had cell phones, with one exception, and 65.6% had cars in their households. The women were asked about the amount of physical activity they did, specifically during work, travelling to and from places and for exercise or sport. Two (6.2%) women said that they performed vigorous-intensity activity for more than 10 minutes in each hour for five days in a typical week as part of their work and one (3.1%) woman did this for two days per week. Thirteen (49.6%) women answered that they performed moderate-intensity activities (for longer than 10 minutes) for approximately 2 to 8 hours. Of these, three women said that they performed these activities every day of the week, six said between 5 to 6 days per week and the remainder said approximately 1 to 2 days of the week. Moreover, 14 (43.7%) of the women reported running or cycling for at least 10 minutes per day, in order to travel to and from places, for an average of  $4.1 \pm 1.7$  days per week. Eleven (34.4%) women did vigorous-intensity sports, fitness or recreational activities for more than 10 minutes for approximately 1 to 2 hours for 2 to 5 days per week. Fifteen (46.9%) women said that they did moderate-

intensity activities for more than 10 minutes for approximately 1 to 2 hours. Finally, regarding sedentary behaviours, the women spent on average  $3.4 \pm 2.6$  hours – maximum 10 hours and minimum 1 hour sitting or reclining on a typical day.

A HFIAS score was used to measure the degree of food insecurity (access) during the past four weeks (30 days). First, a HFIAS score variable was calculated for each household by summing the codes for each frequency-of-occurrence question. Before summing the frequency-of-occurrence codes, frequency-of-occurrence was coded as 0 for all cases where the answer to the corresponding occurrence question was 'no'. The maximum score a household could obtain was 27 (if the household response to all nine frequency-of-occurrence questions was 'often', coded with response code of 3) and the minimum score 0 (the household responded 'no' to all occurrence questions or frequency-of-occurrence questions were omitted by the interviewer, and, subsequently, coded as 0 by the data analyst.) The higher the score, the more food insecurity (access) experienced by the household. The lower the score, the less food insecurity (access) a household experienced. The average result for our sample of 32 women was 4.3, therefore, our sample was not considered particularly food insecure, according to the HFIAS.

As part of food security, the women's shopping and cooking behaviours were explored. The women reported cooking for an average of  $4.3 \pm 2.2$  people, and all of them were responsible for buying the groceries for the household. Just over half (53%) shopped monthly and the remainder weekly. The shops that the women frequented regularly to buy food were, in order of popularity, Checkers, Pick n Pay, Shoprite, Food Lovers Market, Woolworths, small local shops, markets, local farms and street vendors. The women were asked to identify from a list of 7 factors the 3 most important factors which were important to them when deciding what food to buy. The most important factor was found to be price for 65.5% of the women, followed by taste, health reasons and distance. For 40.6% of the women, the factor of 'food that your household likes' was found to be extremely important, followed by brands of the food or shop. Lastly, the factor that few women found to be important was the 'environmental impact', for only 28.1% of the participants.

### **4.3.2. Quantitative results**

The quantitative data for the women was collected at three checkpoints (Visits 1, 7 and 11). During the follow-up testing at Visit 11, it was only possible to collect data from 21 participants (65.6%) (Appendix T). Visit 11 did not include 24-hour food recalls or Actigraphs.

#### **4.3.2.1. Diet assessment**

The diet assessment was done at EBSA Visits 1 and 7, through 24-hour food recalls and FFQ, and on Visit 11, through FFQ. The data analysis of nutrient intake is shown in Appendix T1. Regarding fat intake, the data was normally distributed with equal variances and showed no significant change ( $p = 0.099$ ) (Figure 5a). After the program, participants were consuming an average of 63.7 grams, which was not significantly different to that consumed at baseline (73.3 grams). The data on saturated fat intake was not normally distributed and, according to the Wilcoxon test, showed no significant changes ( $p = 0.688$ ). However, sugar intake was found to be significantly reduced from 58 grams to 22 grams ( $p = < 0.0001$ ), and fibre intake reduced from 12.9 to 8.4 grams ( $p = 0.0003$ ). Regarding protein intake, the data showed a normal distribution and equal variances and, according to the paired t-test, no significant changes were found ( $p = 0.326$ ) (Figure 5b). Women reduced significantly their carbohydrate intake from 168.6 to 54.1 grams ( $p = < 0.001$ ) (Figure 5c). Before the EBSA program, participants consumed an average of 1,576.5 kcal/day and after the program it was reduced significantly, according to Welch test ( $p = < 0.0001$ ) to 1,018.4 kcal/day (Figure 5d).



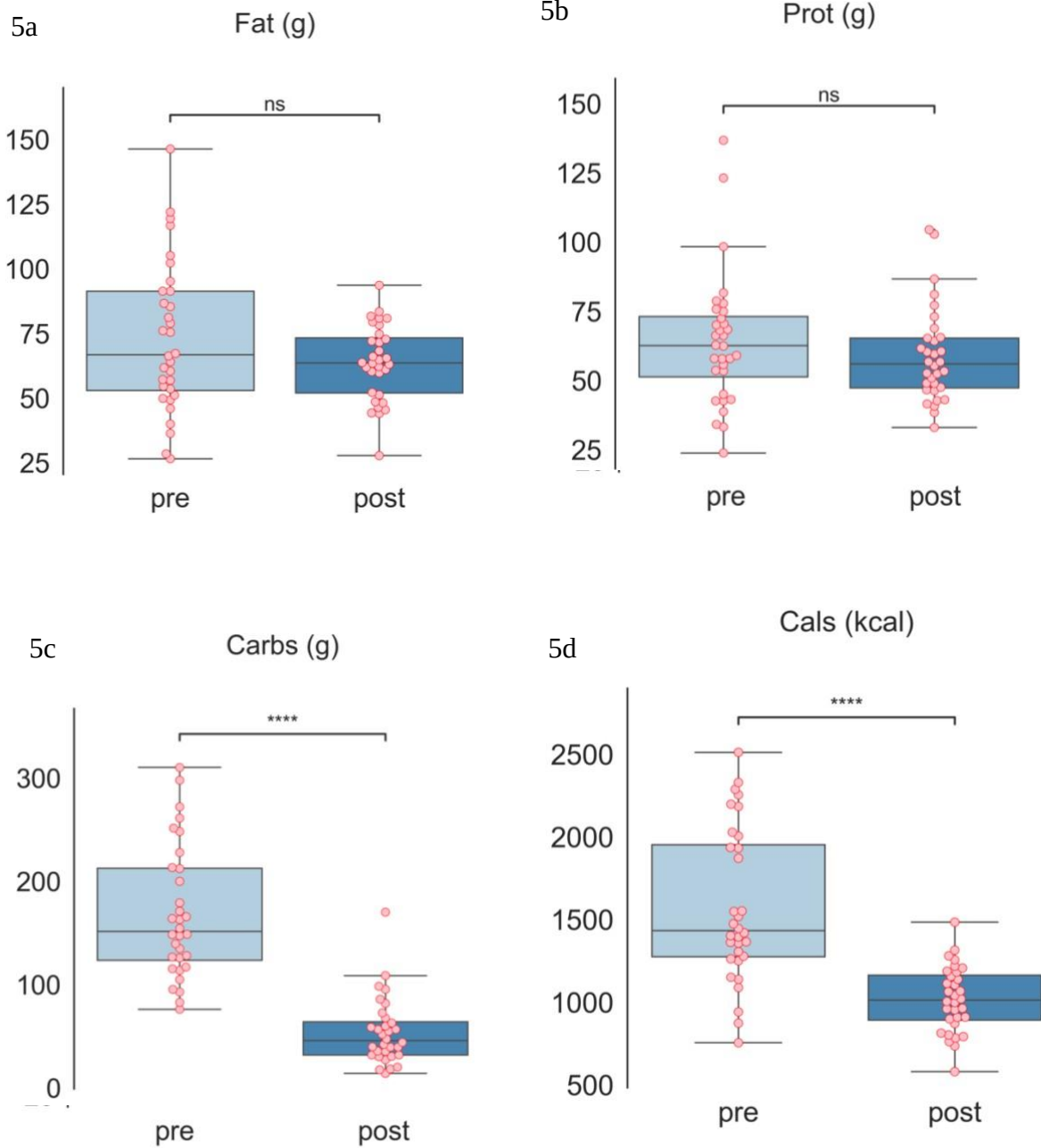


Figure 5. 5a Fat, 5b protein, 5c carbohydrate (grams) and 5d calories (kcal) Pre (Visit 1) and Post (Visit 7) (n=32) 24-hour food recall (\* =  $p < 0.05$ , \*\* =  $p < 0.01$ , \*\*\* =  $p < 0.001$ ).

As part of the diet assessment, the women completed an FFQ (Figure 6), with the baseline and those from post EBSA in Figure 6a. When comparing pre- and post-EBSA data, significant changes ( $p = < 0.05$ ) were shown regarding the decrease in certain foods with high calories, carbohydrates and sugar (Appendix T2). There was a significant increase ( $p = < 0.05$ ) in low carb products; non-starchy vegetables; animal, coconut and olive oils, fats, and eggs. Regarding the pre- and post-FFQ, Figure 6a shows that the women significantly reduced their intake of foods which are high in carbohydrates and sugars, mostly decreasing the consumption of foods such as sweetened drinks, sweets, fast food, bread, cereal and grains, potatoes and fruits. When comparing fats and proteins, although there was an increase in the consumption of foods such as animal fats, eggs, red meat and cheese, the difference was not significant, as can be seen in the 24-h food recalls.

Figure 6b shows data from the follow-up EBSA FFQ, which is similar to Visit 7, except that they seemed to be eating more carbohydrates, although the intake was still much less than the reported foods at Visit 1. Participants reported an egg intake of, on average, less than five servings per week initially, then it increased to 20 on Visit 7 and then decreased slightly to 12.5 servings per week by Visit 11. In terms of bread, cereals and grains, the women initially reported eating on average approximately 18 servings per week, and this was reduced to approximately one serving and, eventually, 7.5 servings were reported in the follow-up. Animal, coconut and olive oil/fats were reported to be the most commonly eaten post-intervention.

6a

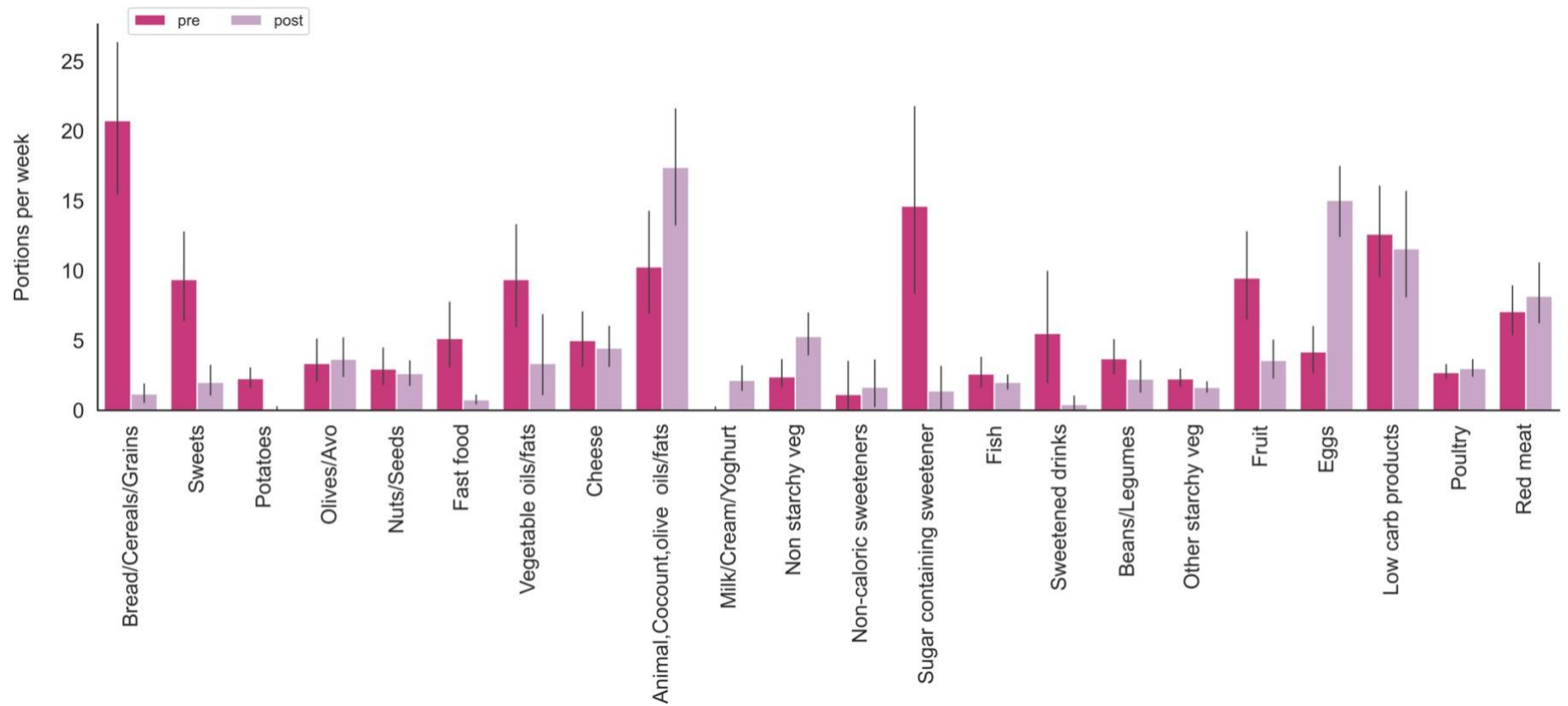


Figure 6a. Serves per week Pre (Visit 1), Post (Visit 7) (n=32) FFQ.

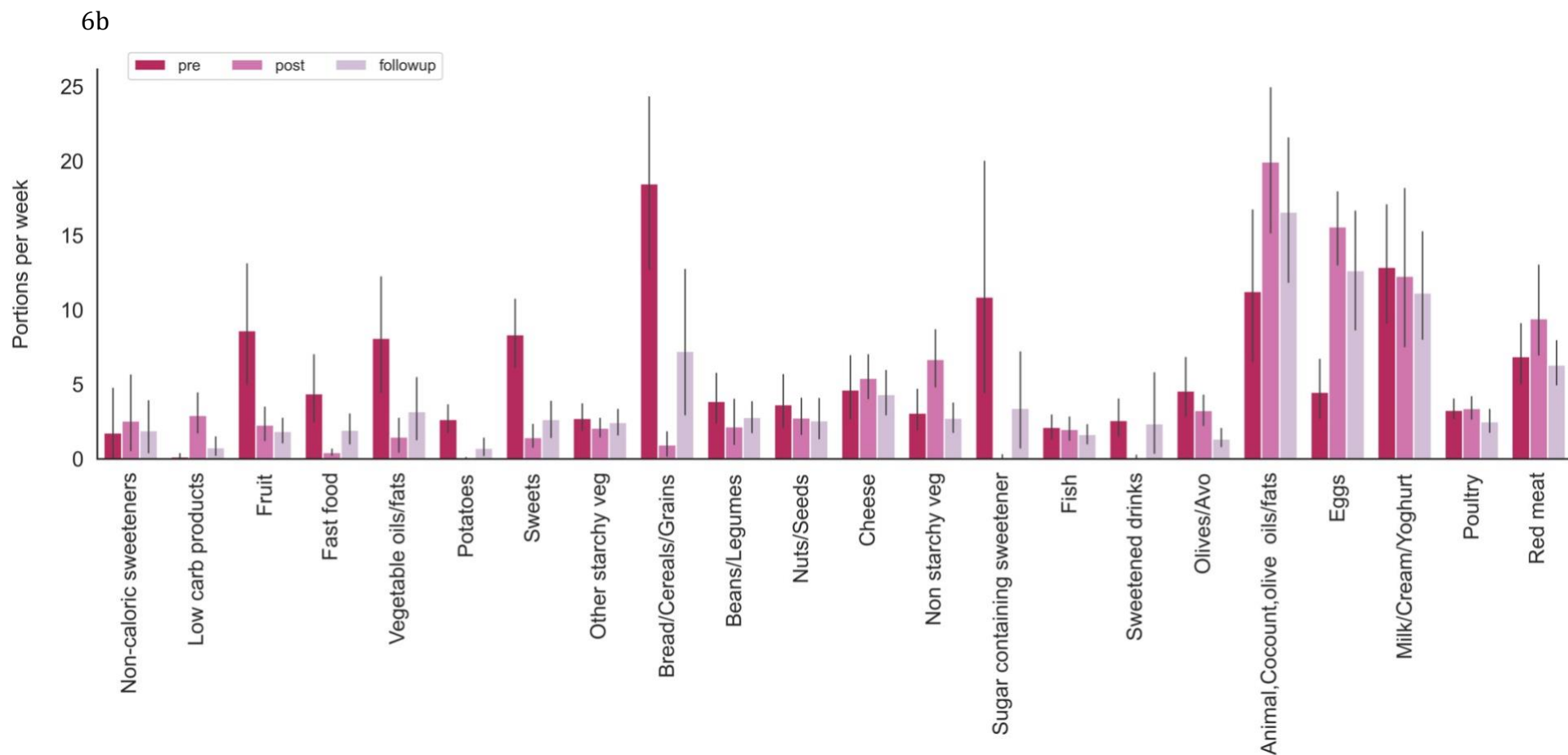


Figure 6b. Serves per week Pre (Visit 1), Post (Visit 7), Follow-up (Visit 11) (n=21) FFQ.

#### **4.3.2.2. Blood pressure and anthropometric measurements**

The women's anthropometric measurements and blood pressures were measured during Visit 1 (Pre-EBSA), Visit 7 (Post-EBSA) and Visit 11 (Follow-up EBSA) (Figure 7). Data analysis from Visits 1 and 7 are displayed, showing mean, standard deviation, quartiles, median, maximum and minimum values in Appendix T4. Appendix T5 shows the analysis of the three checkpoints. Blood pressure, weight, BMI, and waist circumference showed a significant decreased ( $p = < 0.05$ ). The mean at the baseline for blood pressure was  $139.7 \pm 20.9$  mmHg systolic (Figure 7a) and  $91.6 \pm 11.0$  mmHg diastolic (Figure 7b) and for heart rate  $73.0 \pm 11.5$  bpm. Out of the 32 women, three (9.4%) initially had normal blood pressure, nine (28.1%) were considered to have elevated blood pressure or prehypertension, 14 (43.7%) had hypertension 1, and six (18.7%) had hypertension 2. After the EBSA program, 11 (34.4%) had normal blood pressure, nine (28.1%) were considered to have elevated blood pressure or prehypertension, 11 (34.4%) had hypertension 1 and only one (3.1%) had hypertension 2. Those participants who had higher values in both systolic and diastolic measurements were the ones whose blood pressure improved the most.

In March 2020, the mean difference in both systolic and diastolic increased slightly but not significantly (Figure 7a, 7b). According to the Tukey post hoc test, systolic blood pressure showed a significant difference between pre and post ( $p = 0.001$ ) and pre and follow-up ( $p = 0.002$ ) but not between post EBSA and follow-up ( $p = 0.871$ ). It was different with the diastolic blood pressure, which was only significant between pre and post ( $p = 0.001$ ) but not during pre to follow-up ( $p = 0.189$ ) or post to follow-up ( $p = 0.213$ ). Out of the 21 participants, six (28.6 %) women ended with normal blood pressure, five (23.8%) had elevated blood pressure, eight (38.1%) had stage 1 hypertension and two (9.5%) had stage 2 hypertension. Heart rate did not show any significant differences over time ( $p = 0.264$ ).

According to WHO BMI classification, at baseline, four (12.5%) women were classified as having normal weight, eight (25%) were overweight, five (15.6%) had obesity class I, seven (21.9%) had obesity class II and the remaining eight (25%) of the women had obesity class III. Only two women (6.2%) gained weight (0-2.5 kg) and the remainder

lost an average of 3.3 kg (0 to 6.8 kg) (Figure 7c). Approximately 50% of the women lost between  $< -0$  and  $\geq -3.5$  kg ( $p = < 0.0001$ ) and the remaining (43.75%), who lost more than 3.5 kg, experienced the most significant change ( $p = < 0.0001$ ). Although BMI showed significant changes from 35.3 kg/m<sup>2</sup> to 34.2 kg/m<sup>2</sup> ( $p = < 0.001$ ), when classifying BMI according to the participants' baseline weight, those with values of BMI considered normal weight, between  $\geq 18.5$  and  $< 24.9$  kg/m<sup>2</sup>, did not show a significant difference ( $p = 0.5$ ), but all the others did. The most significant difference ( $p = < 0.0001$ ) occurred with the women who had obesity class III, with BMIs of more than 40 kg/m<sup>2</sup> (Figure 7e). In regard to waist circumference, the average of the sample was  $116.2 \pm 2.0$  cm, and, after the program, this decreased significantly, on average approximately 8.2 cm ( $p = < 0.0001$ ) (Figure 7d). In addition, there was only one woman with a waist circumference/height ratio below 0.51. The women with ratios between 0.51 and 0.64 showed a significant difference ( $p = 0.01$ ) and it was even more significant for those with ratios of more than 0.64 ( $p = < 0.0001$ ).

Considering the body measurements at follow-up, there was a significant difference in weight, BMI and waist circumference. Every checkpoint was significant, which means that the post and follow-up mean differences were reduced compared to baseline values. In terms of weight, the women lost a mean of 5.6 kg when comparing follow-up to baseline data ( $p < 0.001$ ), and, with regard to BMI, a mean difference of 2 kg/cm<sup>2</sup> ( $p < 0.001$ ) (Figure 7e). Waist circumference was also found to continue decreasing on average, although the mean difference when comparing follow-up and baseline data (6.6 cm) was not as much as when comparing pre- and post-baseline (8.1 cm) (Figure 7d). According to the data, weight and BMI were the outcomes that kept improving at the follow-up, so the woman continued to lose weight.

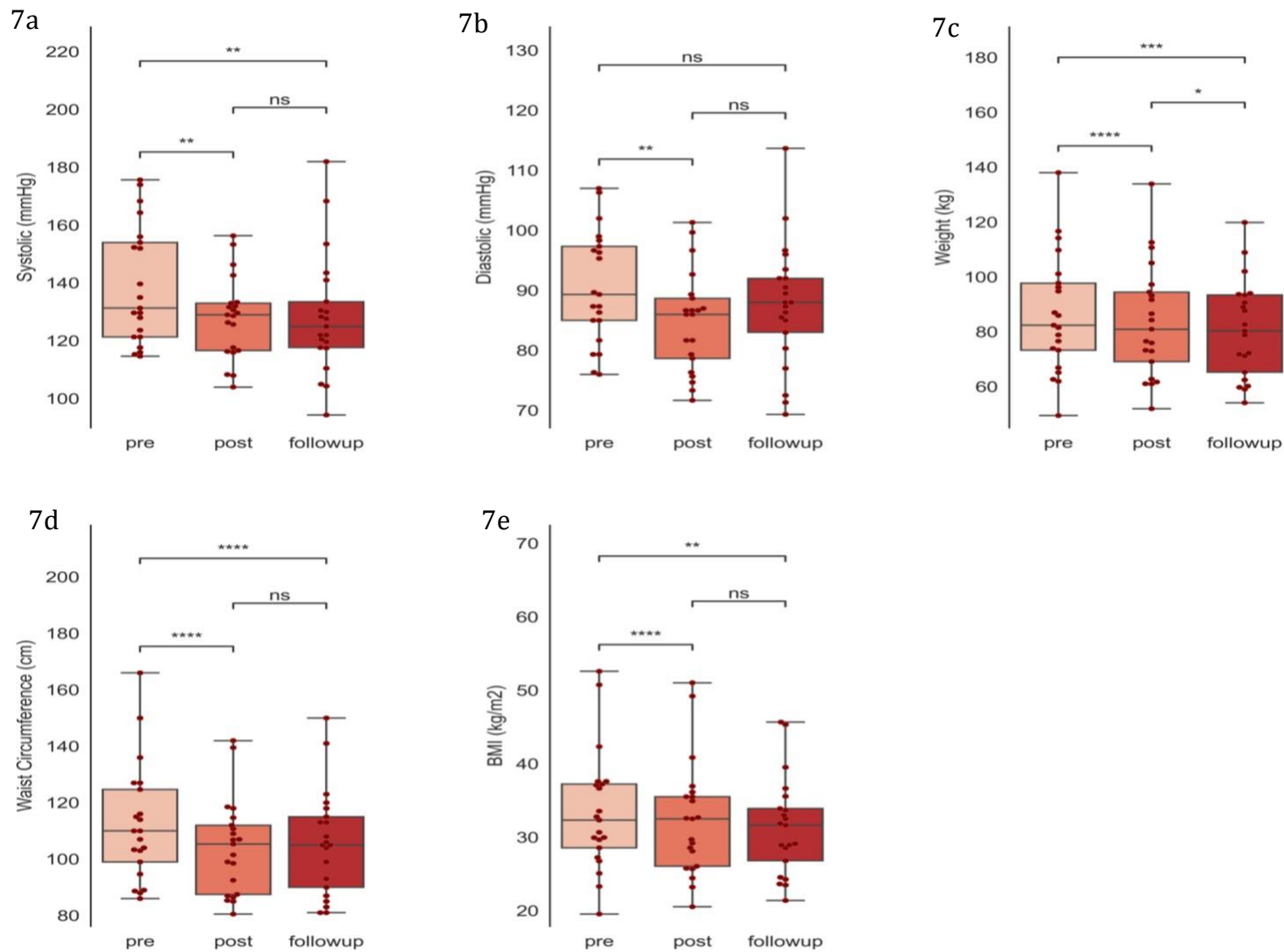


Figure 7. Blood pressure 7<sup>a</sup> systolic 7<sup>b</sup> diastolic and body measurements weight 7<sup>c</sup>, waist circumference 7<sup>d</sup>, and 7<sup>e</sup> BMI Pre (Visit 1), Post (Visit 7) (n=32), Follow-up (Visit 11) (n=21) (\* =  $p < 0.05$ , \*\* =  $p < 0.01$ , \*\*\* =  $p < 0.001$ ).

#### **4.3.2.3. Blood markers**

The following blood markers showed significant changes: GGT, ALT, LDL, triglycerides, insulin, HbA1c, HOMA and the Quicki index (Appendix T6). Appendix T7 shows the data analysis from pre, post and follow-up ( $n = 21$ ). One participant's results were excluded as an outlier (insulin concentration of 195.7 mmol/L, HOMA index of 60.01). Although this did not change the statistical trends, it changed the mean values slightly. As for the liver function values shown in Figure 8, the majority of the women had optimal values.

At the follow-up visit, the GGT marker (Figure 8a) was different only when considering the data from pre to post ( $p = 0.001$ ) and from pre to follow-up ( $p = 0.03$ ). The same was seen in ALT (Figure 8b), pre-post ( $p = 0.041$ ) and pre-follow-up ( $p = 0.018$ ) were significant. In contrast, there was no significant difference with the follow-up data of the enzyme AST. With respect to the C-reactive protein values (Figure 8d), almost half of the women (46.9%) initially had values below the optimal, with an average of  $2.1 \pm 1.7$  mg/L, and the remaining 53.1% had values that are considered to be a higher risk (above 5 mg/L). There was a small but significant change from pre-post, but this did not remain significant at follow-up.



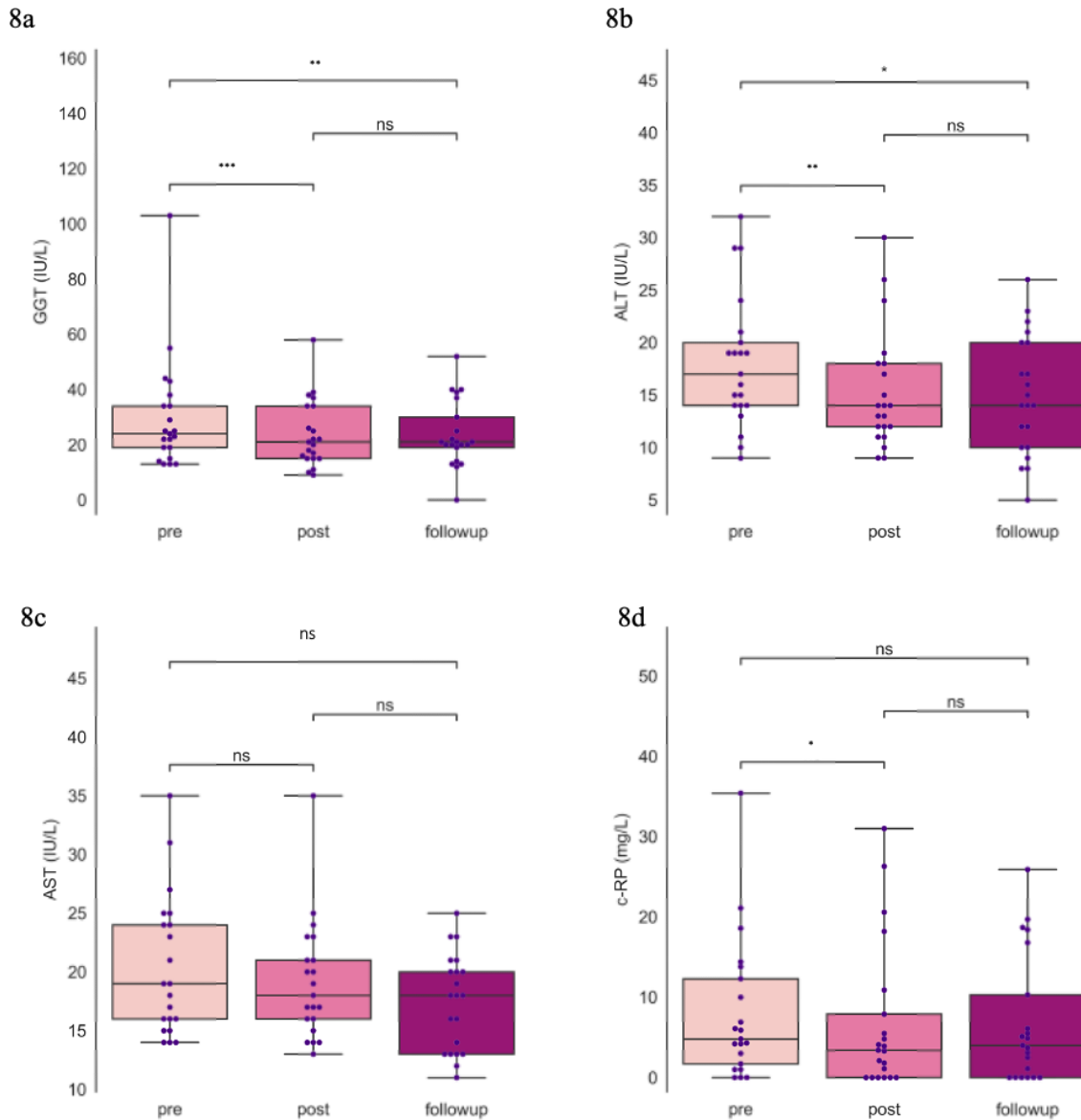


Figure 8. 8a GGT, 8b ALT, 8c AST, 8d CRP-protein Pre (Visit 1), Post (Visit 7) (n=32), Follow-up (Visit 11) (n=21) (\* =  $p < 0.05$ , \*\* =  $p < 0.01$ , \*\*\* =  $p < 0.001$ ).

The women's lipid profiles were described, with the blood markers shown in Figure 9. Cholesterol values (Figure 9a) were initially optimal for 46.9% of the participants, with an average of  $4.3 \pm 0.5$  mmol/L and showed no significant changes ( $p = 0.281$ ). In terms of the type of cholesterol lipoproteins, only LDL showed a significant increase (Figure 9b) ( $p = 0.01$ ). Lipoproteins HDL, non-HDL and cholesterol/HDL cholesterol did not change significantly (Figure 9c). Triglycerides showed a significant

decrease when comparing baseline and post values ( $p = 0.004$ ) (Figure 9d). When analysing the three check points (pre, post, follow-up), the only significant differences were seen in LDL cholesterol ( $p = 0.042$ ), triglyceride ( $p = 0.001$ ) and the cholesterol/HDL ratio ( $p = 0.006$ ). Repeated measures ANOVA tests for cholesterol ( $p = 0.387$ ), HDL ( $p = 0.120$ ) and non-HDL ( $p = 0.255$ ) were found to be not significantly different.

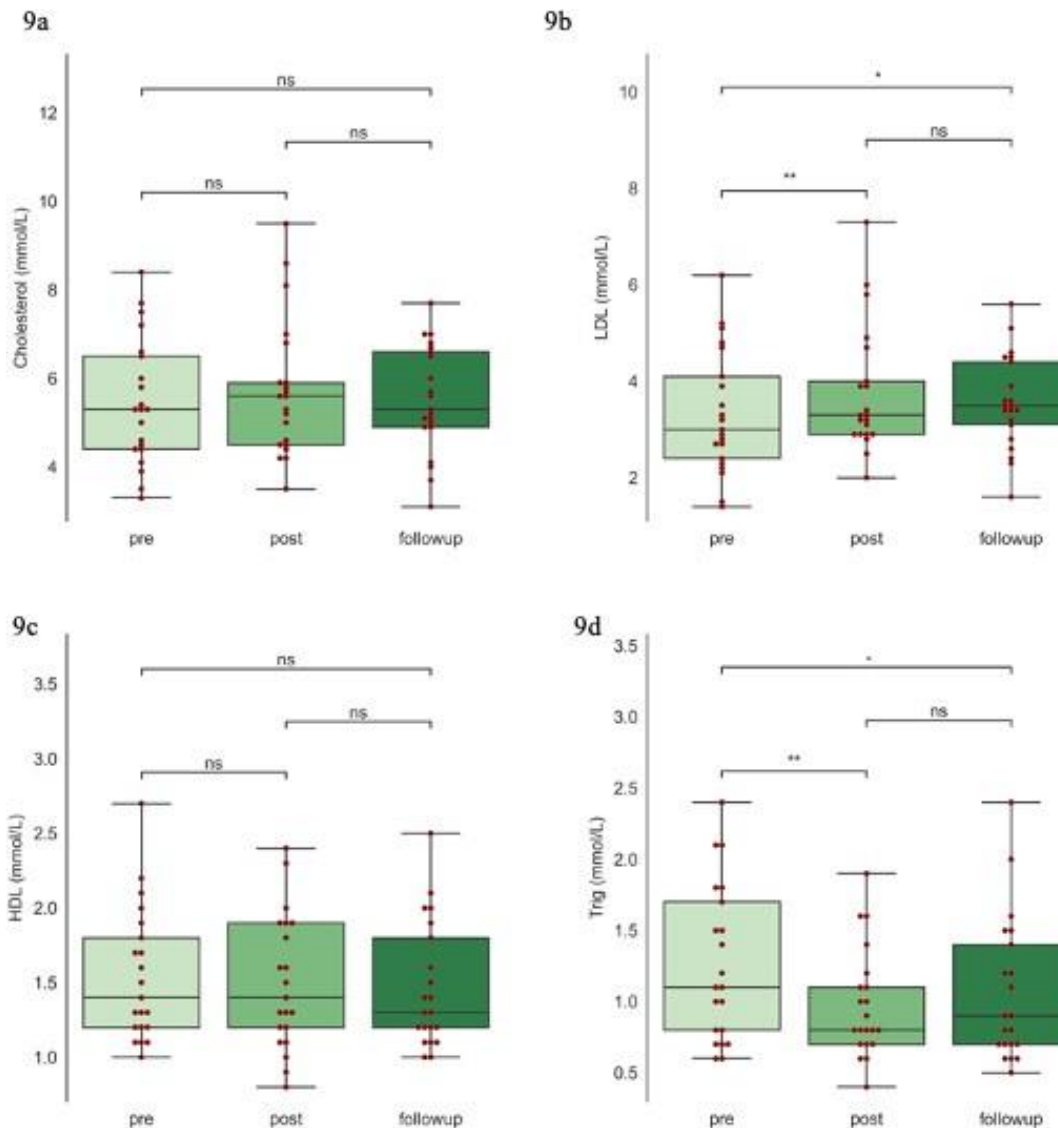


Figure 9. 9a Cholesterol, 9b LDL, 9c HDL, 9d Triglycerides Pre (Visit 1), Post (Visit 7) ( $n=32$ ), Follow-up (Visit 11) ( $n=21$ ) (ns = non significant, \* =  $p < 0.05$ , \*\* =  $p < 0.01$ ).

Regarding the glycaemic profile (Figure 10), the outcomes with significant reductions were HbA1c (Figure 10a), fasting insulin (Figure 10c), HOMA index ( $p = 0.04$ ) (Figure 10d) and the Quicki index ( $p = 0.01$ ) (Figure 10e); in contrast, fasting glucose (Figure 10b) did not show significant changes. After the EBSA program, all participants improved their HbA1c values (Figure 10a), decreasing the percentages by an average difference of  $-0.3$  ( $p < 0.001$ ). At the follow-up, changes in HbA1c% (Figure 10a) were found to be significantly increased.

According to the Durbin Conover test, HbA1c% was reduced significantly in the pre-post ( $p = 0.001$ ), pre-follow-up ( $p = 0.001$ ) and increased post-follow-up ( $p = 0.044$ ). Fasting glucose ( $p = 0.791$ ) (Figure 10b) and fasting insulin (Figure 10c) ( $p = 0.114$ ) were not significantly different. HOMA index showed significant decrease between pre-post ( $p = 0.002$ ) and pre-follow-up ( $p = 0.022$ ). The Quicki index showed a significant decrease only between pre-post ( $p = 0.040$ ).

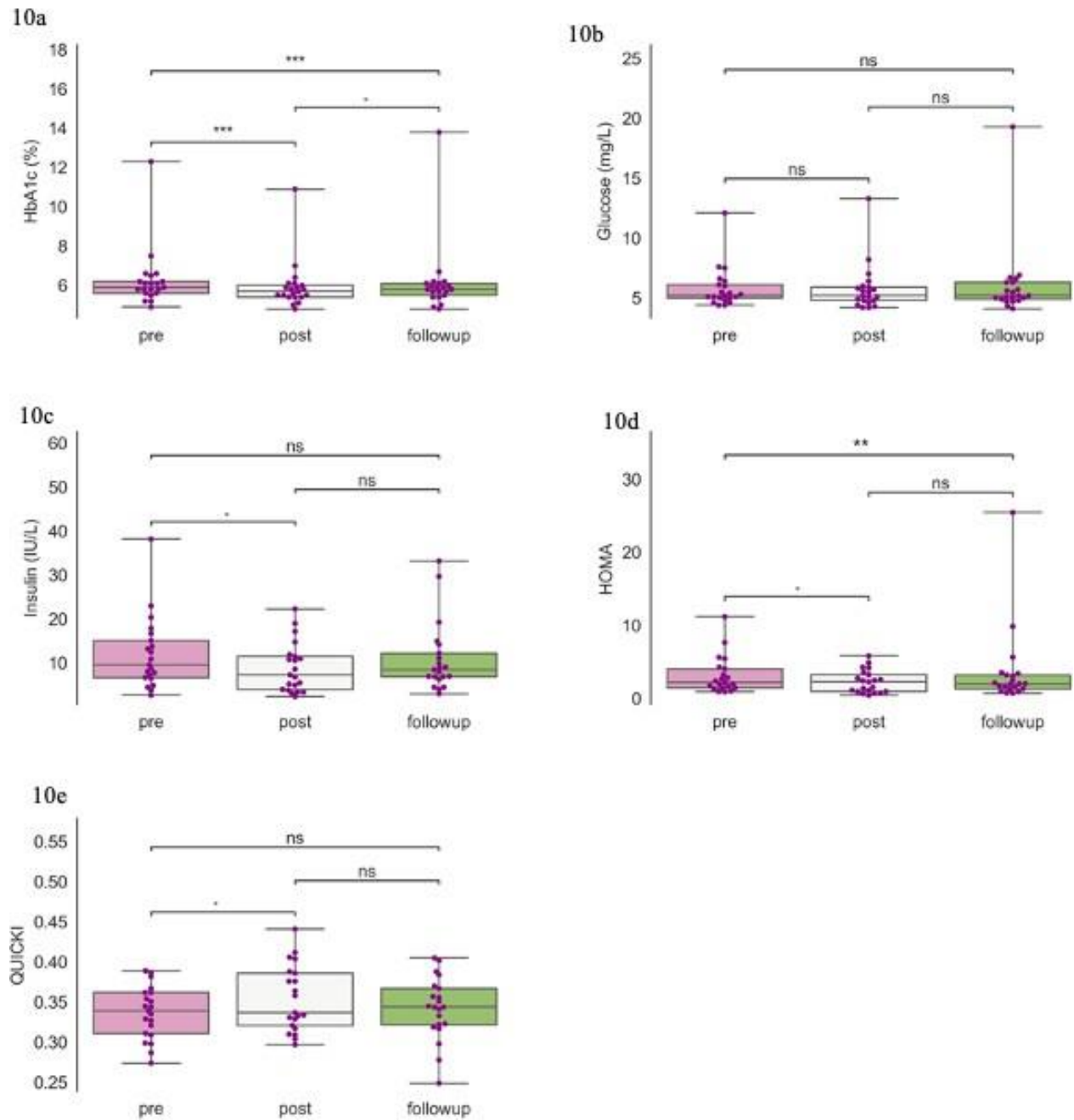


Figure 10. 10a HbA1c, 10b fasting glucose, 10c, fasting insulin, 10d HOMA, 10e Quicki Pre (Visit 1), Post (Visit 7) (n=32), Follow-up (Visit 11) (n=21) (ns = non significant, \* =  $p < 0.05$ , \*\* =  $p < 0.01$ , \*\*\* =  $p < 0.001$ ).

#### ***4.3.2.4. Objective measured sleep and physical activity behaviour***

The 32 female EBSA participants were fitted with accelerometers on Visit 1 and Visit 7, and Appendix T8 shows the descriptive analysis from pre and post EBSA program. The criteria to analyse the data was a minimum of 600 minutes per day and a minimum of 4 days, of which three were weekdays and one a weekend day. Four participants were excluded due to insufficient wear time; thus, 28 female participants had valid data.

For the entire sample, there were 186 valid days (weekday and weekend day), and the average number of days of wear time was  $6.6 \pm 0.6$  days ( $n = 19$  had seven valid days,  $n = 8$  had six valid days and  $n = 1$  had five valid days). Sedentary behaviour increased ( $p = 0.011$ ) (Figure 11a) and light physical activity behaviour decreased ( $p = 0.006$ ) (Figure 11b) but there were no significant changes in moderate (Figure 11c) and vigorous physical activity behaviour (Figure 11d). There were also no significant changes in sleep time from pre to post (data not shown).

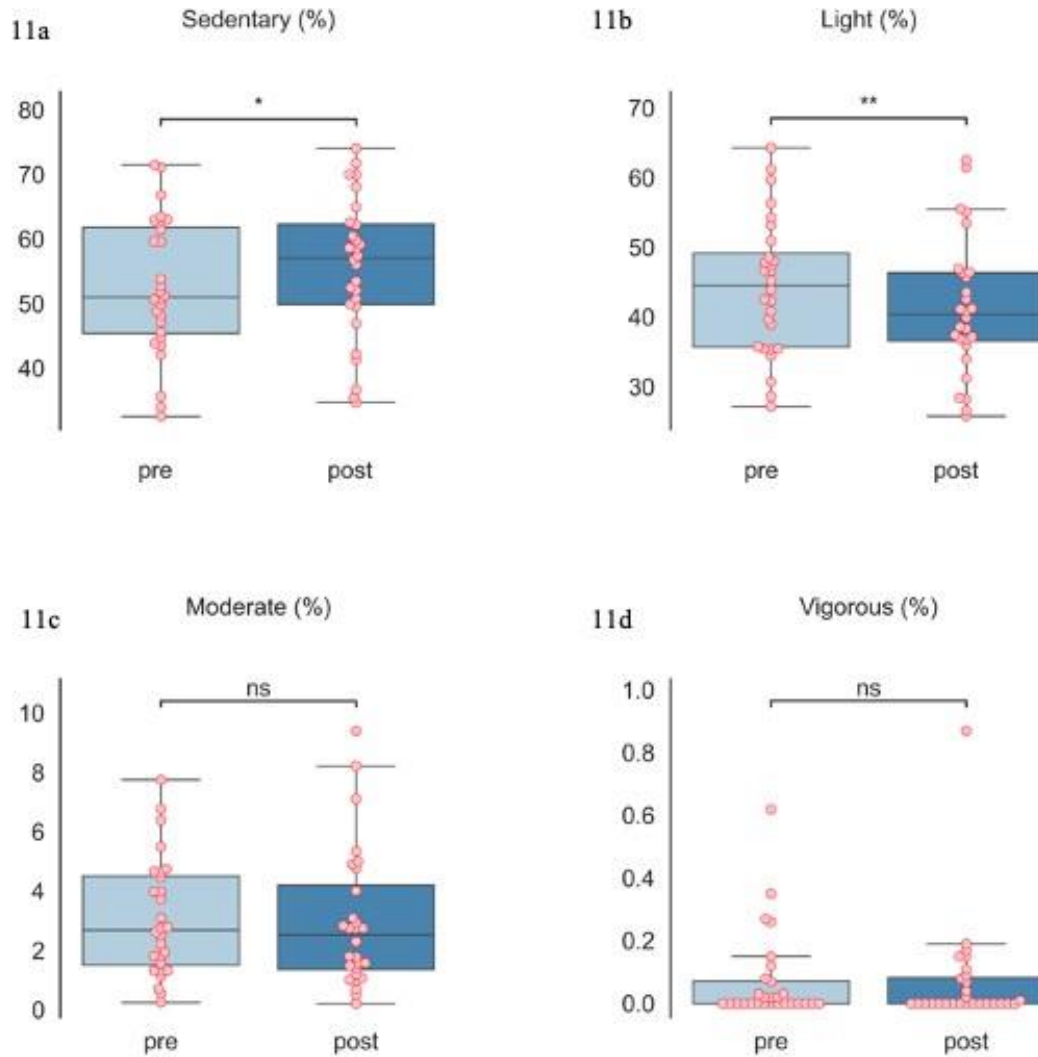


Figure 11. Percentages (%) of physical activity: 11a Sedentary, 11b light, 11c moderate, 11d vigorous Pre (Visit 1), Post (Visit 7) (n=28)(ns = non significant, \* =  $p < 0.05$ , \*\* =  $p < 0.01$ ).

#### 4.3.3. Qualitative data

Qualitative data was gathered in November 2019 at Visit 8 through FGDs (n = 18), Visit 9 through IDIs (n = 4) and Visit 10 through FGDs (n = 22) as part of the follow-up in January 2020.

#### ***4.3.3.1. Focus group discussions and in-depth interviews after EBSA***

A total of 18 out of the 32 participants participated in the first of three FGDs in October 2019. In November 2019, four key informants were selected from the FGDs to further explore their experiences with the EBSA program. Key informant 1 (IDI 1) was part of the first EBSA group in 2015, and she was selected to be an EBSA coach. She was interviewed because she provided some suggestions on how to improve the EBSA program by taking the community's context into consideration. Key informant 2 (IDI 2) was selected because of her approach to her household dietary behaviours. She was a single mother living in one of the most dangerous areas of the community. Key informant 3 (IDI 3) used to become emotional during the group discussions. She had changed her households' eating behaviours. She had reduced and in some cases, was able to discontinue her chronic medication. Key informant 4 (IDI 4) was the only participant with Type 1 diabetes. Since she had a condition that did not allow her to completely stop medication, her personal experience was considered to be unique and worth exploring in further detail.

Five themes were developed from the three FGDs (n = 18) and the four IDIs (n = 4) of the EBSA participants: (i) motivation to enrol in the EBSA program; (ii) experiences with the EBSA dietary recommendations; (iii) facilitators of participation in the EBSA program; (iv) barriers to participation in the EBSA program; and (v) ways in which the EBSA program could be improved. Table 9 shows the themes, sub-themes, definition of the themes and examples of the quotes.

##### ***4.3.3.1.1. Theme 1: Motivations to enrol in the EBSA program***

The women mentioned their reasons for enrolling in the EBSA program, and these were mostly related to their personal health. There was a general desire to be healthy and to reduce medication. Some became emotional when talking about how they were feeling before the program and how their wellbeing had improved after the program. When sharing their experiences regarding their health conditions, some mentioned that they

were afraid of death due to their family history. Support was seen as a necessary tool to initiate dietary changes, and the women mentioned that they thought it would help them to break the dieting cycle. Some mentioned that, previously when attempting some kind of dietary changes, they did not have support from their relatives or the people around them. Some of the women who decided to enrol in the program in 2019 had been influenced by past participants who had successfully changed their dietary behaviours and improved their health. Some of those who participated in the 2019 EBSA program also participated in the program in 2015 and had high expectations of the new program. Others mentioned that they felt more health conscious at that point, compared to 2015, and wanted to enrol in the EBSA program and change their dietary behaviours.

#### ***4.3.3.1.2. Theme 2: Experiences with the EBSA diet***

Participants stated that, before the program, their understanding of the EBSA diet made them feel sceptical, especially regarding affordability and availability. The women mentioned that it was an “eyeopener” to learn about the simple sugar content in their everyday food. They expressed that they changed their dietary and cooking behaviours and had started eating certain foods, such as eggs or fatty meats, more often than before. They also changed their shopping behaviours, avoiding certain foods and purchasing new ones. Some women were even successful in changing the dietary behaviours of their entire households. Although they felt that they liked the foods that they were eating, they still missed certain foods that were not considered healthy according to the EBSA recommendations.

The women noted that weight loss was the most significant dietary change that they experienced. Most of them also felt that they had more energy and were more active and motivated. They explained that they had more control over their hunger because they felt satiated. The women thought that the EBSA diet was suitable for everyone because they could see improvements in their physical and mental health. Therefore, they could recommend the program.



#### ***4.3.3.1.3. Theme 3: Facilitators of the EBSA program***

The women seemed to be satisfied with the program and the educational sessions. They commented on the health benefits that they experienced such as weight loss and pain relief. According to the participants, the health benefits facilitated their compliance and motivated them to remain in the program. In addition, some mentioned that they had started to exercise more frequently. A number of participants reported that they had relief from symptoms of stress and depression, improved self-esteem and the focus and clarity to address the problems that they faced. Linked to this and adding to the improvement in mental health, the women mentioned that the group support was definitely a facilitator to remain in the program. They claimed that the EBSA program created a safe space for them, and that they felt empathy for each other. Some participants said that, in their communities, women had not prioritized their health and needs and that the program gave them reasons to do so.

Another aspect identified as a facilitator was the empowerment that they received from each other and also from the EBSA educator. The participants said that, due to the education sessions, they learned to understand how their bodies function, the effects of the foods they were eating and the effects of the treatments and medications they were taking. According to them, every week was exciting, and they appreciated that there was a continued space for questions after the education sessions. According to most of them, the WhatsApp group was a helpful tool to sustain the dietary changes and maintain motivation throughout the program and afterwards to stay on track.

#### ***4.3.3.1.4. Theme 4: Barriers to the EBSA program***

The women identified certain barriers that they encountered during the EBSA program that made it difficult for them to sustain the recommended diet. Because they participated in the study and the EBSA program, they had had some tests done, such as blood tests and body measurements. The women felt that this was a barrier for them since some were not used to needles and some were even afraid of them. Furthermore, some

women talked about the fact that, in some cases, the nurses had difficulty finding their veins, and this made them feel uncomfortable at certain points. One challenge that some identified regarding their dietary choices was headaches, which they experienced at the beginning of the program. Some participants had cravings for snacks and sweets, although they tried to snack on the recommended foods. Emotions related to stress influenced their cravings and desire for sweets.

In terms of their social environment, the women mentioned that living in their community could be challenging due to of the high rates of violence, especially among the youth. They felt that the social situation in the community made them feel worried, stressed and anxious. According to them, carbohydrates are considered a treat, '*food luxuries*', especially when people meet for social gatherings such as holidays or religious festivities. The women said that food is linked to specific memories, culture and traditions, and it is a challenge to change those. Generally, regarding external support, some said that they received support from their relatives and friends but that they mostly did not want to participate in the lifestyle changes. This aspect caused them to even avoid certain family members by not visiting them and to cook different meals for the household since some people did not want to eat the way they were eating now. The women mentioned that they felt that they were not ready to be advocates for a LCHF diet.

Regarding advocacy, the lack of support that they received from their health practitioners was also identified as a potential barrier. Although the majority mentioned that doctors seemed to encourage them to stay on track with the diet, they told them that they would not advocate for a LCHF lifestyle. Consequently, some women felt confused about their health practitioner's approach although they continued to follow the EBSA recommendations. Moreover, some women reduced their medication, as suggested by the EBSA medical doctor, and mentioned that they were scared to tell their doctors.

#### ***4.3.3.1.5. Theme 5: Suggestions to improve EBSA***

Sustainability was a concern for some of the women and they suggested that it would be necessary for them to schedule visits from EBSA to monitor the participants'

journeys. They wanted to add more educational sessions so that they did not lose momentum and the group support. Some women said that EBSA could improve the organization of the sessions and the testing by improving the communication and giving participants enough time to plan for and schedule the meetings. Another suggestion for a follow-up session was to involve family members so that they could invite their relatives to come to one of the sessions or suggested that EBSA do some home visits. Moreover, they suggested that, as part of the follow-up sessions, EBSA could provide training to participants to become coaches.

The women suggested that EBSA should also target other groups of people such as wellness or exercise groups, mental health groups and children at schools. One woman mentioned that, to encourage one another, they could plan to exchange foods and recipes so that they could have access to different types of foods. Thereby, women who cannot afford or access certain foods would perhaps be able to try them.

Table 9. Themes developed from the first set of FGDs and IDIs with EBSA participants (n=18).

| Theme                                            | Definition                                                                        | Sub-Theme                                                                                                                      | Quotes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theme 1: Motivation to enrol in the EBSA program | Participants' intentions when deciding to take part in the EBSA program           | 1.1. Desire to be healthier<br>1.2. Seeking support<br>1.3. Influenced by previous participants                                | <p><i>"I joined because I have arthritis, I had to lose weight. (...) I am more here for my health and because I want to eat correctly and be healthy. I am tired of pills. (FGD 3)"</i></p> <p><i>"Before the program it was like I am going to die. (...) My mum died from diabetes and I saw how she suffered. (...) My goal was to eat better. (IDI 4)"</i></p> <p><i>"I wanted to take part because I knew the support would get me going in the right direction. (IDI 1)"</i></p> <p><i>"My own family didn't support me, but I wanted to get healthy, so I thought this is a good opportunity to have this support. (FGD 1)"</i></p> <p><i>"My sister was on it, but I wanted to have more information for myself and to see if it is going to work. (FGD 1)"</i></p> <p><i>"The first time I participated it was very successful. (...) There was the expectation that it [EBSA program] would be an improved program and therefore more effective (FGD 3)."</i></p> <p><i>"I decided to be a part again because I am a little older and I realised that we have to live a healthy lifestyle, because living an unhealthy lifestyle only exposes you to a lot of illnesses. (FGD 2)"</i></p>                  |
| Theme 2: Experience with the EBSA diet           | Participants' opinions with the LCHF diet and its recommended foods               | 2.1. Dietary and cooking behaviours<br>2.2. Shopping behaviours<br>2.3. New foods and missed food<br>2.4. Feelings around diet | <p><i>"The only thing that I was worried about was where I was going to get all the food that I needed. (IDI 3)"</i></p> <p><i>"I was on a high all the time! (...) It was the equivalent of a drug addict, because I was a sugar addict! (FGD 2)"</i></p> <p><i>"In the past I probably used to have one egg per month. Now I have eggs every day. (FGD 1)"</i></p> <p><i>"It's such a nice feeling to be able to say that I don't buy bread anymore. I don't even buy sugar anymore. And then I said to the family: the people who live in this house who want to have sugar must go and buy their own sugar with their own money. (FGD 3)"</i></p> <p><i>"I can do the cooking, I can clean at night, I am more energetic and more alive now. (FGD 2)"</i></p> <p><i>"Now I wouldn't eat for a period of time because my body is telling me when I am hungry and when I have enough. I eat when I am hungry. (IDI 2)"</i></p> <p><i>"I think everybody should eat this way; it's just people don't choose to. (IDI 1)"</i></p>                                                                                                                                                                                     |
| Theme 3: Facilitators of the EBSA program        | EBSA's positive impacts on participants' life which facilitated their experiences | 3.1. Health benefits<br>3.2. Group support<br>3.3. Empowerment<br>3.4. Nutritional knowledge                                   | <p><i>"I feel the changes on the clothes and, and I feel that centimetres, that slowly but surely disappear. I see the changes in the pains I get in my knees. I can exercise. (FGD 3)"</i></p> <p><i>"We became like a family rather than a group of individuals. (...) The program helped us to stand together and assist each other, pulling together towards the same goal. (FGD 2)"</i></p> <p><i>"As women in our communities we always put other people first. We're always putting ourselves in the back burner. (...) We want to be nice to people, but we do it at the expense of our own wellbeing. (IDI 1)"</i></p> <p><i>"She [educator] is real. She empowers us, she was giving me a lot of power. (IDI 3)"</i></p> <p><i>"They empowered us with a lot, they equipped us with a lot of knowledge. (...) It's for us to go forward with that and just to keep on the healthy lifestyle. (FGD 1)"</i></p> <p><i>"You were excited to come [EBSA program], because you knew you were going to find out something new. (FGD 3)"</i></p> <p><i>"The WhatsApp group is a great help. It is motivational to me. (...) it's an A+ because if you maybe don't understand, you can always ask. (IDI 2)"</i></p> |

|                                                |                                                                                                         |                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theme 4:<br>Barriers of<br>the EBSA<br>program | Difficulties that<br>EBSA<br>participants<br>encounter after<br>the program                             | 4.1. Testing<br>procedures<br>4.2. Diet related<br>4.3. Social<br>determinants<br>4.4. Advocacy | <p><i>"My least favourite was drawing blood. It is like the vampires that draw your blood. For me it is always an issue because it is not easy to find a vein. (FGD 1)"</i></p> <p><i>"I am a snacking person and I know that Banting doesn't encourage snacking, but I reckon that if I am snacking on the right things then it's better for me. (IDI 1)"</i></p> <p><i>"Sweet things are the challenge and on an emotional level, usually when I am very stressed at work, I'd be inclined to say oh I really need a chocolate or a piece of cake. (FGD 3)"</i></p> <p><i>"The shooting does affect. It does put a lot of strain on you knowing that you are rising youth and it's happening to the youth. (...)</i><br/><i>Parents do not have control over the gangsters and there is the sad part. (IDI 2)"</i></p> <p><i>"For me it [changing the diet] was emotional because I am sure each mother has a separate cupboard in her house which is stocked with these food luxuries. (FGD 3)"</i></p> <p><i>"They [family] say to me: you must stop following this lifestyle. This is always when we have family days because that used to be a special time with all the food stuff we used to have, which is no longer the case. (FGD 2)"</i></p> <p><i>"I never go there now [other's people house] because I don't want chips, I don't want cake, because those things almost killed me (FGD 2)"</i></p> <p><i>"My husband doesn't want to understand but it's his decision. I can't force him and it's a bit difficult to make two lunches, two pots of food, it's expensive. (IDI 4)"</i></p> <p><i>"I feel that – in order for me to share this information with someone else – I would like to know more. I have to be sure that what I am sharing is the honest truth. (FGD 3)"</i></p> <p><i>"I was just saying I am taking my medication. Because he [doctor] can see that I look good, and my heart rate is good. I don't want to let him know [reduced medication] otherwise I am scared that he can tell me you must take your medication. (IDI 3)"</i></p> |
| Theme 5:<br>Improvements for<br>EBSA           | Participants' ideas to<br>optimize the<br>program and<br>spread the word<br>in broader the<br>community | 5.1. Follow-up<br>5.4. Broader<br>community                                                     | <p><i>"We [EBSA participants] must go on, we have to go on every week or every second week, or twice a month then come in and weigh us and take the measurements and things like that. (FGD 3)"</i></p> <p><i>"Why don't we take it [EBSA] into our personal homes. We will get them to hear the truth and to see how it is possible to do this. (FGD 2)"</i></p> <p><i>"It is a must that coaches can be trained up. They [community members] can see this is someone we know from my community. (FGD 1)"</i></p> <p><i>"Children can be part of it. What I see that a lot of kids a very young age they become obese. (IDI 2)"</i></p> <p><i>"I had some ideas like having a little market day. Some ladies also cannot afford to buy some of the products and that's one of the reasons why people fall out of the wagon. (IDI 1)"</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

#### **4.3.3.2. Focus group discussions from the follow-up EBSA (Visit 10)**

In January 2020, a total of 22 females participated in the second set of FGDs (4,5,6 FGD), and four themes were developed from the analysis: i) challenges after the EBSA program, ii) realities within the community, iii) support system and iv) the influence of EBSA on the women's lives. Table 10 shows the sub-themes, themes and definition of the themes.

##### **4.3.3.2.1. Theme 1. Challenges after the EBSA program**

The women described their current diets after the program as being mostly similar to those they followed during the EBSA program. They mentioned that they struggled to continue eating the foods recommended by EBSA on specific occasions, such as holidays or social gatherings. All participants expressed feeling guilty after eating something that is not recommended by the program and that it was difficult to stay on track. Foods mentioned most when describing what they ate when they 'cheated' were chips and sweets. Some mentioned that not working during holidays was one of the reasons why they fell off the wagon since they had more free time and did not have a daily routine.

Moreover, participants felt that they had to turn down invitations, which made them feel bad. Some participants even felt that they were being judged by friends and family when adhering to the lifestyle and refusing to eat certain foods and even when 'cheating'. All participants said that, though they had deviated from their routines during the holidays, they were now transitioning back into the lifestyle with relative ease once their routines had stabilised. As seen previously after the EBSA program, these women were also confused by their doctors' opinions about the LCHF diets and their approach to drug treatments.

##### **4.3.3.2.2. Theme 2. Realities within the community**

When the question '*What do you want to tell anyone who knows nothing about Ocean View?*', was asked, the women started talking about the lack of safety within the community. According to them, there was an increase in crime in the community during the holiday

season. Participants mentioned that they witnessed daily shootings and stabbings. They described that the perpetrators could be friends and even children and that they did not know who to trust anymore. Participants mentioned that they felt that they had no freedom and that made them feel emotional. The women said that some members of the local police force may even be involved in gangsterism. They also explained that this has affected the community's local economy since some shops had to close because they were constantly being robbed. According to the women, robberies are usually at gunpoint and they even explained that the community has created a group that escorts people to the taxi rank or the bus stop to make sure that they are safe.

The women talked about the fact that many children from the community join these gangs. Some felt that they, the adults, have let the children down somehow. A woman described the children's attitudes, that they were acting out and pretending to be gangsters because that is what is considered to be normal by them. Participants said that the current situation in Ocean View has physical and mental consequences on their health. They said that, since it may be too dangerous to walk, run or attend the gym, they felt that they could not perform any physical activity outside their houses or walk to places within their community. Some of the physical symptoms that they experience when the crime in the community is rife is high blood pressure and lack of sleep.

Mental health is also affected by the current situation within the community according to women. Fear and anxiety were some of the emotions mentioned that affected their dietary behaviours. Although the women mentioned that this is an ongoing situation in their community and also while EBSA has been running the program, they decided to come to the meetings and take part in the group regardless because of the support they received from the program and the other participants. The fact that the sessions were during the day when it was light, and they felt it was safer for them to leave their homes and come to the meetings was one of the reasons why they came, and it was always easier if it was with someone else.

#### **4.3.3.2.3. Theme 3. Support system**

Support appeared to be an extremely important factor that encouraged the women to remain in the EBSA program. After the program, some of the participants said that they were receiving a great deal of support from the EBSA WhatsApp group. This support was generally regarded as a motivator due to sharing recipes, supermarket special deals, personal experiences, encouraging messages and the educator's approach. Some mentioned that being part of the group helped them to get back on track after the holiday season when they fell '*off the wagon*' since they motivated one another to return to their healthy habits.

Some of the participants mentioned that, although they appreciate the support, it was not always beneficial. For some women, the WhatsApp group had some negative aspects. Some described that it could be overwhelming, and they felt pressure to compare themselves to others and were disappointed if there was something that they had not achieved or experienced.

Regarding EBSA's potential follow-up meetings, most of the women mentioned that they would like to have more meetings and support after the program ends. Although the WhatsApp group provided support for most of them, they said that they missed meeting in person. Furthermore, some participants mentioned that they knew women who wanted to enrol in the next EBSA program, if there was another one. Some of them even mentioned that they would like to be part of another program since they recognised that they required the support system to keep following the healthy lifestyle.

As seen before, the EBSA educator was a facilitator for the participants since they felt that she encouraged and supported them. Her approach was valuable to all the women and they said that they felt accompanied during and after the EBSA program. They mostly felt that she was supportive, it was easy to talk to her and she helped them to understand the educational materials.



#### **4.3.3.2.4. Theme 4. EBSA's influence in the women's lives**

The women talked about how they felt about the information they received throughout the EBSA program. They said that they have become self-aware about their health conditions and the risk factors of metabolic diseases. Participants said that what they gained from the EBSA program was a change of mindset; in their words, the knowledge that they gained from the education sessions was like a *seed in their brains* and that would remain there. Since the Ocean View EBSA program was evaluated by researchers, the women were also asked about whether and how the testing influenced them.

According to all of them, the testing procedures, consisting of several questionnaires, diet assessment, body and blood pressure measurements and the physical activity monitors, made them more aware of their health status. Nevertheless, some mentioned that it took a considerable time and was intense for them, especially the first time during the first visit, but that the second time, during Visit 7, it was much easier. Participants also mentioned that they gained personal insight when they had the second round of tests after the EBSA program since they realized how much their health had improved. Moreover, some said that the testing initiated many feelings and that they felt as if they were confessing when answering some questions and doing the diet assessment since they had to discuss some stuff that they then realized was considered as being wrong or unhealthy. The EBSA program raised their awareness of not only their own health but also of the health of the others around them, especially friends and family. Participants felt that they had a responsibility towards others who were suffering within their community and that they had to take care of others. They mentioned that the LCHF lifestyle was meant for everybody but mostly for people with metabolic conditions. Although they felt that they wanted to spread the word in the community, some mentioned that they would only talk about their lifestyle when asked directly. They said that family and friends were more likely to listen to outsiders because they are regarded as experts. Women expressed their desire to either be part of another EBSA program or for EBSA to run more programs in the community so that more people would be able to join and gain the knowledge.

Table 10. Themes developed from the second set of FGDs with EBSA participants (n=22).

| Theme                                      | Definition of The Theme                                                                                        | Sub-Theme                                                                 | Quotes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theme 1. Challenges after the EBSA program | Participants' challenges around sustaining the EBSA advice regarding dietary behaviours and recommended foods. | 1.1. Feeling guilty<br>1.2. Social environments<br>1.3. Doctors' opinions | <p><i>"Once you are off, it's difficult to get back on track completely. (...). Then you think, I am going to eat a whole packet of chips instead of those five chippies. (FGD 6)"</i></p> <p><i>"I was very naughty because I ate all those puddings. I am guilty and I had symptoms. (...) In my heart, I knew that what I was doing was wrong. (FGD 4)"</i></p> <p><i>"My friend, she will always invite me. (...) I'm trying to please most of the people most of the time. I feel so bad by saying no. (FGD 5)"</i></p> <p><i>"I basically finished most of the trifle. (...) The best of all is that they watched me – they [relatives] penalised me – the crucified me. (FGD 6)"</i></p> <p><i>"After the holidays the reality struck that you fell off the bus, but now the main focus is on my health. (FGD 5)"</i></p> <p><i>"They [doctors] strengthened my medication. (...) I didn't like it at all, so I didn't take the cholesterol tablets because it triggers the pain, and if I don't take it then I'm fine. (FGD 5)"</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Theme 2. Realities within the community    | Participants' descriptions and feelings about living in their community and their fears.                       | 2.1. Lack of safety<br>2.2. Physical and mental consequences              | <p><i>"Ocean View is being overrun by crime. There is shooting every single day. I am getting emotional, because you are no longer safe here. And you feel that pain and that hurt. It's the place that you live, and you no longer have that freedom. (FGD 4)"</i></p> <p><i>"They steal and hold you up at gunpoint and my husband belongs to the neighbourhood watch. (...) They escort people to the taxi rank or to the bus stop so that they can get to work safely. (FGD 6)"</i></p> <p><i>"There is a child he stays in the flats, that child walks around like a gangster and they act out. And you cannot blame them. It is normal for them. (FGD 5)"</i></p> <p><i>"I used to run every day. (...) It is affecting me emotionally. I am a human being, and I feel the unjust, it is so unfair to us. (...) People that are trying to better their lives, are under gunpoint from gangsterism. (FGD 6)"</i></p> <p><i>"This [violence in Ocean View] is putting me personally with high blood pressure, I can't sleep properly. (FGD 4)"</i></p> <p><i>"I have had a lot of anxiety attacks. (...) When I was trying to get back on Eat Better, I was sleeping better, and I don't get hot flushes anymore. Everything is back now because of the crime, especially because of the crime. (FGD 5)"</i></p> <p><i>"The fear of not knowing if you would be approached next or get crossed in gun fires. With fear comes emotions. Emotions plays a big role basically on your eating habits. (FGD 6)"</i></p> <p><i>"I think the safety part of this program is because of daytime. Because you still feel safer because of the light. I just pray when I come down [to the sessions] because I like to be with the group. (FGD 5)"</i></p> |
| Theme 3. Support system                    | Participants' support or lack of it around them in relation to family,                                         | 3.1. EBSA support<br>3.2. EBSA participants                               | <p><i>"I do find it encouraging and inspiring to see how everybody inspires each other with encouraging words. (...) I can get back on the way, encouraging, inspiring, specials that they put on, it's a simple meal, but that triggers you to correct yourself. What I like is when they share recipes, like I get a lot of ideas. (FGD 5)"</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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|---------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                         | relatives, friends and the EBSA team.                    |                                                   | <p><i>"It seems to me as if there is so much pressure and I feel everybody is succeeding and here I'm like the tortoise struggling to get where they are. (FGD 6)"</i></p> <p><i>"It is nice to chat but to see people builds more relationships. (...) We meet once a month, maybe two. You are looking great by seeing everyone. (FGD 4)."</i></p> <p><i>"You can go to her and talk to her, and she will really do her best to help you understand. (...) The explanations she gave us, talking about her own life, it's like relating. She was on our level in the sense that we are going through this together. (FGD 4)"</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Theme 4:<br>EBSA's<br>influences in<br>women's<br>lives | EBSA's impact into<br>women's feelings and<br>knowledge. | 4.1. Self-<br>awareness<br>4.2.<br>Responsibility | <p><i>"At the end [of the EBSA program] when I went off the seed has been planted. (FGD 6)"</i></p> <p><i>"It was an eye opener for me. Especially coming back the 2nd time to see the difference in what kind of lifestyle have you been living, what have you been eating, and to see how easy and good it can actually be for you, and how healthy it can be. (FGD 4)"</i></p> <p><i>"You have a past that you don't want to know about, and here it is being rubbed in your face and now you are opening up. (...) It was very deep, very intense but on a good level. The first one was like a confession. That's how I feel. (FGD 6)"</i></p> <p><i>"It is when you talk to people about the program that you are following. (...) The knowledge that we gained; it doesn't just come on its own. Because when you interact with other people, and you hear what they are going through, that is a big help that EBSA introduced us to. Because now you want to tell the next person. (FGD 5)"</i></p> <p><i>"I was also very sick and when I came those two groups of people [EBSA and researchers] kept track of me, they drew blood and everything, they could see what is going on, and what I eat, and the other group helped me a lot. (FGD 5)"</i></p> |

#### **4.3.4. Mixed-method integration**

To integrate the quantitative and the qualitative data, convergent/divergent integration tables between pre-EBSA (Visit 1) and post-EBSA (Visit 7 – quantitative data – Visit 8 – FGDs – and Visit 9 IDIs) were created (Table 11). The only aspects found to be divergent were physical activity and sleep patterns. The remainder of the variables, which consist of diet assessment, body measurements, blood pressure, and blood markers, were convergent.

The diet assessment showed that the women were following a low carbohydrate diet and the qualitative descriptions of their diets supported that. In terms of the blood pressure measurements, the results converged because the physical measurements improved relative to baseline and the women mentioned their blood pressure improved and some had their medication reduced. Quantitative data of weight and waist circumference showed a significant improvement, and this was also mentioned by the participants during the interviews. Most of the women noticed that they had lost weight. They could see the benefits of losing weight and that made them want to continue following the EBSA recommendations. Blood marker changes are not easy to associate with certain feelings or experiences. However, the women mentioned certain subjective perceptions regarding their health status that converged with health marker improvements. Participants stated that they could see and feel health benefits with the recommended diet, so, therefore, the blood markers should reflect an improvement as well. The feeling of “being healthier” was consistent with the improvements in weight loss, blood pressure control, HbA1c and fasting insulin concentrations. The fact that the participants reported that they were following a LCHF diet, it is also convergent that plasma triglycerides concentrations decreased, and the LDL-cholesterol ratio increased slightly.

The community situation was identified as barrier for engaging in physical activity and walking in the community. Although the women mentioned that they had increased their physical activity levels, this was not reflected in the quantitative data. In fact,

participants appeared to have become more sedentary and there were no significant changes in moderate-vigorous activities. Some women mentioned that, because of their health benefits, their sleep had improved, but this was not supported by the quantitative data regarding sleep duration.

Table 11. Convergent/Divergent results comparing for data analysis integration from pre and post EBSA (n=32).

| <b>Variables</b>                                                                        | <b>Quantitative results</b>                                                                                                                                                                                               | <b>Qualitative results</b>                                                                                                                                                                                         | <b>Convergent or Divergent</b> |
|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| <b>Diet assessment (24-hour food recall and FFQ)</b>                                    | A significant decrease in calories, carbohydrate, sugar, and fibre intake. FFQ showed a significant decrease in intake of sugar, fruit, bread, cereal, and grains, and fast food. FFQ showed an increase of healthy fats. | Participants reported that they changed their diets to a low carbohydrate diet. Women said that they increased healthy fat intake and provided some examples.                                                      | Convergent                     |
| <b>Blood pressure (systolic and diastolic blood pressure)</b>                           | Systolic and diastolic blood pressure showed a significant reduction.                                                                                                                                                     | Participants reported having improved their blood pressure control and some reduced medication.                                                                                                                    | Convergent                     |
| <b>Anthropometric measurements (weight and waist circumference)</b>                     | Weight, and waist circumference showed significant reduction.                                                                                                                                                             | Participants reported having lost weight. Weight loss was seen as a facilitator to adherence.                                                                                                                      | Convergent                     |
| <b>Blood markers (liver function, inflammation, lipid profile and glycemic profile)</b> | GGT, ALT, Triglycerides, CRP, LDL-cholesterol, HbA1c, fasting insulin, HOMA, and Quicki index significantly improved from pre- to post-testing.                                                                           | Participants mentioned they had improved symptoms of atherosclerosis like inflammation and pain. Women reported having reduced inflammation. Women mentioned they feel more energetic, less lethargic, and sleepy. | Convergent                     |
| <b>Physical activity (sedentary, light, moderate, vigorous) and sleeping patterns</b>   | Sedentary behaviour increased significantly. Light decreased significantly. Moderate and vigorous showed no difference. No significant difference were seen in sleeping duration                                          | Some women mentioned that they started exercising more and meeting for walks weekly. Participants mentioned they improved their sleep.                                                                             | Divergent                      |

The integrated data comparison between pre-EBSA, post-EBSA and follow-up EBSA (Visit 10 FGDs and Visit 11 – quantitative data) was found to be convergent (Table 12). As the follow-up data collection was performed after the holiday season when there were many family gatherings, the women mentioned that they struggled to adhere to the diet. This was clearly reflected in the FFQ results, where there was a significant increase in foods that contained carbohydrates. Although the results suggested convergence, significant differences were not found, and as a result, participants' diets were still considerably lower in carbohydrates than their pre EBSA diets.

As mentioned by the participants, during the holiday season the gang violence also increased exponentially in the community. The lack of safety affected them mentally and physically. One of the consequences of experiencing anxiety and fear was that their blood pressures increased. The blood pressure values were convergent with their perceptions of their own health status. They had increased slightly, but remained significantly lower than baseline, pre-EBSA values. Similarly, waist circumferences increased slightly but remained lower than baseline. In contrast, the women's weight continued to decrease after the EBSA program. These results were convergent with the qualitative results, as some women mentioned that, although they did not adhere to the diet, they felt they were losing weight.

Table 12. Convergent/Divergent results comparing for data analysis integration from pre, post and follow-up EBSA (n=21).

| <b>Variables</b>             | <b>Quantitative results</b>                    | <b>Qualitative results</b>                                                                                                                                                               | <b>Convergent or Divergent</b> |
|------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| <b>Diet assessment (FFQ)</b> | A significant increase in carbohydrate intake. | Participants mentioned that they felt guilty because some went back to eat certain foods that were not recommended by EBSA. Those foods were considered high in carbohydrates and sugar. | Convergent                     |

|                                                                                         |                                                                                                                         |                                                                                                                                                                                                          |            |
|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Blood pressure (systolic and diastolic blood pressure)</b>                           | Systolic and diastolic blood pressure had a significant increase. Heart rate didn't change.                             | Some participants mentioned that the current situation in the community related to the gang violence affected their blood pressure.                                                                      | Convergent |
| <b>Body measurements (weight and waist circumference)</b>                               | Weight kept dropping significantly and waist circumference had a significant increase.                                  | Participants mentioned that one of the most important EBSA's influences in their life was the weight loss from those who were obese or overweight.                                                       | Convergent |
| <b>Blood markers (liver function, inflammation, lipid profile and glycemic profile)</b> | GGT, ALT, . LDL-cholesterol, cholesterol/HDL ratio, Triglycerides, HbA1c, HOMA, and Quicki index significantly changed. | Women didn't report having reduced inflammation compared to November. Participants mentioned they didn't feel as healthy as previously and that they felt more energetic when sticking to the LCHF diet. | Convergent |

Regarding the health markers and women's experiences of their health, the participants stated that they could discern the difference in their body when they were not eating the recommended foods, in terms of feeling more lethargic and less energetic. Although some blood markers increased slightly on the follow-up, none of them reverted to pre-EBSA values. Blood marker values were found to be convergent with the women's perceptions of their own health status.

#### ***4.3.5. EBSA team perceptions of the program***

As part of the evaluation of the Ocean View EBSA program, the program providers and organizers were also interviewed to compare the participants' experiences to the EBSA members' experience of the same program. The manager, the medical doctor and the educator are EBSA employees, and two nurses from Ocean View were hired to assist during the program to take body measurements and blood pressures each week during the program.

These five EBSA team members (the manager, medical doctor, educator and two nurses) were interviewed through IDIs. Three themes were developed from the analysis (Table 13): i) EBSA structure and purpose, ii) the impact of EBSA on people's lives and iii) challenges to health, according to the EBSA team.

#### ***4.3.5.1. Theme 1: EBSA program structure and purpose***

The EBSA team members defined the program and its purposes in this theme. The manager explained that the program started in Ocean View in 2015 and that it was an experiment to see whether what they envisaged was even possible. After seeing the results of the first pilot program, they decided to continue and expand the program to other communities with similar characteristics. The medical doctor said that the group of people participating in the Ocean View program was unhealthier than expected compared to other intervention groups that they had managed before. She highlighted the importance of closely monitoring those who had pre-existing organ failure because they required adapted diets, and their medication had to be adjusted as they improved. The educator mentioned that she learned a significant amount from the participants and that the perspective she had had of the community had changed as a result. The nurse said that they saw how the participants' health improved and that EBSA should run more programs in the community. One nurse mentioned that people from this community wanted to be healthier despite having to cope with safety issues and several socioeconomic challenges.

The team members had some ideas on how they saw EBSA moving forward into the future. They had many suggestions, such as to focus on the coaches' development so that they can lead the educational programs effectively in their communities. Another approach was to add psychological and mental health aspects into the sessions, such as how to manage stress. According to the team members, approaching children to provide them with nutrition education was something that they were also considering. The medical doctor suggested that it would be advantageous to team up with organizations that would allow them to teach mothers, and also children, in nutrition education sessions in the schools to inspire the children. Finally, when talking about the sustainability of the program and its purposes, the manager mentioned that, although they could do a significant amount of groundwork, the changes should be in the dietary guidelines. According to the team members, these changes are required in order to impact healthcare, nutritional treatments and social welfare.



#### ***4.3.5.2. Theme 2: The impact of EBSA on the participants' lives***

This theme involves the EBSA team members' thoughts on how the program impacted the participants' lives. They said that one important aspect of the success of the program was the participants' commitment to it right from the outset. Team members expressed that these communities needed support. They mentioned that the changes in dietary behaviours had the greatest influence on the women's lives. Some of the EBSA participants started the program quite sceptical about the diet, but, after experiencing how their health improved and how they felt, their attitudes changed. The team members mentioned that the knowledge may have helped the EBSA participants to be more conscious of what is in food and what they buy when they go shopping. Apart from the nutritional aspects of the program, team members also mentioned that the program probably influenced the women's lives on social levels and emotional levels.

The educator stated that she tried to talk about how emotions affect bodies and the decisions we make. The medical doctor mentioned that nutritional knowledge empowered the EBSA participants. Moreover, team members mentioned that the EBSA participants spread the word in the communities and that there is a process of transformation for better health. The group support was also mentioned by the team members and they stated that it influenced the success of the program since the women felt encouraged by each other. Even the EBSA nurses mentioned that they had been influenced by participants' journeys, and that they also wanted to participate in the program.

#### ***4.3.5.3. Theme 3: People's health challenges according to EBSA team***

The EBSA team members stated that, although people from under-resourced communities may have problems with access to food and proper nutrition, it is not apriority for most and that nutrition education is what people need. They mentioned that the people are not aware of the dangers of foods with high sugar content andcarbohydrates. They said that people do not know about the link between nutrition and illness and how diet can affect the development of certain diet-related diseases. The medical doctor considered that, due

to the past political situation in the country, people became used to behaving in a certain way and now these are behaviours that are difficult to change. She stated that people from these communities carry a significant burden from the trauma of the past generations.

According to the team members, there is a general need for safety within the communities because of the higher rates of violence, which is causally linked to stress and mental health disorders. Team members mentioned that the diet and their interventions that combine group support and changing the participants' dietary behaviours can help with stress. According to them, carbohydrates and sugar have a certain biological effect on one's body that makes one feel better, so, if one finds oneself in a stressful situation, it is understandable that one might want to start eating more carbohydrates. This is otherwise known as emotional eating. The educator emphasized the importance of the support and empathetic approach to the education sessions to ensure that people felt comfortable and supported.

The EBSA team members reflected on the fact that there is a need for better healthcare facilities and sanitation in the community. The nurses mentioned that there is only one clinic in the community, and it needs more staff. The manager mentioned that people do not always have access to water that is safe for drinking. She also mentioned that people with chronic conditions are often underdiagnosed and not properly monitored. The EBSA manager explained that there are gender disparities within these communities, in South Africa, women have the worst health statistics, and they are the ones struggling the most with obesity. Moreover, she talked about the role women play as caregivers in their communities, which sometimes does not allow them the time to take care of themselves. Food security was identified as another challenge by the EBSA team members. The nurses mentioned that 'thinking outside the box' and changing cooking habits can also be a challenge and that people do not always want to make that effort. They mention that the unhealthy food is cheap and all too easy to access.

Table 13. Themes developed from the EBSA team members' IDIs (n=5).

| Theme                                                     | Definition of The Theme                                                                     | Sub-Theme                                                                            | Quotes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theme 1.<br>EBSA<br>program's<br>structure and<br>purpose | Definition about the EBSA program, its aims, the Ocean View program and the future of EBSA. | 1.1. Meaning of EBSA<br>1.2. Roles<br>1.3. Ocean View program<br>1.4. Future of EBSA | <p><i>"This was a sick group that we didn't expect because we didn't have such sick people before. (EBSA medical doctor)"</i></p> <p><i>"It was quite inspiring and humbling, and I think it made me learnt a lot. (...) It changed a lot of my perspectives on how we perceive communities and specifically like Ocean View, understand where they are coming from and the struggles they are facing. (EBSA educator)."</i></p> <p><i>"It [EBSA] must be a continuous thing. When one group is finished, another one starts again. (...) Although they [community] live these dangerous things and the violence and stuff, when they do something like that, they are very committed to it. (EBSA nurses)"</i></p> <p><i>"Appointing a community coach or coaches and then providing ongoing training, so not just a once off training and a once off set of slides but ongoing. (EBSA educator)"</i></p> <p><i>"I know it's not necessarily nutritional, but I will try and have a session solely on stress or like a psychological type of session. Mental health is often being neglected. (EBSA educator)"</i></p> <p><i>"What EBSA would really like to do is to change children's diets rather than needing to change the adults. (...) If every child under the age of ten today started eating a healthy balanced diet, we could fix the country in a dramatic way. (EBSA manager)"</i></p>      |
| Theme 2.<br>EBSA's impact<br>on<br>participants'<br>lives | Team members' idea of EBSA's influences on the program's participants' lives.               | 2.1. Commitment<br>2.2. Dietary behaviour<br>2.3. Empowerment                        | <p><i>"These people are wanting change in their lives. (...) They are now sitting there [sessions] with that attention. Not because they are getting freebies, but they are there for their health. I mean that drew me. (EBSA medical doctor)"</i></p> <p><i>"I think obviously people went into it [EBSA] sceptical. I think they were pleasantly surprised by the health benefits that they felt. (...) That they had appetite control for the first time. (EBSA medical doctor)"</i></p> <p><i>"The ketosis and the restriction of carbohydrates is actually what works because other things that we add on our community are based to support them and make people more likely to sustain it over time and give them a sense of purpose and commitment, but they are accessories. (EBSA manager)"</i></p> <p><i>"When you are teaching a person to eat and make the right choices, you are not just teaching them about food, you are empowering them about their own survival. Their ability to choose better for themselves. Empowering a mindset and so when you empowered that, you changed everything. (EBSA medical doctor)"</i></p> <p><i>"You could see they were like chubby and, all of a sudden after three weeks you could just see how they look different. They had more energy and it actually opened my eyes a bit. (...) I think we must join the next group. (EBSA nurse)"</i></p> |
| Theme 3:<br>People's<br>challenges to<br>health           | Socioeconomic and environmental reasons why people from under-resourced                     | 3.1. Nutrition education<br>3.2. Stress<br>3.3 Food culture and tradition            | <p><i>"When it comes to our Eat South Africa groups, I would say education is one of the biggest needs. (...) I think sometimes their basic needs might not be met, which makes it very hard for them to meet things like nutritional needs. (EBSA educator)"</i></p> <p><i>"I don't think they understand the dynamics of when they do have an illness. Most of the time of course that contributes to what you eat and how much you eat and, and not eating the correct food. (EBSA nurse)"</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

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| according to<br>EBSA team | communities eat the<br>way they eat. | <p><i>"The cheapest way to feel good is to have a whole lot of food that your family can share. This community's challenge is not just food, not just poverty. Their challenge is alliance, is being overlooked, is this feeling of I am not enough from the past. The victimization, just being the forgotten period. (EBSA medical doctor)"</i></p> <p><i>"[The crime] It gives them lots of stress and that is where the blood pressure then goes up, because you are scared. People worry about the children because the children also act in this violence and form gang groups. (EBSA nurse)"</i></p> <p><i>"Having a good nutrition and having this education and having this group participants. People can talk about their fears and concerns and that helps them to relieve a lot of that stress. (EBSA nurse)"</i></p> <p><i>"Highlights for me like was definitely when the ladies stood up and shared their either victories or obstacles of the week. I think for the women as a group, they're not alone in whatever they're experiencing, because they can relate to each other (EBSA educator)."</i></p> <p><i>"They [people of low-income communities] get very limited access to public health and they don't really see doctors. (...) Often, they are dying, people are dying before they get diagnosed. (EBSA manager)"</i></p> <p><i>"It is what they eat and how they eat it and, and the fact that it is easily accessible. People don't want to make the effort once again to go the old route like cooking up the vegetables, taking time to peel it. The processed food is easily available and accessible. (EBSA nurse)"</i></p> |
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#### 4.4. Discussion

A total of 32 women participated in an EBSA program in Ocean View from August to October 2019. The EBSA program was evaluated through a pilot, mixed-method study to provide information that could improve the implementation, translation, and sustainability of the EBSA program. This study's specific objectives were to determine the extent to which women from Ocean View participate in an EBSA intervention and to evaluate the facilitators and barriers to attending and understanding the EBSA sessions and implementing and sustaining dietary changes. Other objectives were to evaluate how the EBSA program impacts participants and pilot data collection procedures. Moreover, this pilot study aimed to establish whether and how we should conduct a more extensive study to evaluate the effectiveness of the program on improving diet and health outcomes, to optimise data collection procedures for our third study and to evaluate the impact of these procedures on the program. A mixed-method analysis consisting of a joint display through a convergent design was used to integrate qualitative and quantitative methods. The study included 11 visits. Of these, Visits 1, 7 and 11 were used to collect quantitative data – diet and health assessments – Visits 2–6 involved the EBSA program and qualitative data – FGDs and IDIs – were collected during Visits 8–10. In addition, the EBSA team members were interviewed as part of the evaluation of the program.

Regarding the EBSA's program structure and purpose (4.3.5.1. Theme 1), the team members explained that EBSA started in Ocean View in 2015, and they understood these programs as being a series of pilot interventions. They stated that their mission was to educate under-resourced communities about nutrition, chronic diseases and health. Moreover, they mentioned that the group appeared to be considerably unhealthy at the baseline and that there was a need to provide nutrition education so that people can become healthier. The EBSA participants described the reasons why they decided to enrol in the program (4.3.3.1.1. Theme 1) in the first set of the FGDs at Visit 8. They indicated that they desired to be healthier and thought they would need some support. These are common

findings when exploring a participant's willingness and motivations to participate in any behavioural intervention (213,218,227,269–272).

The women's diets before the program were assessed and again evaluated after the program and six months on. The dietary assessment showed that participants significantly reduced their total caloric, carbohydrate, sugar and fibre intake. Data was collected from the participants' food recalls and compared to FFQ to validate the findings. EBSA's focused on carbohydrate reduction and not counting calories as women were supposed to eat to satiety. Nevertheless, the low calorie intake after the program (an average of 1000kcal/day) was potentially due to underreporting and we cannot assume this finding completely. The qualitative data concerning food and dietary behaviours converged with the quantitative findings. In the first set of FGDs (4.3.3.1.2. Theme 2), the women described their EBSA diet experiences based on a LCHF diet. They mostly liked the recommended foods, and participants expressed that they had changed their dietary, cooking and even shopping behaviours. As seen in the first set of FGDs as well (4.3.3.1.3. Theme 3), the women found that the knowledge about nutrition they had gained from the EBSA program was a facilitator for them, and they felt empowered. This aspect was also important as part of the follow-up assessment on the 2nd set of FGDs (4.3.3.2.4. Theme 4), regarding the influence of EBSA on the women's lives. The participants demonstrated self-awareness and declared that they would "retain the nutritional knowledge forever, no matter what". The EBSA team's perceptions regarding the program's impact on participant's lives also explored that aspect (4.3.5.2. Theme 2). Team members mentioned that the women's dietary behaviours had changed, and that following the diet made them feel more in control and empowered.

Although participants seemed to enjoy the diet and said that their health was improving and they were feeling much more energetic, the women confessed that there were some foods that they still missed. This finding was also prevalent in the previous study with past EBSA participants (10) and other studies that explored the LCHF diets (81,175,192,203,208,273). Participants talked about challenges related to the diet in the first set of FGDs (4.3.3.1.4. Theme 4). Cravings and the desire to eat certain foods triggered by missing those foods, as noted before, was found to be a challenge for some participants, especially for sweet items. This barrier was also found during the follow-up assessment

regarding the challenges the women experience after the EBSA program (4.3.3.2.1. Theme 1). The women mostly expressed that they had not followed the LCHF lifestyle strictly during the holiday season, which caused them to feel guilty. Some mentioned that it was difficult for them to eat the EBSA-recommended foods during social gatherings, which was found to be a common theme found in previous studies (175,203). The food security problems that people in under-resourced communities face and the food culture mentioned by the EBSA team members exposed the challenges people face during social gatherings (4.3.5.3. Theme 3).

In addition, team members described that carbohydrates and added sugars could have a specific biological effect on people's bodies that makes them feel better. Therefore, they described that, when people feel stressed or anxious, they tended to eat more unhealthy foods. Participants described the same feeling regarding the diet-related barriers (4.3.3.1.4. Theme 4). In addition, similar emotions were described when talking about the physical and mental consequences of living in constant fear in their community's dangerous environment (4.3.3.2.2. Theme 2). Indeed, the most challenging environmental factor was their concern for and lack of safety. As expressed by the women, this situation impacted their health, and this was shown in the data. Blood pressures were measured before, immediately after, and again six months after the EBSA program. Initially, there was a significant difference in the comparison of systolic and diastolic pressure before and after the EBSA program. The women mentioned in the first FGDs that the health benefits were a motivating factor for them to remain in the program (4.3.3.1.3. Theme 3), and some women could even reduce their medication due to the dietary changes. Therefore, the finding of quantitative data converges with the qualitative data. During the follow-up assessment, although blood pressure was found to still be significantly lower than at Visit 1, it had increased some when compared to Visit 7. This increase was justified by the community situation the women described during the 2nd set of the FGDs (4.3.3.2.2. Theme 2).

Moreover, the EBSA team members also mentioned that crime was one of the most critical challenges the women have to face (4.3.5.3. Theme 3). Regarding the community's realities, the women talked about the physical consequences of having to live with such

a higher rate of crime daily (4.3.3.2.2. Theme 2). They specifically expressed that this situation affected their blood pressures, and this converged with the quantitative data collected on Visit 11. This problem was initially explored immediately after the EBSA program, where the women talked about the social determinants that they considered to be barriers to them sustaining the healthy dietary behaviours in their communities (4.3.3.1.4. Theme 4).

The improvement in blood pressure on a LCHF diet has been noted several times in different scientific articles (274–280). It usually accompanies weight loss, which the participants experienced throughout the EBSA program and even during the follow-up (146,152,281–283). Weight was found to be the only consistent significant difference when comparing pre, post and follow-up data, which means that the women were still losing weight even six months after the EBSA program. Waist circumference was significantly different, which was one of the highlights of the study's findings in the post-data collection. While waist circumference increased slightly but significantly between the post evaluation and the follow-up evaluation, it was significantly lower at follow-up compared to baseline. Losing weight was a motivation for most of the women, as seen in the 1st FGDs (4.3.3.1.3). Theme 3), when the participants talked about how noticing the health benefits of weight loss especially helped them stay on track. This outcome is probably the most common pattern seen with those following a LCHF diet. It has been identified in several intervention studies when comparing this diet to other diets, such as reduced calories, low fat, and other treatments (146,152,281–283). However, weight loss can be seen as a negative, as expressed by EBSA team members in (4.3.5.3. Theme 3), where they talked about potential challenges the women face within their communities. Team members mentioned that some women could be judged on a cultural aspect because they were losing weight or were on a diet as seen in other studies (284–286). Therefore, the community's understanding of weight and health could eventually influence the EBSA participants.

The improvements in anthropometric parameters outcomes were accompanied by an improvement in some health markers. Drawing blood was mentioned as a challenge (4.3.3.1.4. Theme 4), and some of the participants were not used to needles. Afterwards,



some participants expressed that the testing procedures increased their self-awareness of their health status, as was seen in the 2nd FGDs (4.3.3.2.4. Theme 4). The aspects that had shown significant differences after the EBSA program were those related to liver function, the liver enzymes GGT and ALT, inflammation marker CRP, the lipid profile, LDL cholesterol and triglycerides, and the glycaemic profile, HbA1c, fasting insulin, HOMA and the Quicki index. All the significant markers improved, meaning that they had decreased, and the only marker that had increased slightly was LDL cholesterol. The available scientific evidence shows that this is a common outcome with LCHF interventions (287). As mentioned before, regarding the results, the optimal values of LDL have been contradictory recently. Before, total cholesterol, especially LDL cholesterol, was causally linked to an increased risk of suffering cardiovascular disease. Currently, this theory has been broadly rejected in several recent articles (170,288–292). There has been a shift in attention to the triglycerides as a marker to classify the risk of eventually becoming metabolically unhealthy (170,288–292). The quantitative findings related to blood markers and health converged with what the women expressed during the FGDs and IDIs, since they highlighted a reduction in inflammation and increased energy levels with feeling less lethargic, which were also identified as facilitators in the 1st set of FGDs regarding the facilitators of the EBSA program (4.3.3.1.3. Theme 3).

During the follow-up testing, with a smaller sample of participants and considering a repeated measured analysis, the women showed significant differences in mostly the same markers as before. Indeed, the ones that were significant were related to liver function, namely the liver enzymes GGT and ALT, lipid profile, namely cholesterol/HDL ratio, LDL cholesterol and triglycerides, and glycaemic profile, namely HbA1c, HOMA, and the Quicki index. The only marker that was still significant when comparing the post-EBSA and follow-up was the HbA1c, which had increased slightly. Therefore, the markers that were not significantly different from the post-EBSA data were CRP and fasting insulin. Furthermore, the ratio of cholesterol/HDL was found to be significant. The follow-up data showed a slight increase in all the markers that converged with the findings from the 2nd set of FGDs (4.3.3.2.1. Theme 1), regarding the challenges women faced after the EBSA program and regarding the realities of living in Ocean View

(4.3.3.2.2. Theme 2). As described in 4.3.3.2.4. Theme 4, regarding the influence of EBSA on the women's lives and previously discussed regarding diet and body measurements, the women gained knowledge regarding their health markers through the testing procedures. Consequently, a better understanding of their diseases and the biological aspects raised self-awareness regarding their health status as seen previously in other studies (175,203,205,228) and the impact of the EBSA program.

Regarding the impact of the EBSA program on the women's physical activity, sedentary behaviour, and sleeping patterns, sedentary activity was the only outcome that showed a significant increase. The remainder of the classified exercise activities were not significant, but device-measured light and moderate activity actually decreased, and vigorous activity increased slightly. Although there was an increase in the average hours of sleep, the participants' sleep patterns did not differ significantly. With the mixed-method analysis throughout the convergent table, the only outcomes that were found to be divergent were physical activity and sleep patterns. Nevertheless, it is necessary to understand that sleep duration and sleep quality are not the same, and sleep could have improved without the duration of the sleep changing.

The participants expressed in the 1st FGDs (4.3.3.2.3. Theme 3) that one of the health benefits they had experienced was the way they felt – more energetic and less lethargic; they had started to do more exercise and were more active. The divergence of this outcome could potentially be explained by the fact that the women's activities outside the home in the community were limited (1,293). They mention this issue when talking about the social determinants' regarding barriers during the EBSA program (4.3.3.2.4. Theme 4). Moreover, the social and environmental aspects were also discussed in the second set of FGDs (4.3.3.2.2. Theme 2), when the women talked about the reality of living in their community and how some aspects could potentially affect them physically and mentally. The EBSA team members mentioned that the social factors women faced in their communities could be potential challenges for them to overcome to sustain the new dietary behaviours and healthier habits (4.3.5.3. Theme 3).

The EBSA team members' experiences were explored to add background to the Ocean View program and as a tool to evaluate the program. They were interviewed about

the program in Ocean View, which aligned with the participants' experiences. In addition, they were asked about the future of EBSA (4.3.5.1. Theme 1). In the first FGD (4.3.3.1.5. Theme 5), the women made several suggestions to improve EBSA and its impact in the community. One suggestion converged with what the EBSA team members mentioned regarding EBSA's future, which was to train coaches within the community. As identified by both participants and team members, the community coach or ambassador figure was seen as a tool that would support sustainability. By the virtue of their position within their community, the women could have a leading role in spreading EBSA's nutritional information. This aspect has been shown to be a successful tool when targeting metabolic diseases and also other diseases in previous studies (294–297). The use of what it is called an 'expert patient' is a common method used in different contexts, mainly in HIV programs (298,299) and diabetes care management interventions (296). Therefore, as part of providing the necessary knowledge regarding a specific disease and treatment or management as the program providers could, the expert patient has much more to offer. Previous participants' experiences could eventually lead to improvements in other participants' lifestyles and even psychosocial outcomes. Moreover, expert patients' knowledge can also help clinicians to better understand patients' subjective experiences to improve healthcare support quality (205,227,296).

Finally, the EBSA participants identified as a common challenge a lack of support from their doctors. Other studies on the LCHF diet have also previously identified this challenge (192,272). Regarding the challenges the women face after the program, one of the barriers that some experienced was that they felt confused about healthcare nutritional advice (4.3.3.2.1. Theme 1). The lack of advocacy from their doctors was identified as a potential barrier to the women to sustain their dietary behaviours. This aspect has been shown before since the LCHF diet has been quite controversial, as mentioned before, mainly because of the high-fat content aspect. According to the participants, healthcare practitioners seemed to appear hesitant about the LCHF lifestyle and the metabolic and health outcomes. During the interview with the EBSA nurses, they mentioned that there were some confusion and sceptical thoughts when they thought about LCHF diets before the program. After the program, though, they expressed that

they felt quite different about the lifestyle and were influenced by the improvement in the participants' health and the nutritional knowledge that they had gained (4.3.5.1. Theme 1).

Pilot studies are inherently limited by their sample size but are designed to be an essential component to inform further experimental studies. A mixed-method approach and an analysis through a convergent design were used to integrate the different types of data. Nonetheless, this study has several notable limitations. Although integration helped to provide greater insight into the feasibility, acceptability, and implementation of the EBSA program, knowledge assessment was limited to what was taught in each session of the EBSA program and could not be properly confirmed. A broader pre-post nutrition knowledge assessment would have provided a useful addition to the topic-specific assessments conducted at each session.

The qualitative data related to nutritional knowledge and, consequently, self-awareness revealed a deeper understanding of how things work and the women's experiences, thereby facilitating transferability. Indeed, almost all of the participants decided to participate in the FGDs. Those who chose to attend, however, were unlikely to include those who had had a bad experience. Potential for bias may have been somewhat mitigated through the additional data related to the barriers and facilitators recorded following each intervention session. As a purposive sample, our participants knew each other personally and established group dynamics throughout the EBSA program, which might have impacted the dynamics of the FGDs.

A further limitation is that, despite the participant adherence to the program being high, as per our definition, we do not have data related to whether individual participants' goals were met. In this regard, attendance at the sessions was found to be, on average, highly successful. However, it was not included as a potential outcome, because the pilot sample size was too small, and there was lack of a comparator group. Measuring diet intake and dietary behaviour remain a challenge for any nutrition intervention study. Using only one tool to assess diet can potentially cause both intake-related and person-specific biases (251). Women could have overreported their healthy food intake and underreport unhealthy food intake. Person-specific bias is the difference between an individual's reported intake

averaged over many repeated measures and true average intake, after taking intake-related bias into account (184,186, 208, 251). It varies from person to person and may be caused by personality characteristics. For instance, in the case of the reduction of participants carbohydrate intake, but no rise in fat or protein, we could potentially suspect underreporting or inaccuracies with dietary intake. To overcome some of the potential bias and to assess the validity of dietary intake methods to determine if the method is measuring what people are really eating, this pilot study used both food frequency questionnaires and 24-hour food recalls together with qualitative descriptions of dietary behaviour changes (251). Moreover, the diet assessment focused mostly on macronutrients and not micronutrients. In a better designed control study, micronutrients should be included to better evaluate and assess diet and individuals' dietary needs.

Limitations to using accelerometers to measure physical activity included high unit cost, the inability to capture the context in which physical activity occurs or the actual type of physical activity the women engaged in. An additional limitation with objectively measured sedentary behaviour with accelerometers is that there is a risk of misclassification of sedentary behaviour as sleep time or non-wear time. When motionless, an accelerometer will register zero counts. Much like physical activity, objective sedentary behaviour measurement with accelerometers cannot determine the context in which sedentary behaviour is occurring or the type of sedentary behaviour women engaged in (263-265).

Although the follow-up data assessments differed from post-EBSA measurements because of the pandemic, a considerable sample of the women were able to undergo several tests that provided valuable, multi-faceted outcome data over time and strengthened the validity of the results achieved. Eventually, the follow-up data helped to facilitate the application of theory and formative research in a future study. Finally, as the study was not a randomised control trial, any causal interpretation should be made with caution. Despite these limitations, this pilot study provides unique insights into the women's experiences and perceptions regarding participating in a nutrition and health education program that promotes LCHF diets in under-resourced communities to prevent or treat metabolic

conditions. The intention of this study was to generate hypotheses that could be tested with further studies, and it should be interpreted through that lens.

#### **4.5. Conclusion**

In conclusion, in this mixed-method pilot study, the intention was to evaluate the EBSA program and its potential benefits to participants' health parameters and wellbeing. The purpose was to explore the women's perceptions regarding the EBSA program, along with any dietary behavioural changes and their experiences with the recommended diet. The data showed that the women experienced improvements in dietary behaviours, blood pressure, weight and waist circumference, and several biomarkers related to inflammation, lipids, and glycaemic profiles. After following a 5-week LCHF nutrition education program, the changes were more or less sustained after six months. Women's carbohydrate intake was reduced significantly, and their health markers improved despite a slight increase in sedentary behaviour.

Despite the stresses caused by violence within the community and the Covid-19 pandemic, women's health outcomes did not return to baseline values. Moreover, no participant's health worsened during the EBSA program. In general, the participants were satisfied about the program's structure, the changes in their dietary behaviours and the health benefits from having participated in the program. This proof-of-concept pilot study demonstrated the potential of a LCHF diet, implemented within a community-based education and support structure, for improving health risk status of women from low-income settings in South Africa.

Unfortunately, there was an aspect that neither EBSA as an organization or the participants can control, which is the social environmental factors in the community that can be identified as social determinants of health. The participants and the program could not change the social or structural aspects of their environment. This pilot study has shown that it is essential to target those aspects to ensure that any intervention is sustainable. It has also been shown how important it is to integrate any dietary behavioural change into the participants' lives as part of a sustainability plan. Therefore, it is necessary to

ensure that there is a support system beyond the program. Support from health practitioners was mainly required since most of the participants suffered from chronic metabolic diseases, and the lack of advocacy and the confusion were found to be barriers for some women. This theme was also found consistent with the experience of previous EBSA participants. As a result, the next chapter explores health practitioners' perspectives regarding health, nutrition and the EBSA program.

# CHAPTER FIVE: HEALTH PRACTITIONERS' PERCEPTIONS

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## 5.1. Introduction

South Africa's Constitution guarantees access to health services to every citizen; therefore, it is unconstitutional to deny anyone access to essential healthcare services, even undocumented immigrants (300,301). South Africa's health care system comprises the public sector, run by the government, and the private sector; both rely on an individual's ability to pay for health care. Public health services are classified into primary, secondary and tertiary health facilities, managed by the respective provincial departments of health divided into districts. Referred to as primary health care, clinics run by specially trained nurses serve typical health demands and refer patients to hospitals when further treatment is required. Secondary health facilities consist of larger clinics called community health centres, which usually have complements of doctors and nurses. The tertiary health facilities consist of hospitals for surgery, emergency treatment, and severe illness that cannot be treated at the clinic (301–303). The majority of patients access health services through the public sector District Health System, which is the preferred government mechanism for health provision and implements a primary health care approach. Approximately 80% of medical specialists serve the private sector which consists of 16% of the population. Many specialists who work in the private sector also work part-time in the public sector. Similarly, approximately 62% of nurses employed in the public sector also moonlight in the private sector (304).

The general public has raised several issues regarding public health institutions in the past (107,301,303). These issues are still present today and include prolonged waiting times due to a shortage of human resources; poor hygiene; insufficient infection prevention and control measures; increased litigation due to avoidable errors; a shortage of medicine and medical equipment; and poor recordkeeping. A major factor leading to these pertinent complaints is the unequal distribution of resources, largely caused by rapid urbanization, increased disease burden, and slow progress in concomitant



restructuring of the healthcare system (305,306). The primary health facilities in urban areas were designed and built to cater to a total population much smaller than the current population (306,307). The sudden influx of people into cities has forced health facilities to function beyond capacity. These movements have led to overcrowding and lack of resources, consequently adding strain on an already overtaxed healthcare system

Moreover, the shortage of healthcare workers, caused by inadequate training, inadequate recruitment (especially in rural areas), low retention, and staff mismanagement, is an additional issue (308). To make matters worse, there is a particularly debilitating shortage of professionals and skilled people in the South African public sector compared to the private sector (301). As a result, there is an unequal distribution of healthcare workers between the well-resourced private sector and the poorly resourced public sector in both urban and rural areas. The shortage of staff is mostly felt at the nursing level, thus, in primary care, as nurses are on the front line of service delivery in SA health care (309,310).

The health care workforce plays a critical role in advancing the health system goals, primarily driven by a policy position of improving access to health care for all citizens. With regard to South Africa's double burden of disease (infectious diseases as well as NCDs), health practitioners have the potential to play a vital role in improving diet-related chronic diseases. Health practitioners have not traditionally embraced nutrition education as core to their practice. However, they are faced every day with the fallout of the global obesity epidemic and the chronic diseases linked to it (88,301,310– 312). Despite the profound impact that good nutrition has on health and wellness, the science of nutrition and its application to health care is not fully integrated into most health professions training programs (313). Patients and the general public remain confused about the proper nutritional advice to follow, given the widespread media interest in different diets and the disparity in nutrition-related health messages in circulation. While dietitians are health professionals with nutrition expertise, all health care professionals should ideally be competent to dispense nutrition advice as it is used for health promotion and prevention (314). The same can be said when treating acute and chronic diseases. Even within a sturdy referral system between doctors and dietitians, there must be effective nutritional screening

and triage by doctors and nurses to provide specialist input for the most appropriate patients (313,315,316). Most non-nutritionist healthcare providers have to deal with nutrition-related conditions and diseases daily. However, few are adequately prepared to recognise key diagnostic signs and to assist their patients with preventive and effective interventions (313,315,316). This issue has global relevance as there is no region or country without a significant nutrition impact on health outcomes (28,30,59,317). Recent exchanges between several countries have highlighted several common aspects relating to gaps in medical and health care nutrition education worldwide (28,30,59,317). The evidence base for the practical use of nutrition-based preventive and curative interventions is rapidly growing, and implementation research is steadily improving the delivery of best practices (318).

Diet and physical activity interventions have increasingly shown improvement and benefits that are equal to, if not surpass, pharmacologic intervention, often with less risk, reduced side effects and lower costs (222,313,316,318–320). Many dietary interventions have been shown to reduce the incidence, severity and associated morbidity of diet-related NCDs. There are many examples of beneficial outcomes resulting from nutrition practices in inpatient, outpatient and community settings (123,184,238,320,321). In acute care settings, best nutrition practices have been shown to improve not only patient outcomes and reduce health care costs but health practitioners' own health risk status (322,323). While the evidence concerning the health benefits of the LCHF diet has remained controversial, it has been advocated by some clinicians and professional societies as a valid and effective therapeutic option for diabetes and obesity (153,154,272). "This is a scientific area that is rife with controversy and it has polarised expert opinion. More importantly, it has caused confusion for both health care professionals and their patients" (163).

In fact, treating obesity and diabetes in this way is not new. In the first proposal for its routine use in clinical practice in 1869, William Banting recognised even then the inevitable controversy and reputational risk it would evoke (324). International consensus guidelines on the dietary management of type 2 diabetes now endorse carbohydrate restriction as a legitimate therapeutic strategy (325,326).

EBSA has been running LCHF dietary education programs in under-resourced communities, emphasising the reduction in dietary sugars and the intake of healthy dietary fats. During FGDs with previous EBSA participants, it emerged that the women felt that the dietary information they received from health care practitioners, mostly nurses and medical doctors, in their communities was different to EBSA recommendations (see Chapter 3 and 4). They also felt that some health practitioners were not initially supportive of the EBSA diet but became supportive of it after seeing their patients' health improving. The EBSA programs promote a diet that is lower in carbohydrates and higher in healthy fats than most traditional dietary guidelines have recommended. However, many components of the recommended diet are consistent with current dietary guidelines. Despite the popularity of LCHF diets in South Africa and the health benefits identified in the scientific literature, many health practitioners continue to think of LCHF as dangerous.

Given this backdrop, we designed a study to better understand how health practitioners in the community setting perceive the 'EBSA' diet? What would they think of it and how they would respond to patients attempting to follow it? Exploring the health practitioners' opinions of the EBSA program and the health and nutrition status of community members, would greatly add context and insights into current eating habits of the community, and provide much needed support for changes in dietary behaviour, aligned to the "lived experience" of the community. This context could be used to further improve the EBSA program and contribute to training of health practitioners. Hence, the major aim of this chapter was to explore the health practitioners' perceptions of health, nutrition and the EBSA program with its recommended diet.

## **5.2. Methods**

### ***5.2.1. Study Design and Ethical Approval***

This was a qualitative study using in-depth individual interviews (IDIs) with health practitioners who work in communities in which EBSA has run previous nutrition education programs and in communities where EBSA intends to conduct nutrition

education programs. This research was approved by the Human Research Ethics Committee (HREC REF 512/2019) of the University of Cape Town. The study was performed in accordance with the principles of the Declaration of Helsinki (2013, Fortaleza, Brazil), the International Conference on Harmonisation, and the South African Good Clinical Practice (GCP) guidelines.

### **5.2.2. Study settings**

Health practitioners from health care facilities that would service the current and planned future EBSA programs were selected, two tertiary institutions, namely False Bay Hospital and Groote Schuur Hospital, and a primary health clinic in Hout Bay (Appendix U). False Bay Hospital is a public hospital that was opened in 1965 in Fish Hoek, a town approximately 30 kilometres south of Cape Town. The hospital has approximately 80 beds and its facilities include a 24-Hour Emergency Unit. It is the only district hospital in the South Peninsula Health District of the Metro Region and serves many communities, including Simonstown, Masiphumelele, Ocean View, Clovelly, and many more surrounding areas (327). Groote Schuur Hospital is one of Cape Town's largest government-funded academic hospitals and was officially opened in 1938. The hospital has almost 900 beds and it is renowned as the hospital where the world's first human-to-human heart transplant was performed in 1967 by Christiaan Barnard and his team (328,329). The Hout Bay health clinic non-profit organization works mostly in the informal settlement called Imizamo Yethu and provides nutrition and health education to the community. Hout Bay is a seaside town in the Western Cape province situated in the Cape Peninsula, 20 kilometres south of Cape Town (327).

### **5.2.3. Participants**

To be eligible for the study participants had to be health practitioners; work in and see patients from the communities where EBSA has conducted a nutrition education program or a community where EBSA is planning to run future programs; and be able to

understand and speak English. Community health clinics were contacted by email or phone calls to identify potential participants. A researcher explained the study to interested participants, either via phone or at a scheduled meeting, and, if they met the inclusion criteria, they were given the study information sheet (Appendix V) and the informed consent form (Appendix W). An interview visit was then scheduled at a convenient time and place for participants who agreed to volunteer for the study and met the eligibility criteria. Participants met individually with a researcher for about an hour in a private venue, and interviews were conducted in English.

#### **5.2.4. Procedures**

The IDIs were conducted between November 2019 and February 2020 and lasted, on average, 30 minutes. The sample size is consistent with recommendations in the literature which ranges between 5 to 50 participants (198,330). According to the literature, the first five to six IDIs generally produce the majority of the new data, and the majority of concepts are identified within the first 10 interviews. As such, new participants were interviewed until saturation was obtained (198,330). Participants were interviewed on a one-on-one basis to explore their understanding and perceptions of chronic disease, nutrition, low-carbohydrate high-fat diets, and the EBSA program.

An interview guide was used which included both open-ended and probing questions (Appendix Y) as a guide for the discussion, although questions were not necessarily asked verbatim. Probing questions were asked only if subjects had not already been covered. All interviews were audio-recorded, with the permission of the participants. Interviews were conducted by GPB and saved in a password-protected folder. Recordings were transcribed by Cyber Transcription (South Africa) in the original language. The accuracy and editing of the transcriptions were double-checked by an external qualitative researcher for rigor and appropriateness. Each transcribed interview was compared with the corresponding audio, to ensure that the transcription had been done in context and captured the interview as accurately as possible.

### **5.2.5. Data analysis**

The Braun and Clarke approach to thematic analysis (199) was used to identify and analyse themes with NVivo 12 software (QSR Internationality Ltd., Melbourne, Australia). All the researchers participated in the analysis, which was conducted in a stepwise fashion. First, Christopher C. Webster (CCW) and GPB read and summarized the transcripts. Second, two respective codebooks were developed inductively by CCW and GPB, based on the previous readings. Third, CCW and GPB discussed their individual codebooks and merged them into one codebook. Finally, the two researchers independently coded three randomly selected interviews using separate NVivo projects. Thereafter, CCW and GPB met again to revise the coding, and disagreements were discussed and resolved by consensus. The content and structure of the final codebook was subsequently finalised, with consensus from ABF, SF, and KL to check for consistency in the codes. Thereafter, the interviews were divided into two groups, each containing eight interviews, and one group each were assigned to GPB and CCW. Both coding schemes emerged in the same NVivo project, and GPB and CCW worked on developing the sub-themes and themes that were, subsequently, displayed by GPB as thematic maps (Appendix Z).

The following step involved naming the themes and defining the main concepts of each theme, resulting in a total of four themes. The last phase, which was mainly conducted by GPB, consisted of producing a report. The resulting themes were shared with ABF, SF, KL and JS to confirm their relevance to the research questions. Although GPB conducted the interviews and participated in the analysis, multiple coders (CCW and GPB) were used to allow greater probability to ensure that all themes were identified and that data were being consistently interpreted, to limit the potential effect of bias or singular point of view. Quotations from the qualitative data were selected to illustrate the emergent themes, and these capture the essence of the theme. Square brackets indicate text added by the authors to provide clarity or context and an ellipsis indicates the omission of irrelevant parts of the

quote. The health practitioners' professions are included with the participant quotes with the gender provided in parentheses at the end of the quote.

### 5.3. Results

Participants recruited for the study were from a variety of general practices and socio-economic localities. Sixteen participants completed the study, 11 women and five men; seven were medical doctors, seven were nurses and two were dietitians. The average age of participants was  $37.1 \pm 9.8$  years. The majority of participants ( $n = 13$ ) worked only in the public sector, two participants practiced in both the public and private sector and one participant practiced only in the private sector. Four themes (Table 14) were developed from the analysis: i) nutritional knowledge, ii) thoughts on LCHF, iii) thoughts on EBSA and iv) view of patients' barriers to health.

Table 14. Themes developed from IDIs with health practitioners (n=16).

| Theme                                            | Definition of The Theme                                                                                                   | Sub-Theme                                                                                                                                         |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Theme 1.<br>Nutritional knowledge                | Participants' opinions about their own nutrition knowledge                                                                | 1.1. Lack of confidence in own knowledge<br>1.2. Minimal reference to science<br>1.3. Catchphrases and statements of belief<br>1.4. Health advice |
| Theme 2.<br>Thoughts on LCHF                     | Participants' opinions of LCHF diets, their recommended foods and potential clinical advice.                              | 2.1. Own experiences<br>2.2. Concerns<br>2.3. Lack of advocacy                                                                                    |
| Theme 3. Thoughts on EBSA                        | Participants' idea of the EBSA program and its format and their suggestions.                                              | 3.1. Support<br>3.2. Considerations                                                                                                               |
| Theme 4:<br>View on patients' barriers to health | Participant's socioeconomic and environmental reasons why patients from under-resourced communities eat the way they eat. | 4.1. Food security<br>4.2. Determinants of health<br>4.3. Food culture and tradition                                                              |

### 5.3.1. Theme 1: Nutrition knowledge

The health practitioners recognised that they are not that well-informed regarding nutritional advice and its role in disease prevention. Practitioners felt that they barely have enough time to see patients for clinical advice and feel that nutritional advice, although important for disease prevention, requires extra time. They did, however, acknowledge that nutritional advice is ‘vital’ to promote healthy-diet behaviours so that diet-related chronic diseases can be addressed.

*‘Nutrition education will make people live longer’ (Female nurse).*

There seemed to be general confusion regarding nutrition in this sample as they mentioned that every second article one reads contradicts the previous one (male doctor), there is not sufficient data, and they do not keep up with new studies. As a result, practitioners find it difficult to deliver nutritional advice. As it stands, they tend to use many ‘catchphrases’ and their own statements of beliefs, basically based on what has traditionally been promoted as healthy behaviours: small portions, reduce red meat, eat fruit and vegetables, drink water, reduce dietary fats, avoid unsaturated fats (for instance, remove fat and skin from chicken) and practise physical activity. Some of them produced unsupported statements to explain this advice, and they repeated those statements to their patients.

*‘Every plate should have two different colour vegetables on it’ (Male nurse).*

Nurses and physicians frequently came across as lacking confidence in their own nutritional knowledge. Several practitioners said they found nutrition confusing, and there was often uncertainty when talking about nutritional concepts. Rather than advising patients themselves, many practitioners said they would refer patients to a dietitian, especially if they felt the patient required specific nutritional advice.

They mentioned that a large amount of often contradictory information from science, the media, and the government were often the major sources of the confusion about diet-related diseases.

*‘I feel there is a lot of confusion out there. Even I get confused’ (Male doctor).*



Health professionals highlighted the contradictory information as a source of confusion for themselves, their patients and the general public. A few health professionals blamed their lack of self confidence in this matter on the lack of nutrition education they received during their training and in continued education.

*'The reason why I'm saying I'm confused is I remember 4 or 5 years ago there was a huge promotion of [foods containing] poly-unsaturated fatty acids. Two years ago, poly-unsaturated fatty acids were hailed as causing lots of cancer. So now, you're uncertain which to promote' (Male doctor).*

Few health professionals made any reference to science when justifying or explaining their nutritional advice. In those few instances where the health professional did appeal to science, it was in a broad and vague manner.

*'Studies have shown that with diabetes even if you increase the medication or you optimize the medication, at the end of the day it's the diet that kind of makes or breaks the disease' (Female doctor).*

The health practitioners did not refer to any recent scientific evidence when they did refer to science. From the results, they indicated that do not remain up to date with scientific advances and research in the field of nutrition. Despite the fact that they were unable to remain current on these advances, there was agreement that more clinical trials were needed to support new dietary trends or to break dietary stigmas, for instance, such as those regarding dietary fats and effects on cholesterol levels.

*'I don't know if studies are currently running, I think they are for them to sort of prove [that fat] is not going to increase total cholesterol. I don't go for high fat either because we don't know the long-term risks. Because there isn't sufficient data as yet' (Female doctor).*

The health professionals interviewed in this study used a range of jargon and diet statements that were stated as fact. These 'catchphrases' can be defined as phrases or statements that are repeated without any justification or attempt to explain them, as if they were obvious.

*'Because I want people to be on sustainable diets in the long term. (...) A dietary change for a lifestyle disease can't just be a fad thing that comes and goes. It has to be sustainable' (Male doctor).*

Some of these ‘catchphrases’ appeared when they had to define a healthy or unhealthy diet. Moreover, several statements appeared when they were asked about the type of advice given to patients, especially from the two dietitians.

*‘If it is diabetes, we will focus first on eating guidelines and trying to encourage them to lose weight because that is what we want. (...) Then obviously explaining how to control it through diet with your carbohydrate intake, portion sizes of foods’ (Female dietitian).*

Another aspect considered in this subtheme takes into consideration statements about nutrition that provide insight into the beliefs of the health professional. Phrases such as ‘obviously’, ‘we all know’, and ‘we have known for years’ demonstrate that the health professionals hold these nutritional beliefs to be true and beyond doubt. This also links to the theme of references to science, implying that these things are known or have been proven. Some nutritional statements were unique, and sometimes quite specific advice was given about a specific food.

*‘You can even lose your immune system with Banting’ (Female nurse).*

*‘There is not really one. I don’t really know which one [food helps prevent chronic diseases] is the best but what I can tell them is that maybe the beetroot, and it just helps’ (Female nurse).*

Some also provided broad nutritional statements without any context, explanation, definition or understanding of the statement being demonstrated.

*‘I think there’s more, we can do it like advising, we can tell the patient to limit the starch, not to eat mash, eat lots of veggies, to drink at least 2 litres of water’ (Female nurse).*

The health practitioners said that they have an idea of what are considered problematic foods based on their understanding and seemed to agree on the foods that they consider unhealthy or that were causing medical problems.

*‘We basically follow the protocols of the National Health Department and at the moment, there isn’t really much with regards to prevention, they have information, but it’s outdated and it’s not up to speed with what’s really happening’ (Male doctor).*

There was also some consistent advice that was tailored to specific conditions. For instance, low salt for hypertension and portion control and exercise for obesity. The practitioners agreed indirectly that healthy food improves immunity, so HIV patients should be encouraged to eat healthy foods because their immune system is compromised. In

general, the cohort thought that good advice would be to promote physical activity, cut out simple sugar, stop or reduce smoking, lower salt intake, reduce alcohol, not to eat spicy food, remove the skin off chicken, remove fat from red meat, and only drink sugar-free sodas instead of regular ones. The above advice was consistent among the professions. There were, however, some differences in their approach to nutrition, based on profession. Although there were only two dietitians, the one approach was quite simple and general, namely 'portion and moderation'. For example, when talking about sugar addiction, it was thought unrealistic to completely exclude sugar from their patients' diet but to simply reduce it and adapt the diet to the patient's life and circumstances instead.

*'I definitely don't say you need to cut it out completely [sugar]. Because I don't think it is realistic. I understand we all do enjoy sweet things here and there' (Female dietitian).*

Doctors and nurses, when advising patients, tended to be more specific by defining some foods as problematic and causative of chronic disease. Of those foods, high sugar and fat content foods were the majority identified as problematic. Examples of such foods were described as: instant or convenience food, inexpensive and easy to access, served in large portions, high-starch content, sugary drinks, 'chippies and sweeties', junk food, fat food, high calorie food, salty food, 'braai-ed' [cooked on a barbecue] meat and more. When advising on healthy food alternatives, health practitioners referred to the following: vegetables and fruits, small portions, oats, three meals a day, snacks in between (apples, whole-wheat bread with peanut butter and crackers biscuits). Some also mentioned low fat foods, eating chicken instead of red meat and less carbohydrates. Some mentioned that they advised their patients to eat food in their natural state, not too over processed, in moderation and avoid sauces. In general, the advice on practicing physical activity seems to be non-specific and used when explaining healthy living behaviours and to promote health.

*'I advise exercise, but again many people sort of think you can only exercise if you go to the gym. (...) Every day you walk, why don't you just try and walk that same distance a little bit faster so that you can get exercise built into your daily routine' (Male doctor).*

### 5.3.2. Theme 2. Health practitioners' thoughts on LCHF

Almost all the health practitioners had heard of the LCHF diet. For those who did not know about the diet and for clarity for the others, it was defined as: *'A low-carbohydrate high-fat (LCHF) diet is a way of eating that restricts the amount of carbohydrates and increases the number of healthy fats that you eat to optimize your health and nutrition'*. The statements on this theme refer to the health professionals talking about their own knowledge of the diet. Some knew LCHF diets as the *Banting* or Tim Noakes diet, as they said that these terms have been popularised over the past few years in South Africa. Most practitioners learned of the LCHF diet through social media. Mostly, they defined LCHF as a diet that promotes unprocessed foods. Some of the cohort had a clear understanding of the diet and the foods that were recommended but most did not. Regarding their opinions on LCHF diets, many of them mentioned some catch phrases such as: *'long term health'* (Female doctor) and *'not sustainable'* (Female dietitian) as a general understanding of this diet. A relatively large number of participants had some personal experience or first-hand knowledge of LCHF diets. These accounts were predominantly positive, but some explained why they stopped following a LCHF diet, given the potential challenges one may face on a LCHF diet. These included a lack of support from relatives and the perceived expense of it:

*'I was on [a LCHF diet], but because I didn't have a lot of support (...) I just left it then, but it's actually a good diet, I found out, and I didn't feel so tired'* (Female nurse).

Those who had personally followed the diet mentioned that they experienced that they needed to eat less, had increased energy levels and fewer cravings. These same individuals stated that they were initially sceptical of the LCHF diet, as it contrasted with their university nutrition education. Although some mentioned that it limits one from eating essentials (such as fruit or fibre), that one should eat a complete diet, and that the body requires starch. The heightened public controversy around the diet further perpetuated their hesitancy at first. The health practitioners expressed their concerns regarding the LCHF diet that they tell their patients considering or following a LCHF diet, which were stated as reasons for the support or lack of support for it. Overall, the practitioners were most concerned about the high fat component of LCHF diets. Some also mentioned that it was difficult to sustain this diet because of the food prices, hence, there is the general understanding that LCHF foods are expensive.

In general, they were prepared to be supportive of the diets but would monitor patients to see if there are any harmful effects. There were general concerns due to the controversy surrounding the LCHF diet that has resulted in some health professionals being sceptical about it. Some common factors that made them sceptical were the sustainability of the diet, the affordability, the amount of meat, the exclusion of an entire macronutrient ('no carbohydrate at all') and, mostly, the fat intake due to the apparent link to cholesterol levels. Although, some mentioned that they were aware that their perceptions regarding cholesterol levels and dietary fats might be outdated since they did not have access to enough nutrition information.

*'Fat has a negative impact because it increases cholesterol. (...) A low fat diet would keep the levels of cholesterol at an average level' (Male nurse).*

*'If you eat high fat things your cholesterol is going to go up (...) I say our nutritional education is lacking because you're not taught about the good types of fats and the bad types of fats' (Female doctor).*

Moreover, some were concerned that patients do not really understand Banting, that they lack information and that it would be difficult for patients to change their dietary behaviours to this diet and to monitor patients on this diet.

*'I haven't read all the research about it. I know it's very controversial (...) I know that it's not completely accepted (...) I think it's almost too much of a mindset change for most people' (Male doctor).*

When asked about introducing a LCHF diet to treat or prevent metabolic conditions, health practitioners said that they would support it, but not advocate it for reasons including the mentioned concerns. This led them to a cautious and vigilant attitude regarding their patients who followed a LCHF diet.

*'They know I don't advocate a low carb high fat diet but I'm supportive of what my patients want to try and then I monitor them closely - I watch their cholesterols, I watch their triglycerides, I watch their blood pressures. I mean so many can't maintain it [LCHF diet]' (Male doctor).*

Alternative reasons for this attitude include beliefs that the LCHF diet is a restrictive diet and that no vegetables should be cut out of a nutritional plan.

*'I wouldn't encourage it [LCHF diet], but if a patient really wanted to do it and ask for my advice, I would try to guide them on it yes, for sure' (Female dietitian).*

The practitioners said that they believed that their patients did not have enough knowledge about their own health prior to embarking on a LCHF diet – further reducing their willingness to advocate. The two dietitians mentioned that adherence is a problem and that the most effective nutritional approach could be an individualised diet, including LCHF for some patients. Hence, they did not advocate LCHF diets generally, as they do not consider it applicable to everyone.

### **5.3.3. Theme 3. Health practitioners' thoughts on EBSA**

Some of the interviewees were familiar with the EBSA program, but the majority were introduced to the program for the first time during the interview. Those who knew about EBSA had patients who had participated in the program. The EBSA program was defined to all participants as: *'Eat Better South Africa is a nutrition education program for people from under-resourced communities that promotes low-carbohydrate high-fat diet or Banting diet to prevent or treat metabolic conditions. It consists of groups of people that meet everyweek for an educational session for a period of six weeks'*. This theme involves the thoughts and opinions provided by the health professionals specific to the EBSA program. Interviewees mostly highlighted the importance of group support to successfully achieve a lifestyle behaviour change. Although some mention that it is good because it can change the way people think, some concerns regarding the program were also related to concerns about LCHF diets. The concept of EBSA stressed the importance of and need for nutrition and lifestyle support in the healthcare system both inside and outside of hospital facilities. They also stated that health practitioners would appreciate having a similar nutrition education program to give them the tools to better address diet-related diseases. The majority of participants said they would support the patient but were specific about how they would offer this support:

*'I would be supportive, but I would lay out the dangers and make sure to monitor cholesterol' (Female nurse).*

*'I would be supportive but send them to a dietitian' (Male nurse).*

Despite this attitude towards practitioner patient support, group support was considered the most valuable aspect of the EBSA program. In their opinion, behaviour change is not easy to achieve as an individual, and it is easier in a group.

*'When you're in a group, then there's more support from one another. Then you don't feel like, no, I want to eat the chocolate, but now that support comes in' (Female nurse).*

Some practitioners valued the education aspect of the EBSA program. They indicated that, if more unhealthy people participated in support groups such as EBSA, there would be less pressure on hospital facilities from chronic diseases.

*'I think it's a good thing, especially to educate yourself' (Female nurse).*

*'I think it's a great initiative, very needed, very necessary because it will probably, if it's successful, it will definitely reduce the disease burden in our community and that impacts on everything' (Female doctor).*

EBSA was seen as a good initiative, and that it could change the way people think. The only concerns regarding the EBSA program were those related to the LCHF diet that were mentioned before.

There were suggestions for community implementation and adherence to a LCHF diet – that it needs to be tailored to food prices, accessibility and sustainability. They stated that it was necessary to ask whether people can afford it and what the food options were in their communities and surroundings because it has to be sustainable. Some health practitioners even provided suggestions that EBSA could incorporate, regarding the food prices and how to approach the sustainability of the programs in communities where poverty is a common challenge.

*'If the people don't have the funding, they're not going to be able to buy it [recommended food]' (Female doctor).*

#### **5.3.4. Theme 4. View of patients' barriers to health**

This theme emerged from questions pertaining to reasons why people from poor communities (patients) eat in the way they eat. The practitioners spoke in general about the challenges that people living in under-resourced communities face. Thus, they are quite aware of the community challenges to healthy living. They specifically mentioned those

related to poverty and the social determinants of health found in communities such as Ocean View or Masiphumelele. Some of the health practitioners interviewed live in the same communities as their patients. They had great insight into the rationale behind food choices and the challenges that patients faced. These communities are commonly known, usually appearing in the media because of crime, violence and safety concerns. Moreover, this theme was also a combination of those codes related to accessibility, affordability, understanding and safety regarding food and food resources. Some health practitioners mentioned that *'Food is not a priority. (Male doctor)'* to explain that people from under-resourced communities were in a survival mode. The price of food was often mentioned, emphasizing that healthy foods were more expensive than unhealthy food. Some emphasised that meat was extremely expensive, but others pointed out that it was the same with vegetables.

*'I think the economy does play a big role. (...) They've [people from under-resourced communities] got lots of extended families' (Female doctor).*

*'Even vegetables are expensive in relation to other foodstuffs that they can get cheaper' (Female doctor).*

*'I can't remember off-hand prices, but vegetables and meat, depending on what meat you're getting. They're almost the same price/kg when you look at it' (Male doctor).*

The interviewees cited poverty or lack of resources due to socio-economic circumstances as a problem for lifestyle choices and changes.

Communities such as Ocean View and Masiphumelele were considered under-resourced communities with a high rate of unemployment, gangsterism, lack of resources, lack of housing and limited access to health and proper nutrition education. Unemployment appeared to be a major contributing factor to the high level of poverty in these communities.

*'People eat what they can afford. It's that simple' (Female dietitian).*

*'There's a lot of poverty and there's a lot of theft. (...) Because even now there are so many children and women that are being raped in our areas and some, we don't find their bodies' (Female nurse).*

*'When you're in that state of poverty with 3 to 4 children per household may be 50 % of adults unemployed, only 20 % of people are living in fixed accommodation as opposed to like*



*shacks. You kind of get to that expression that beggars can't be choosers, and so while they might know that what they're eating is not good for them, they don't have the means to put that into place' (Male doctor).*

The interviewees mentioned that education was a problem for lifestyle choices, change, or nutritional interventions. They recognised that nutrition education could have a huge influence on unhealthy habits.

*'I think education is the most important thing. Most patients don't know that sweets are bad' (Female dietitian).*

Alcohol abuse was mentioned a few times during the interviews and the health practitioners said that it can be a problem for some people, as it leads to increased rates of crime, in addition to perpetuating unhealthy habits and poor adherence. Compliance to the medication/treatment/lifestyle advice was identified as a challenge for the patients from the health practitioners' perspective.

*'People when they're drunk, they forget the treatment' (Female nurse).*

Health practitioners mentioned that culture and tradition regarding food and nutrition play a significant role and that patients were influenced by their upbringing. There was a cultural opinion regarding weight and physical appearance and a large amount of stigmatization, especially for women. Slim people were regarded as being poor, malnourished and unhealthy, yet large to obese people were seen as wealthy and healthy.

*'It's a very big cultural thing to have, to be big, so it's another thing, there's a stigma around it if you're skinny and you're losing weight, you are becoming sick' (Female doctor).*

The health practitioners stated that there were also gender differences in the living conditions in these communities. Women's roles in the community and household were also highlighted. The participants mentioned that women are usually responsible for cooking yet have to deal with gender role challenges.

*'I think in certain cultures, women don't have a lot of say in what gets done, so if the man comes home and he says "he wants this sort of meal" that's what she must prepare. And a lot of the women also aren't educated about contraception, so they end up having lots of children and it's difficult to feed so many mouths with this expensive [LCHF] diet you know' (Female doctor).*

Another aspect that appeared to be important according to health practitioners was that these communities were made up of different people from diverse races and cultures. Relocation from rural areas to cities for greater job opportunities was considered a potential problem regarding food habits. When people relocate, there was less opportunity to move and less physical work, yet they wanted to eat the same diet. This diet was usually high in carbohydrates, but in rural areas people tend to have larger and healthier sources of food through gardening or farming. When they come to the cities, they tended to eat poorly.

*'In Ocean View we've got a very sort of traditional eating style (...) they generally eat rice and potatoes with meat and the vegetables sort of fall by the wayside and in Masiphumelele two different population groups where we've got a lot of immigrant population who suddenly adjust to a diet (...) from Malawi and Zimbabwe where they're used to eating lots of vegetables and whole grains. (...) And then people that have grown in and around Cape Town, who also somehow eat a lot of meat and carbohydrates so pap and rice, chicken. (...) The other population obviously lives around the hospital heart and they've got access to what's easy and available tends to be sort of take-away food' (Male doctor).*

When talking about traditional ways of eating or upbringing, the health practitioners found that, despite dispensing nutritional advice, patients did not follow the recommendations. They spoke about a lack of compliance from patients who were largely averse to different foods.

*'If I ask for big changes, they do nothing' (Female dietitian).*

*'I don't think they're educated in terms of low-cost options. (...) But it's also what patients are used to, what they brought up with. So if they're not used to eating that, they are not going to try it' (Female doctor).*

The health professionals recognised that foods considered problematic were being eaten because they were enjoyable. This did not aid in compliance to dietary advice or education and was tied in with food addiction and eating disorders as medical conditions.

*'Some people get addicted to cigarettes, and I wonder if some people get addicted to certain types of food, high fat food from outlet stores or a high carbohydrate diet. I wonder if that stimulates the same sort of mechanism, the same kind of pathway' (Male doctor).*

An interesting aspect of the culture in these communities mentioned by health practitioners was one of food and status. People who lacked resources may desire to appear as if they can afford foods that they cannot, and there was a certain status attached to those unaffordable foods.

*'There's also this shift from people who are poor but maybe have some income – they start moving from foods that they cook at home to buying take-out high fat fried, deep-fried, high fat content foods because though they might live in a small house or a room in someone's house, there are like outward signs of poverty and they don't want to appear poor' (Male doctor).*

#### **5.4. Discussion**

This is the first study to explore health practitioners' perceptions of a nutrition and health community-based program promoting LCHF diets in under-resourced South African communities. Here we found that health practitioners' understanding of nutrition is in line with conventional dietary advice (5.3.1. Theme 1). This is derived from the national food guidelines, which emphasize vegetables and fruit as healthy foods, promote whole grains, dietary diversity, lean animal and plant protein sources, and recommend limiting saturated fats and sugar-sweetened beverages (331). The doctors and nurses were aware of their lack of nutritional knowledge, yet acknowledged that nutritional advice and education was a useful tool for disease prevention. Regarding appropriate nutritional advice, there is a significant amount of confusion for many reasons. One reason is that new information is constantly forthcoming, and it is difficult to stay up to date with the latest nutritional science (5.3.1. Theme 1). This was evidenced through self-admission and a lack of references to scientific evidence. Another is the assumption that everyone has some general idea of what is and is not healthy. As seen in other studies, the healthcare providers seemed to reproduce medicalized narratives of exercising prudence and extending knowledge related to diet (332).

The different professions affected the various health practitioners' approach to nutrition advice. The doctors said that they had some nutrition knowledge, but they were cautious and had a lack of confidence when dispensing dietary advice. This is a serious barrier to health promotion that has been explored and reported before (333). General practitioners are uncertain about health promotion to the point of ambivalence in their work. The nurses appeared to be less deeply attached to any nutrition views and were open to new information (334,335). Because they are the primary health-care point of contact to many patients, nurses have a significant impact on health care dispensation in the communities (336). Consequently, nurses have the greatest capacity to provide health-promoting advice regarding diets and habits that will reduce the risk of NCDs in communities (334–336).

A qualitative study involving nurses explored their experiences with counselling patients with diabetes on diet, physical exercise and smoking cessation (337). These nurses mentioned that patient factors such as limited knowledge and motivation, a lack of counselling skills and insufficient time were challenges to effective lifestyle counselling. These findings indicated that nurses are willing to provide weight management advice as part of their practice, as seen in this study (336). The nurses who participated in our study showed interest in participating in a nutrition and education program such as EBSA (5.3.3. Theme 3).

Contrary to the doctors and nurses, the two dietitians in the cohort rigorously upheld the current dietary guidelines. They were quite concerned about drastic dietary changes, saying that these were the least likely to be sustainable. This disparity should be seen in context, as there were only two dietitians to the numerous nurses and doctors in the cohort. Furthermore, one of the two dietitians works for an NGO, and it is understood that private organisations do not always follow governmental guidelines (314). Although this is an exploratory study, the small overall sample with more doctors and nurses than dietitians increases the potential biases. We could only access some clinical facilities when we were recruiting. The other previous qualitative studies results found that EBSA participants mostly had problems with their doctors' advice (10). We wanted to include nurses since they are the ones who are usually closer to patients and who monitor them,

especially when they had been prescribed chronic medication (338). Moreover, we interviewed one dietitian from an NGO, and we understand that private organizations may work differently. Therefore, we cannot generalize our results.

Regarding the LCHF diets (5.3.2. Theme 2), the general understanding is that it can be useful for clinical nutrition. Even though they would not recommend it directly, most of the participants in this study said that they would support it. They were concerned about the controversies surrounding meat and dietary fat intake, which has been shared many times in scientific articles (163,339). It is presumably related to high cholesterol levels and the lack of variety of foods, in addition to the cost of the recommended foods. They seemed to be willing to support it if monitoring was done and a thorough understanding of the patients' diets was ensured. The concerns raised by most of the health practitioners were linked to the national guideline recommendations that have been questioned in a recent scientific review (340). The majority of the health professionals said that they would support the patient, but, when they explained how they would do it, their 'support' would ultimately lead to discouragement. It appeared to be backhanded support, which was explicit in some cases. In other cases, the doctors and nurses would refer the patients to dietitians, who would, for the most part, potentially dissuade them from LCHF diets and encourage a more macronutrient balanced diet, as mentioned during the interviews (5.3.2. Theme 2).

Some study participants had personal experiences with or first-hand knowledge of LCHF diets from friends or family, which tended to be positive. Interestingly, some of them were extremely cautious about recommending or advocating for this diet but have tried the diet themselves (5.3.2. Theme 2). This is an example of the reality shown in other articles when participants reported feeling well on the diet, losing weight and decreasing feelings of hunger (81,175,192,203,208). When mentioning the LCHF diet and explaining the EBSA program as a nutrition and health education program that promotes this type of diet, the health practitioners seemed to be keen on the idea of group support, and it appeared as if they would support a program that provided support in the communities. Therefore, the support that the program provided was identified as the facilitator for dietary behavioural changes (5.3.3. Theme 3). However, this did not mean that they would

categorically support a LCHF diet in the communities, as they were still concerned about several controversies, lack of education and poverty. Although some mentioned that the EBSA was appropriate because it could change the way people think, some remained concerned about the LCHF diet. Explaining what the program was about provided them with many new insights into their need for nutrition education and disease group support, apart from providing counselling services.

There was a general understanding of the environmental conditions of living in under-resourced South African communities (5.3.4. Theme 4). Food security was identified as a significant threat as food accessibility and cost are a general concern. Moreover, even though not being asked explicitly, they mentioned facts related to the safety of women. Cultural aspects and traditional ways of upbringing regarding food patterns were also mentioned quite often and have been explored previously (341–343). These challenges were seen as challenges to improve both individual and community health. Health professionals often described these challenges to the patients in a way to provide excuses on behalf of the patients for their potentially inevitable failure to follow medical advice. Health professionals seemed to allow their low perception of the patients' desire for better health neuter their advice. It appeared that the health professionals were justifying their inaction or little action regarding nutritional advice, which has been explored before (332). This ties in with the 'backhanded support' regarding the theme of supporting patients who wanted to follow a LCHF diet. The health professionals recognised that unhealthy foods were being eaten because they were enjoyable (333,338,344–346). The health care professionals, especially dietitians, did not seem to be willing to take this away from the participants.

The use of health practitioners' perceptions is an important strength of this thesis, since their views add weight to the issues at hand. The information provided by participants can help to further explore the public health system and hospital settings. However, the small and convenient sample used in this study may not represent the population, which may limit the generalisability of the results. In the exploration of nutritional knowledge and advice, the results were not quantitatively verified. Thus, the reported qualitative results could be subjective and should not be generalized. However,

as the study's specific objective was to gain insight into the health practitioners' understanding of LCHF diets and the EBSA program, qualitative analysis of nutritional knowledge was deemed sufficient. The fact that different professions were represented in the sample may affected the various approaches to nutrition advice. Therefore, further investigations should target specific health practitioners to explore specific objectives taking into account their different roles within the health field and the disease management.

## **5.5. Conclusion**

Health practitioners' approach to LCHF diets seemed to be supportive but not advocating. Indeed, because LCHF diets are popular in South Africa, health practitioners are likely to be approached by a patient whose acquaintance has had success with restricting refined carbohydrate and simple sugars. Although, currently, some international food guidelines endorse LCHF diets, there is still a considerable amount of confusion and lack of knowledge regarding this diet. In the absence of long-term evidence, existing data suggest that it is a potentially effective treatment to adopt a LCHF diet as an option for patients with diet-related chronic diseases. This may be an important aspect to include in training of health professionals, particularly contextualized to lived experience of their patients.

# CHAPTER SIX: DISCUSSION

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## 6.1. Overview

This thesis evaluated the EBSA program for women from under-resourced South African communities relating to dietary behaviour changes, body measurements, blood markers, physical activity and sedentary and sleep behaviour. The participants and health practitioners' perceptions regarding nutrition, the EBSA program and the social determinants of health in South African under-resourced communities were explored to learn more about the health outcomes. This thesis is the first to report women's experiences of a nutrition education program recommending LCHF diets to treat or forestall NCDs in under-resourced South African communities. This mixed-method analysis presents novel findings that align with and add to the previously presented body of literature regarding factors impacting adherence to and acceptability of a LCHF dietary approach to improve women's metabolic health. This may be achieved by addressing behavioural and environmental factors that impact dietary health behaviours.

This research was designed to explore the acceptability of and adherence to the EBSA program and its recommended way of eating by employing a mixed-method analysis. Although every chapter explored several limitations, this last section aims to expose the strengths and limitations of the mixed-method approach. Applying this method allows researchers to address a broader and a more complete range of research questions. In addition, researchers have the ability to apply the strength of one method of research to counter or overcome the weaknesses in another method. It also provides stronger evidence in the conclusion through convergence and collaboration of the findings (241,347–350). However, as it is a mixture of two relatively different methods of research, many researchers and methodologists have yet to fully solve problems of interpreting conflicting results, quantitative data and the paradigm mixing (241,347–350). Therefore, it is important to follow other authors' frameworks and recommendations.

The results obtained in this thesis provide insight into how to initiate a larger, comprehensive controlled study of the EBSA program, tailored to the participants'



requirements. Each of Chapters 3, 4 and 5 had their own discussion section, and this chapter provides an integration of all three. A detailed literature review is also found in this chapter, which supports the findings of the thesis and explores a deeper discussion of the implications of the topic. Moreover, this chapter highlights the need to narrow the significant existing gap between community programs, academia, the general population and policymakers. An ecological model approach is explained in the last section of this chapter as a potential solution to narrow the knowledge gap.

## **6.2. Demonising LCHF diets: health practitioners' support**

EBSA provided nutrition education sessions based on LCHF diets; therefore, this thesis not only evaluated the program but also this diet. The scientific controversy surrounding these diets is consistent with the well-known challenges to any dietary interventions and nutritional epidemiology limitations (240,351). This controversy and uncertainty are reflected in even the most qualified experts' clinical practice in providing therapeutic nutritional interventions (240,351). As seen in Chapter 5, health practitioners' approach to LCHF diets seemed to be supportive but not advocating. This aligns with the findings from studies on previous EBSA participants in both Chapters 3 and 4.

Although, currently, some international food guidelines – like the American Diabetes Association - endorse LCHF diets, there is still a considerable amount of confusion and lack of knowledge regarding this diet (174). LCHF diets are now gradually actually being used as a therapy for metabolic disease and it is becoming more accepted as a real treatment (174). Health practitioners are likely to be approached by a patient whose acquaintance has had success with restricting refined carbohydrate and simple sugars, as also found in Chapter 5 (5.3.2. Theme 2). In the case of dietitians specifically, a survey found that only 48% of them advised patients to restrict carbohydrate intake 'occasionally', 35% of them stated that they would consider it and they feel that between 30% and 39% of total energy intake from carbohydrates is 'realistic' (352). Multiple scientific articles provide evidence for the health practitioners that carbohydrate restriction is one of the strategies available for weight loss and general improvement of health (240). The evidence suggests that physicians who have

been presented with patients' desire to reduce carbohydrates are, in fact, open-minded on the subject (240). Moreover, in a study by Feinman et al., doctors were more likely to follow LCHF diets; compared to dietitians, food scientists or other healthcare professionals (272). In Chapter 5 of this thesis, some health practitioners also talked about their experiences with LCHF diets. Some of the challenges they raised were similar to those mentioned by EBSA participants in the previous chapters (Chapter 3 and 4).

One of the main concerns about LCHF diets is the high fat content. For many years, fat was considered to be the cause of weight gain and the development of chronic diseases. However, the failure of low-fat diets to result in weight loss and significant health benefits has been demonstrated in previous studies (290,292,353–359). For instance, the Women's Health Initiative report highlighted limitations in the recommendations for a low-fat diet, because on average, the women failed to lose weight or show significant improvement in risk for CVD or stroke (355). In popular knowledge and many professionals' minds, the high fat content symbolises significant increases in saturated fat. More recently, the association between dietary saturated fat and health outcomes has been re-explored (290,292,353,354). Furthermore, even in studies in which participants adopted a LCHF diet, their perception regarding their intake of saturated fat did not match their actual intake. In fact, the most significant change in intake was an increase in non-starchy vegetable consumption. The average diet was high in non-starchy vegetables, low in fruit, and included only slightly more meat compared to the respondents' baseline diet (272). These findings directly align with those presented in this thesis in the assessment of the diet in Chapter 4. As previously discussed in the Methods section 4.2.5.3. of Chapter 4, LDL cholesterol has been the main atherogenic lipoprotein for the last years (163,339). Nevertheless, LDL cholesterol is far more complex than currently understood by mainstream general medicine. Other lipoproteins such as HDL cholesterol or very low-density lipoprotein have shown repeatedly to play a role in atherogenesis (290,292,353,354). Isolated low HDL-C in people with normal LDL cholesterol and triglyceride levels has been seen as equivalent to elevated LDL cholesterol as a coronary risk factor (170). Further research is being urgently needed in this matter of lipidology to progress the understanding of this area and particularly help

diffuse some of the controversy around saturated fat, LDL and cardiovascular outcomes while following LCHF diets.

The most substantial primary reason for following a LCHF diet has been to lose weight, facilitated by attitude, perceived behavioural control and subjective norm. One of the most common reasons why LCHF diets have been recommended is that they encourage patients to eat ad libitum to satiety rather than counting calories. The most common positive findings in the studies, which also correspond to the findings in this thesis, are HbA1c reduction, weight loss, lowered blood pressure, and lowered triglycerides. Overall, this thesis indicated participants' high levels of satisfaction with the LCHF diet, which corresponds to the findings of other studies that explored people's experiences with the diet (81,175,192,203,208). The primary principle of the diet has been to replace starch and sugar-containing foods with non-starchy vegetables. Such a strategy would provide the advantages of carbohydrate restriction (81,175,192,203,208). Nevertheless, it might be less iconoclastic than the popular perception of ketogenic diet, Atkins diet, or even very LCHF diets. Therefore, this approach should be more acceptable to health practitioners. Moreover, based on their experience with patients, it should be reasonable for health practitioners to turn their observations into recommendations for weight control and other health problems.

Changes associated with carbohydrate restriction are related to the transition from glucocentric to lipocentric metabolism (280,364,365). These changes account for the weight loss seen during the first six months of following a LCHF diet. Indeed, glycaemic control, or serum insulin, glucose or HbA1c in diabetics, could be improved by short-term carbohydrate restriction, although increased insulin sensitivity is not guaranteed. Our health outcome findings showed this trend in Chapter 4. The HbA1c changed significantly over a period of only two months when comparing pre-EBSA and post-EBSA data. Fasting insulin also showed significant changes at the post-EBSA analysis.

The American Diabetes Association's recent guidelines stated that, for diabetes treatment, reducing overall carbohydrate intake has demonstrated to be the most effective method for improving glycemia. In addition, it also mentioned that low carbohydrate diets may be applied in a variety of eating patterns that meet individual

needs and preferences (367). In the U.K., various foods' glycaemic load infographics from the National Institute for Health and Care Excellence (NICE) are available to help patients to understand the glycaemic 'consequences' of their dietary choices. For patients on multiple medications, insulin or with other comorbidities such as renal disease, low-carbohydrate diets should be supported by experienced health care professionals who can facilitate optimal nutritional intake (368).

### **6.3. Eating healthy does not have to be expensive**

In economic terms, the healthiest diets cost more per day than the least healthy diets (78,79,369). Researchers have found that healthier diet patterns, rich in vegetables, meat, fish and nuts, cost significantly more than those rich in processed foods and refined grains. This could represent a financial burden for some families since it can increase food costs per year for one person. However, this price difference is minimal compared to the economic costs of diet-related chronic diseases, which healthy diets would dramatically reduce (78,79,369). Foods that are considered unhealthy may cost less because food policies have focused on producing high-volume commodities. Eventually, this has led to a network of farming, storage, transportation, processing, manufacturing and marketing that favour sales of highly processed food for maximal industry profit (78,79,369). However, simple and easy healthy choices, such as replacing soda with water or choosing vegetables instead of chips, help with weight loss and help to save money.

During the community assessments in Ocean View and Cloetesville, the women thought that healthy diets and LCHF diets were expensive. However, the group discussions with previous EBSA participants from 2015 to 2017 in 2018 and the Ocean View pilot EBSA program in 2019 showed that women's perceptions of the diet had changed. As some women mentioned, they eventually ate less when they committed to this lifestyle since they felt satiated and had better hunger control. Satiety has been one of the most common aspects previously reported as a motivator to continue with this diet (81,175,192,203,208).

Given this reality, evidence has shown that creating a similar infrastructure to support the production of healthier foods might increase availability and, eventually, reduce

the cost of healthier diets (57). To bring about this change, taxing unhealthy foods and using the revenue to subsidize healthy choices could be implemented by governments. As explained in Chapter 2, South Africa's SSBs tax was implemented in 2018, but there are currently no subsidized healthy food options yet. If a tax and subsidy were to be paired, on balance, food would cost the same, and healthier diets could become less expensive (78,79,369). Indeed, public health efforts to modify the food environment have followed one of two paths (58,59). One strategy has been to attempt to remove the offending low-cost foods from the consumers' reach. Hence, the proposals to restrict the sale of fats and sweets, limit the advertising and marketing of soft drinks or impose taxation to discourage snack consumption. An alternative strategy is the need for many efforts to educate the consumer, as opposed to modifying the food environment to remove disparities in access to healthier foods. Providing the population with the necessary knowledge will ensure that they will be able to make the healthier food choices, within their means (78,79,369).

#### **6.4. Culturally appropriate nutrition education**

In the South African context, economic inequality in terms of income distribution and gender in terms of human development are factors that contribute to the disparities in access to health and education (6,92,176,376). Financial disparities in access to healthier diets may explain why the highest rates of obesity and diabetes are found among minorities and the working poor (7,302). There is an inverse relationship between the energy density and energy cost of foods. The combination of energy-dense grains, fats, and sweets represents the lowest-cost dietary options for the consumer. Good taste and convenience in conjunction with large portions and low satiating power are reasons for overeating. Nevertheless, the obesity epidemic is not only a failure of biological systems but a combination of it and a social and economic phenomenon (31,33,60). Understanding how the vulnerable high-risk groups make food choices is a necessary component for nutrition intervention (377–381). The qualitative findings in Chapters 3 and 4 of this project offer an insight into how women from under-resourced South African communities strive to better

their health. Participants mentioned during the group discussions after the EBSA program that nutritional knowledge was one aspect that they valued the most. This finding highlights the idea that nutrition education is one of the strategies towards more equal societies. Putting into practice nutrition knowledge is a personal choice, but it is the responsibility of governmental structures to ensure that everyone has access to the same information (92).

Cultural foods and traditions matter, and part of the challenge is helping people to change their dietary patterns to make them healthier by adapting the foods that they traditionally consume. Culture and tradition are critical in the qualitative findings in this study and others (342,343,382–384). Food choices are connected to memories and, therefore, feelings and emotions. As commented during individual interviews with the EBSA team, the EBSA participants come from a previously segregated context where people were forcibly removed from their communities. Treating culture as a static factor often furthers stigma and racial bias, which perpetuates the inequalities that attention to cultural differences is meant to redress. In the biomedical field, structural competency aims to train health professionals to consider how illnesses emerge from inequities in the different community levels likewise institutions, markets and health care delivery systems (342,343,382–384).

Health disparities are structured along the lines of race, class, gender and ethnicity. Health professionals should move attention away from individual preferences and focus on the structures that shape health care access and other resources that facilitate healthy living. Structural competency in the case of obesity and diet-related chronic diseases may not be enough. It is critical to ask how and for whom body weight could represent a problem in the first place. Therefore, approaching health with a question and not as an outcome is significant for obesity care. What counts as 'healthy eating' varies widely from person to person and place to place (43,385–387). The notion of translational competency adds to structural competency and an insistence on querying health aspirations and recognizing that not everyone will have the same objective when seeking care. Translational competence involves combining concern for cultural differences with structural inequities (388,389).

Cultural competence is contextualized through attention to history, economics, language and lived experience. Indeed, anthropologists have shown cultures to be

multifaceted and constantly changing as people deploy the resources in their surroundings (390,391). Translational competency means asking about health policies, guidelines, research, and the capability to respond to cultural contexts (388,389). Understanding culture as produced in interactions, instead of as a fixed attribute of distinct others, can change the way policymakers engage with differences. In the case of obesity care, differences must not be seen as an impediment to overcome but as a vital resource to be listened to when caring for health. Likewise, we cannot know from a photograph or a scale if someone is sick or well. The designation of health is as variable as it is powerful. The challenge before us lies in learning how to adapt policy to the contexts of culture in ways that will facilitate living and eating well in terms of health that matter in people's lives (388,389).

## **6.5. Knowledge translation: policy approaches to diet-related diseases**

Focusing on medical treatment and reducing smoking and sodium in the diet will not address the epidemic of obesity; low- and middle-income countries face many other cardiometabolic problems and all the related economic, health, social and environmental consequences. Effective action requires evidence-based, carefully evaluated programs and new and context-appropriate policies (46,392). Moreover, socioeconomic factors make it much more difficult for many people to access healthy food (12,220,393-395). However, some people ignore advice on healthy eating, as mentioned by some of the health practitioners interviewed in Chapter 5.

Implementation science is used to identify effective interventions for scaling-up in real-world settings. It focuses on the process and fidelity of implementation by emphasizing the integration and evidence-based uptake and transfer of interventions into routine healthcare systems (396–399). Implementation science is built on strategies and information to change public policies. Public policy directly impacts almost every single aspect of the general population's lives. Public policy encompasses the laws, regulations, course of action and funding priorities issued by the government. Its purpose is to address issues that affect society at the local, state and national levels. The development

of new policies is directly influenced by social change, which usually leads to a wave of change that begins with the revision of existing policies. Quite often public policies' purpose involves prevention (396–399). Although health issues approaches are slowly moving to preventative strategies, there is still a diagnosis-treatment mentality in the medical field. Some health problems are currently too complex for any organization to address alone. Therefore, a coalition of groups and individuals can be an effective strategy to change policies (400).

There are several methods through which community program providers can work on public policy (371,401,402). The first method is research, which is a key tool to influence policy. Several types of research can be used for policy making. One of those is conceptual research, which is used to educate policymakers and stakeholders on social issues and propose possible solutions. Another one is instrumental research, which has been utilized to persuade policymakers to adopt a policy. Consultation is another method that is currently influencing decision-making in the public policy field. Moreover, evaluation is important across the policymaking process, but particularly in the policy implementation and evaluation stages. During evaluation, community program providers might aim to examine whether a social program works well, whom it works well for, under what conditions it works well, and whether it can work better (226,332,403). Lastly, media and written communication have been largely used in the policymaking process to encourage public participation.

## **6.6. Ecological model approach for diet-related chronic diseases**

To change the paradigm of diet-related disease, an ecological model is needed. As a result, the context or environment is considered to be an integral part when trying to understand and work with communities and the individuals living there. Ecological means that there are multiple levels or layers of issues that need to be considered, including the individual, family, neighbourhood, community and policies at the national level (404–410). When health professionals or researchers attempt to determine why individuals behave in a certain way, they apply behavioural theories. Behaviour is



influenced by various factors, such as the individual's relationships with others, community, job, school and the laws that the government has put in place (407,408,410). One behavioural theory that encompasses all of these factors is the social-ecological model (Figure 12).

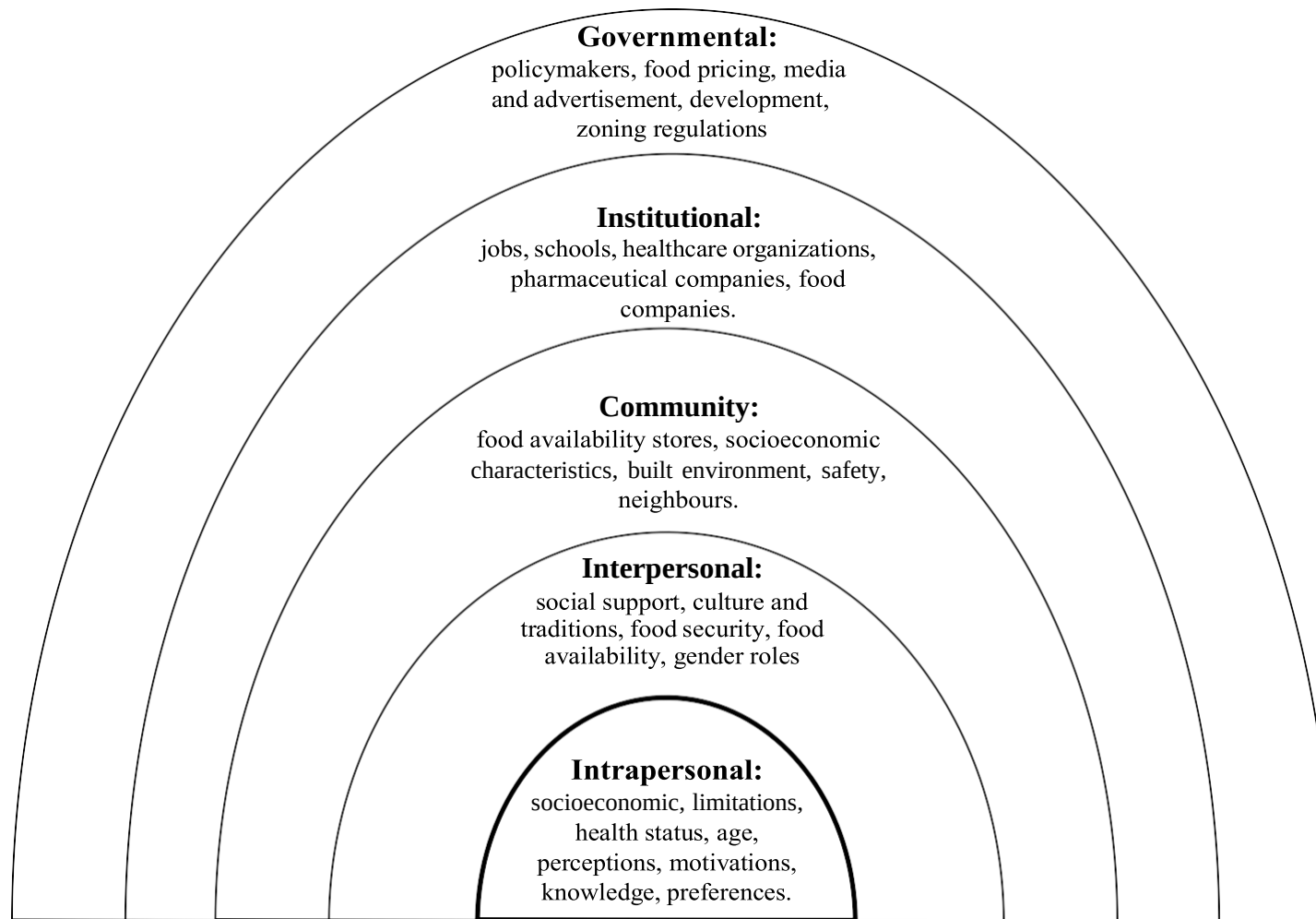


Figure 12. Diet-related diseases ecological model based on the mixed-method analysis of the Ocean View EBSA program (407,408,410).

In the case of diet-related chronic diseases and related to the findings of our study, with the use of an example, we can understand the ecological model. A woman, whom we shall call Nasreen, has been diagnosed with type 2 diabetes at the hospital. Her family is originally from Simon's Town but was forcibly moved to Ocean View due to the Group Areas Act of the apartheid government. She is a 50-year-old working woman of mixed-race ancestry. Her mother died from diabetes, and she has two sisters who are obese, with one also being diabetic. She completed primary school, but she does not have any knowledge of nutrition. She likes cooking but she only has time to cook during the weekends because she works long hours every day as a maid in a wealthy neighbourhood adjacent to her township. The most important aspect for her when shopping is food price, followed by the distance from the shops. She lives with her husband and two children. Her husband has a normal weight, and one of her children is overweight while the other is underweight. She does not have health insurance.

Her diet is based on foods subsidised by the South African government, therefore, basically rice, potatoes and flour. She loves baking and eating desserts and sweets. When she was young, she loved to go for walks, but her community has been facing increased gang violence over the last years, which has made it difficult for her to be outside exercising. She felt sick and could not go to work some days. At the clinic, she can only see her doctor for approximately 10 minutes per appointment, and she has to wait in line for hours. The doctor only prescribes more medication for her several diseases but does not have the time to provide any advice. She does not know how to break the cycle and she fears that her children are going to live the same life as hers. She feels she could die at any time because of her health, so, when she hears about the EBSA program for women in her community, she decides to enrol.

At the individual level, Nasreen is certainly metabolically ill, and this has now disrupted her life. Her ability to work and function normally has changed. She is also spending a considerable amount of money on her medication. Because of this expenditure, she is not able to buy healthier food options and her health keeps deteriorating. An ecological perspective would point to a number of factors beyond the individual and group level that contribute to this unfortunate situation. At an

interpersonal level, Nasreen's social networks, such as family and friends, are also affected by her personal situation. Her family is financially constrained because of her medical bills, and her children are having to eat processed, unhealthy, cheap food. Children are not able to provide their own food, so, therefore, their eating habits reflect the habits of those who provide the food for them. At this level of this model, culture also plays a role. Today's culture strongly associates the over-consumption of food with celebrations (380,384,411,412). Even though eating is an individual choice, social and environmental cues can affect one's behaviour. At the community level, this includes neighbourhoods, businesses, built environment and infrastructure. In some scenarios, and as seen in this thesis, an individual wants to change but their community does not enable that change due to safety concerns. In a study that investigated the barriers that prevent children in low-income areas from being active, they had the children take pictures of their barriers. The results showed that many of the barriers are at the community level, such as not having a sidewalk to walk on or recreational areas not being maintained (413). Changing behaviour is difficult when the environment around an individual does not provide the necessary resources.

The next level is institutional, which includes jobs, schools and organizations. Healthcare organizations contribute to the problem, as many physicians are all too willing to profit by overprescribing medications to their patients. The pharmaceutical industry is part of the problem as it reaps significant profits by oversupplying drugs to pharmacies. Food companies and the food system also share blame for creating unhealthy foods, not providing enough information about the ingredient content of their products and not investing in nutrition education. Finally, there is the government level, where policymakers are included. Instances of government intervention can include regulations that require clear and understandable food labelling as well as requirements that restaurants provide accurate information on the number of calories in their food. These types of difficult and complex social problems are produced and maintained by multiple ecological influences, and corrective second-order community solutions will be required to deal with these contextual issues (407,408,410). As shown in the Figure 12, all of these levels interact with each other, and they can shape or create eating habits.

Therefore, when someone decides to make a change, it is important to understand the impact at every level of the ecological model. The individual should understand what resources may be available to them and also how to advocate for the resources they would like to see in their social and work communities. Understanding eating behaviours is important as it can aid in the prevention and/or treatment of all diet-related chronic diseases (407,408,410). Dietary guidelines are important because they have the power to exert extraordinary influence on people's eating habits. The advice dispensed to each and every person from doctors, nutritionists, dieticians and other health professionals invariably comes directly from the guidelines. Thus, even though the general population may know nothing about the food guidelines, they learn about them through their health professionals (394,414).

Women suggested during the group discussions that EBSA should target schools to provide children with nutrition education. Nutrition is essential for everyone, but it is vital for children because it is directly linked to all aspects of their growth and development, which will directly link to their level of health as adults (415–417). Focusing on nutrition education for children was also mentioned in Chapter 4 by the EBSA team members during the FGDs, as it is directly related to prevention. Therefore, the approach suggests preventing rather than just treating diet-related chronic diseases, going to the root of the problem. No condition or disease has ever been eliminated by focusing on only those with the problem (418). Prevention is also strongly endorsed by those in medicine who have been trained in the public health model, where services are provided to groups of people at risk for a disease or disorder to prevent them from developing it (186,271,419–422). Public health practitioners seek to prevent medical problems in large groups of individuals through, for example, immunizations or finding and eliminating the environmental sources of disease outbreaks. As part of prevention, it is also crucial to analyse social problems and their unique characteristics. An impressive example of prevention occurred with community efforts to change the landscape of tobacco use over the past 60 years. Today, attitudes have changed toward tobacco use, and community and advocacy organizations have made important contributions to this second-order change effort that involved reducing tobacco use (229).

## 6.7. Conclusion

Taken as a whole, the study findings indicate that this community-based, LCHF dietary support program was both acceptable and feasible for the participants. Moreover, the results show that the intervention design was appropriate for this population group, and the medium of delivery was effective. Further investigation is required into adherence over a longer time frame and acceptability and adherence issues with other population groups. It is well known that, by changing their health behaviours to more positive models, women can influence the dietary behaviours of family members and those around them. They are, therefore, a key population group to consider when designing sustainable behavioural community nutrition education interventions, one outcome of which may be sustained weight loss. In conclusion:

- Participants seemed to have adhered to a LCHF diet during the intervention.
- Overall, the EBSA program showed an improvement in the women's health parameters such as blood pressures, body measurements and blood markers.
- Participants did not change their physical activity or sleep patterns during the intervention.
- Regarding the follow-up testing, weight was the only variable that continued improving. It is important to mention that no variables returned to baseline and some markers remained significantly improved when compared to baseline.
- As seen with the mixed-method analysis through the convergent divergent design, the results appear to be largely convergent.
- Social environmental factors have a significant impact on the women's lives, which is reflected in the physical activity and blood pressure data.
- One challenge identified by the majority of the women was the lack of advocacy and support from health practitioners, which lead to conducting a qualitative study with medical doctors, nurses and dietitians to explore their opinions about EBSA and LCHF diets.

- Community assessments should be included as part of the evaluation process of any kind of intervention are essential.
- Finally, results should be interpreted as a pilot study to provide formative evidence for designing a larger, controlled trial, going forward.

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# APPENDICES

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# APPENDIX A: EBSA FRAMEWORK

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## **Eat Better South Africa Community Interventions Framework**

**Overview:** The aim of this document is to establish and standardize a sustainable framework for all future EBSA interventions across SA.

**Goals:** The goal of EBSA is to take healthy eating to lower income communities. It is designed to empower under-resourced communities, severely impacted by Diabetes, Metabolic Syndrome, Hypertension and Obesity, with knowledge and tools to create and live healthy meaningful lives. Whereas the adopted approach is a 6 week intervention programme, the aim is to create a model that is self sustaining to ensure continuity of these lifestyle changes within the communities.

### **Key aspects to consider with regards to the intervention**

Educating: Nutrition education around the harmful effects of sugar and excess carbs & the benefits of healthy fats on the body are at the forefront of the intervention. However, education around aspects such as managing finances, savings, investments, managing stress, mindfulness and the like will be beneficial in upskilling community members. Suggestions: Sugar demonstrations, Weekly LCHF related presentations, Presentations to address other social issues that impact on lower income communities (weekly speakers), Food Diaries, Guidebooks.

Budget meal plan and shopping list: this includes that of the Foundation as well as of community members participating in the intervention. It is imperative that all interventions remain within a reasonable budget to allow for successful replication of the model across SA. At the heart of EBSA is the desire to empower individuals to make better food choices within a sustainable budget. This will be supported by the budget shopping list and budget meal plans. Also suggested is the implementation of the

‘Stokvel’. Here, each participant is encouraged to contribute a portion of their grocery budget to form a pool of funds which will be used to bulk buy foods from the recommended food list, and then distributed accordingly. EBSA’s aim is to form an agreement with local butchers and greengrocers, to support them fully from the Stokvel, in exchange for discounted prices on goods purchased.

**Sustainability:** This can only be achieved with continued commitment from the community as well continuous off site support and intermittent onsite engagement by the EBSA team. Development of EBSA certified LCHF coaches from the community to provide support to community members by ensuring the continuance of weekly support groups. Whatsapp groups to be created and managed by coaches. Incentives for coaches to be discussed. Coaches are to provide regular feedback on members progress, challenges etc. Next steps will then be formulated accordingly.

**Exercise groups / Fit clubs -** The idea is to create community ‘fitness coaches’ with the assistance of Fitness Institutions willing to align themselves with EBSA. This would give community members, especially the youth, an opportunity to upskill themselves. It will equip them with the skills necessary to run free community fit clubs (prerequisite) as well as provide them the opportunity to earn an income, should they wish to extend their services outside of the community intervention. Regular one day workshops to address specific aspects relating to health, nutrition and emotional wellbeing.

**Inspirational/ Motivational & Fun:** Diet and lifestyle changes require a great deal of willpower and motivation. Individuals are generally more inspired by hope than they are by fear. The aim is to keep the intervention interactional, motivational and fun. Participants are encouraged to buddy with one or two participants in order to remain accountable and to provide further support. This will be particularly helpful to those who do not have the support of their families. A weekly competition entailing the most creative, delicious but cheapest recipe by participants can be held. This will encourage participants to get creative and excited about experimenting with meals as opposed to

feeling limited to options on the meal plan. Recipes created by participants should be collated and shared with other members of the group. A Master Chef inspired competition for participants can be held where all community members are encouraged to attend. The end of the intervention should be implemented in a way that truly celebrates the hard work of all the participants. People want to be seen and heard and admired for their efforts. The final prize giving should provide a platform to reflect all of that.

### **Weekly program**

|                     |                                                                                                                                                    |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Introduction</b> | Introduction to the LCHF Lifestyle<br><br>Sugar Demonstration<br><br>Complete and Collect Intake Forms<br><br>Hand out Food Diaries and Guide Book |
| <b>Week 1</b>       | Weigh In + Measurements + Blood tests + Analyse Food Diary                                                                                         |
| <b>Week 2-5</b>     | Weigh In + Measurements + Educational Presentation                                                                                                 |
| <b>Week 6</b>       | Final Weigh In + Measurements + Closing Ceremony + Optional Prize Giving + Advice for Future + Setup of on going Support                           |

### **Set Up for Ongoing Support**

After the final week, coaches are to ensure running of weekly support groups and to provide feedback initially every week then taper to once a month. One day workshops will be then be tailored accordingly. Fit clubs/ park runs to be implemented from week 1. Participants are encouraged to spread their knowledge to friends and family. WathsApp groups created from week 1 to continue to provide support and share information, recipes, encouragement etc. Participants will be encouraged to attend fundraisers to create awareness around the importance and success of the EBSA project. They will also be encouraged to attend other initiatives close to their areas to share their stories and provide inspiration to new participants.

## APPENDIX B: STUDY SITES' PICTURES

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### Ocean View pictures





**Atlantis picture**



## Cloetesville pictures



# APPENDIX C: PARTICIPANTS' INFORMATION SHEET

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## APPENDIX C1

### STUDY INFORMATION SHEET - FOR PREVIOUS EBSA PARTICIPANTS

Dear past EBSA participant

You have been contacted because you are a woman who took part in an Eat Better South Africa (EBSA) intervention. We are researchers from the University of Cape Town (UCT) and would like you to take part in our study so that we can help EBSA improve their future interventions. The study is called '**A qualitative assessment of a nutrition education intervention for women.**' Below you will find more information about what is involved. Please feel free to contact us if you have any questions or would like to take part.

**What is the study about?** EBSA has run a number of community education programs to teach people (predominantly women) how to choose healthier foods. The purpose of this project is to help EBSA improve their education programs by talking to women who took part in past interventions. These discussions will be done in groups of 6-10 women from each intervention and will be led by one of us. We want to find out what made it easy or difficult for you to follow the program and to change your diet. By understanding the challenges that you faced during the program, we can make sure that we help new members of the program deal with these challenges.

**Are you eligible to take part?** You will be allowed to take part in the discussion if you are a woman; are at least 18 years old; have attended at least two visits of a previous EBSA intervention; can understand and speak English or Afrikaans; and are able to attend the study visit (we will give you details about the time and place).



**What will be required of you?** To take part in the study you will visit a study venue within your community for about 2 and a half hours together with a group of 6-10 other women who also took part in the EBSA program. We will explain what the study is about and ask you to fill in a short questionnaire about yourself. We will then have a group discussion where we will ask you what you thought about the EBSA program, whether or not you could change your diet, and what made it easy or difficult to follow the intervention. This discussion will be sound recorded so that we can go over it later. We really want to hear your honest answers, even if you think they are negative about EBSA. This is important so that we can help EBSA improve their program. Coffee, tea and water will be served during the session and you will be paid R150 at the end of the visit to cover your travel expenses and time.

**How do I take part?** If you would like to take part in the study, you can contact one of us via phone, email, sms (see details above), or through your EBSA coach. We will phone you back to explain the study, check that you are eligible and answer any questions you have. If you still want to take part and we decide that you are eligible, we will invite you to the study visit.

**What will be done with the information collected?** The interviews will be recorded for sound (not video). We will then type out everything that was said, using codes whenever your names are mentioned. We will then analyse the interviews and give feedback to EBSA so they can improve their programs. The results (but not the voice recordings or your names) may also be published in research and magazine articles and may be presented at public and scientific talks.

**Will my information be kept confidential?** You will be given a code that only the study investigators will know. This code will be used instead of your name for all the information we collect from the questionnaire and interviews. However, please be aware that other women in the group might talk about what was said in the discussion.

Additionally, EBSA will know who took part in the discussion but we won't tell them who in the group said what.

**What are the benefits for taking part?** You will be given the opportunity to share your experiences with us and will hear what others have to say about the program. You will also help improve the EBSA program which will then help other women like yourself to improve their education and health. We will share our study conclusions with you and you will also will be given R150 to reimburse you for your transport and time.

**What are the risks for taking part?** There are no foreseeable risks in taking part in this study. You will be encouraged to speak honestly about your health, diet and the EBSA program. For some people, these topics may be sensitive and may cause negative emotions. The group will be asked to respect the privacy of the other group members, but it is important to understand that they may talk about the discussion outside of the visit. Please keep in mind that neither us, nor EBSA will judge you or the group for anything that you say.

**Ethical considerations** This study has been approved by the faculty of Health Sciences, Human Research Ethics Committee (UCT). You will only start this study once you have confirmed that you understand what the study is about by signing the informed consent form on the day of visit. Participation in the study is entirely voluntary and you have the right to withdraw from the study at any time. The investigator may also withdraw you from the study at any time should he/she believe it is in your best interests to do so, or you are found to be ineligible for the study.

**Please feel free to contact the UCT Human Research Ethics Committee if you have any queries:** Room E52-24, Old Main Building, Groote Schuur Hospital, Observatory, 7925  
Phone: (021) 406 6338      Email: [nosi.tywabi@uct.ac.za](mailto:nosi.tywabi@uct.ac.za)

## APPENDIX C2

### INFORMATION SHEET - FOR WOMEN FROM NEW EBSA SITE

Dear [add community] resident

We are conducting a study called '**A qualitative assessment of a nutrition education intervention for women.**' If you meet our inclusion criteria, we would like you to take part in this study. Below you will find more information about who we are and what is involved. Please feel free to contact us if you have any questions or would like to take part.

**What is the study about?** Eat Better South Africa (EBSA) is a non-profit organisation which has run a number of nutrition education programs to teach women from under-resourced communities, how to choose healthier foods for themselves and their families. They are considering running another intervention in [add community] and want to gather information to optimise their program for women. To do this we (UCT researchers) will hold a discussion with a group of 6-10 women from [add community] to ask questions about their health and the types of foods they choose to eat and why. We also want to find out what they think about having an EBSA intervention in [add community] and whether they can think of any difficulties that may be faced.

**Are you eligible to take part?** You will be eligible to take part in the study if you are a woman; are at least 18 years old; live in [add community]; do not have access to private healthcare; do not have medical aid or health insurance; can understand and speak English or Afrikaans; and are able to attend the study visit (we will give you details about the time and place).

**What will be required of you?** To take part in the study you will visit a study venue within [add community] for about 2 and a half hours together with a group of 6-10 other women from [add community]. We will explain what the study is about and ask you to

fill in a short questionnaire about yourself. We will then have a group discussion where we will ask you questions about diet, health and [add community] . This discussion will be voice recorded so that we can go over it later. We really want to hear your honest answers, even if you think they are negative. This is important so that we can help EBSA improve their program. Coffee, tea and water will be served during the session and you will be paid R150 at the end of the visit to cover your travel expenses and time.

**How do I take part?** If you would like to take part in the study, you can contact one of us via phone, email or sms (see details above), or through the person that may have contacted you about the study. We will phone you back to explain the study, check that you are eligible and answer any questions you have. If you still want to take part and we decide that you are eligible, we will invite you to the study visit.

**What will be done with the information collected?** The interviews will be recorded for sound (not video). We will then type out everything that was said, using codes whenever your names are mentioned. We will then analyse the interviews and give written feedback to EBSA so they can improve their programs. The results (but not the voice recordings or your names) may also be published in research and magazine articles and may be presented at public and scientific talks.

**Will my information be kept confidential?** You will be given a code that only the study investigators (above) will know. This code will be used instead of your name for all the information we collect from the questionnaire and interviews. Only the study investigators will have access to the voice recorded interviews. However, please be aware that other women in the group might talk about what was said in the discussion.

**What are the benefits for taking part?** You will be given the opportunity to share your experiences with us and will hear what others have to say about diet and health. You will also help improve the EBSA program which will then help women from [add community] to improve their education and health. We will share our study conclusions

with you and you will also will be given R150 to reimburse you for your transport and time.

**What are the risks for taking part?** There are no foreseeable risks in taking part in this study. You will be encouraged to speak honestly about your health, diet and [add community]. For some people, these topics may be sensitive and may cause negative emotions. The group will be asked to respect the privacy of the other group members, but it is important to understand that they may talk about the discussion outside of the visit. Please keep in mind that neither us, nor EBSA will judge you or the group for anything that you say.

**Ethical considerations** This study has been approved by the faculty of Health Sciences, Human Research Ethics Committee (UCT). You will only start this study once you have confirmed that you understand what the study is about by signing the informed consent form on the day of visit. Participation in the study is entirely voluntary and you have the right to withdraw from the study at any time. The investigator may also withdraw you from the study at any time should he/she believe it is in your best interests to do so, or you are found to be ineligible for the study.

**Please feel free to contact the UCT Human Research Ethics Committee if you have any queries:** Room E52-24, Old Main Building, Groote Schuur Hospital, Observatory, 7925  
Phone: (021) 406 6338      Email: [nosi.tywabi@uct.ac.za](mailto:nosi.tywabi@uct.ac.za)

## APPENDIX D: INFORMED CONSENT

**Participant Code:** \_\_\_\_\_

I \_\_\_\_\_ (full name) hereby consent to participate in the study entitled: **A qualitative assessment of a nutrition education intervention for women** - carried out by the investigators of the University of Cape Town.

|                                                                                                                                                                                                      |     |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| I have read and understand all of the information laid out in the Participant Information Sheet.                                                                                                     | Yes | No |
| All the procedures and risks have been explained to me in a language that I understand and all my questions have been answered.                                                                      | Yes | No |
| I am aware that I am free to ask any questions about the study procedures but that certain questions may only be answered after the study, if investigators think they will influence the discussion | Yes | No |
| I am aware that I am not obliged to answer any question that I don't want to                                                                                                                         | Yes | No |
| I am aware that participation in any part of this study is entirely voluntary. I am free to withdraw from parts of the study or the entire study at any time.                                        | Yes | No |
| I also understand that the investigators may withdraw me from the study at any time.                                                                                                                 | Yes | No |
| By agreeing to participate in this study, I am aware that my information will be recorded and stored in an anonymous way at UCT and will then be analysed by the investigators in coded form.        | Yes | No |

**ONLY TICK ONE OF THESE OPTIONS IF YOU HAVE NEVER TAKEN PART IN AN EAT BETTER SOUTH AFRICA EDUCATION PROGRAM:**

- ☐ I want to be contacted regarding future research and to be assessed for eligibility in further studies.
- ☐ I do **not** want to be contacted regarding future research and to be assessed for eligibility in further studies.

Participant Name: \_

**Participant ID :** \_\_\_\_\_

**Postal address:**

\_\_\_\_\_

**Email address:** \_\_\_\_\_ **Phone number:** \_\_\_\_\_ **Cell**  
**phone:** \_\_\_\_\_

**EMERGENCY CONTACT DETAILS**

**Name and \_Surname:** \_\_\_\_\_

**Relation:** \_\_\_\_\_

**Home phone:** \_\_\_\_\_ **Cell phone:** \_\_\_\_\_

\_\_\_\_\_

Print name of participant

\_\_\_\_\_

Signature

\_\_\_\_\_

Date

\_\_\_\_\_

Print name of investigator

\_\_\_\_\_

Signature

\_\_\_\_\_

Date

# APPENDIX E: BASELINE QUESTIONNAIRES

---

## APPENDIX E1

### BASELINE QUESTIONNAIRE: EBSA PARTICIPANT

PARTICIPANT CODE: \_\_\_\_\_

Please remember that the answers to this questionnaire will be kept strictly confidential and only the study investigators will be able to identify you.

**1. Please fill in your:**

Weight (kg): \_\_\_\_\_

Height (cm): \_\_\_\_\_

**2. How would you identify your ancestry (please circle)?**

Black

Mixed/Coloured

Asian

Indian

White

Other: \_\_\_\_\_

I would rather not say

**3. Which suburb do you live in?**

\_\_\_\_\_

**4. How many people do you live with (apart from yourself)?**

\_\_\_\_\_

**5. Please circle the highest level of education that you completed:**

I didn't go to school

Primary school

High school

Certificate

Diploma

Degree

**6. Please circle what best describes your current situation**



Unmarried/Single

Married

Divorced

Widowed

Separated

Living with a partner

**7. Please circle your current employment status**

Unemployed

Employed

Self-employed

Prefer not to say

**8. If you circled “unemployed”, please circle the choice that best describes your situation?**

Studying

Looking for work

Retired

Sick or injured

Retrenched

Pregnant or caring for own children

Caring for other children

Caring for sick/injured

Nothing (not looking)

Other

Prefer not to say

**9. When were you enroled in an EBSA program (month, year)?**

\_\_\_\_\_

**10. Where did you take part in an EBSA program?**

\_\_\_\_\_

**11. How many of the 6 EBSA program sessions did you attend (excluding follow up meetings)?**

\_\_\_\_\_

**12. Before attending the EBSA program, had you been told by a medical**

**professional (doctor, nurse, community health worker) that you had one or more of the following conditions (please circle all that are applicable)?**

Obesity

High blood pressure

High cholesterol

Type 1 diabetes

Type 2 diabetes

High triglycerides

Heart disease

Endocrine disorder: thyroid, reproductive hormones

I have no known condition

Other, please specify: \_\_\_\_\_

I prefer not to say

**13. Currently, has a medical professional (doctor, nurse, community health worker) told you that you have one or more of the following conditions (please circle all that are applicable)?**

Obesity

High blood pressure

High cholesterol

Type 1 diabetes

Type 2 diabetes

High triglycerides

Heart disease

Endocrine disorder: thyroid, reproductive hormones

Other, please specify: \_\_\_\_\_

I have no known condition

I prefer not to say

**14. Please list any medication that you are currently taking?**

\_\_\_\_\_

## APPENDIX E2

### BASELINE QUESTIONNAIRE: PARTICIPANT FROM [add community] EBSA SITE

PARTICIPANT CODE: \_\_\_\_\_

Please remember that the answers to this questionnaire will be kept strictly confidential and only the study investigators will be able to identify you.

**1. Please fill in your:**

Weight (kg): \_\_\_\_\_

Height (cm): \_\_\_\_\_

**2. How would you identify your ancestry (please circle)?**

Black

Mixed/Coloured

Asian

Indian

White

Other: \_\_\_\_\_

I would rather not say

**3. Which suburb do you live in?**

\_\_\_\_\_

**4. How many people do you live with (apart from yourself)?**

\_\_\_\_\_

**5. Please circle the highest level of education that you completed:**

I didn't go to school

Primary school

High school

Certificate

Diploma

Degree

**6. Please circle what best describes your current situation**

Unmarried/Single

Married

Divorced

Widowed

Separated

Living with a partner

**7. Please circle your current employment status**

Unemployed

Employed

Self-employed

Prefer not to say

**8. If you circled “unemployed”, please circle the choice that best describes your situation?**

Studying

Looking for work

Retired

Sick or injured

Retrenched

Pregnant or caring for own children

Caring for other children

Caring for sick/injured

Nothing (not looking)

Other

Prefer not to say

**9. Currently, has a medical professional (doctor, nurse, community health worker) told you that you have one or more of the following conditions (please circle all that are applicable)?**

Obesity

High blood pressure

High cholesterol

Type 1 diabetes

Type 2 diabetes

High triglycerides

Heart disease

Endocrine disorder: thyroid, reproductive hormones

Other, please specify: \_\_\_\_\_

I have no known condition

I prefer not to say

**10. Please list any medication that you are currently taking?**

\_\_\_\_\_

# APPENDIX F: FGDs QUESTIONS

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## APPENDIX F1

### FGDs previous EBSA participants semi structured questions

1. Thinking back over the time, what was the major influence on your decision to participate in the EBSA program?
2. What did you think of the educational sessions during the program?
  - a. How easy were these sessions to understand?
  - b. What aspects did you like or were useful?
  - c. Which aspects didn't you like or were not useful?
3. How did you feel about the number and frequency of the sessions?
4. What influenced your attendance to the sessions of the EBSA program?
  - a. What made it difficult to attend all the sessions?
  - b. What made it easy to attend all the sessions?
5. What are your thoughts on the diet that EBSA recommended during the program?
  - a. What were some of the things that helped you follow the diet?
  - b. What were some of the challenges you faced?
6. After the program, how did you feel about following the recommended diet?
  - a. Can you think of the most difficult food to get hold of or eat from the recommended foods?
  - b. Can you think of the easiest food to get hold of or eat from the recommended foods?
  - c. What can the EBSA program do to better support the change of diet?
7. How did people around you support you while doing the EBSA program?
  - a. How did your family/friends/colleagues support/not support you?
8. In your experience, how did the EBSA program affect your life?
  - a. Were there any positive impacts?

- b. Were there any negative impacts?
- 9. What do you think could be improved from the EBSA sessions?
- 10. What do you think about doing another EBSA program in your area?

## **APPENDIX F2**

### **FGDs previous EBSA-naïve participants semi structured questions**

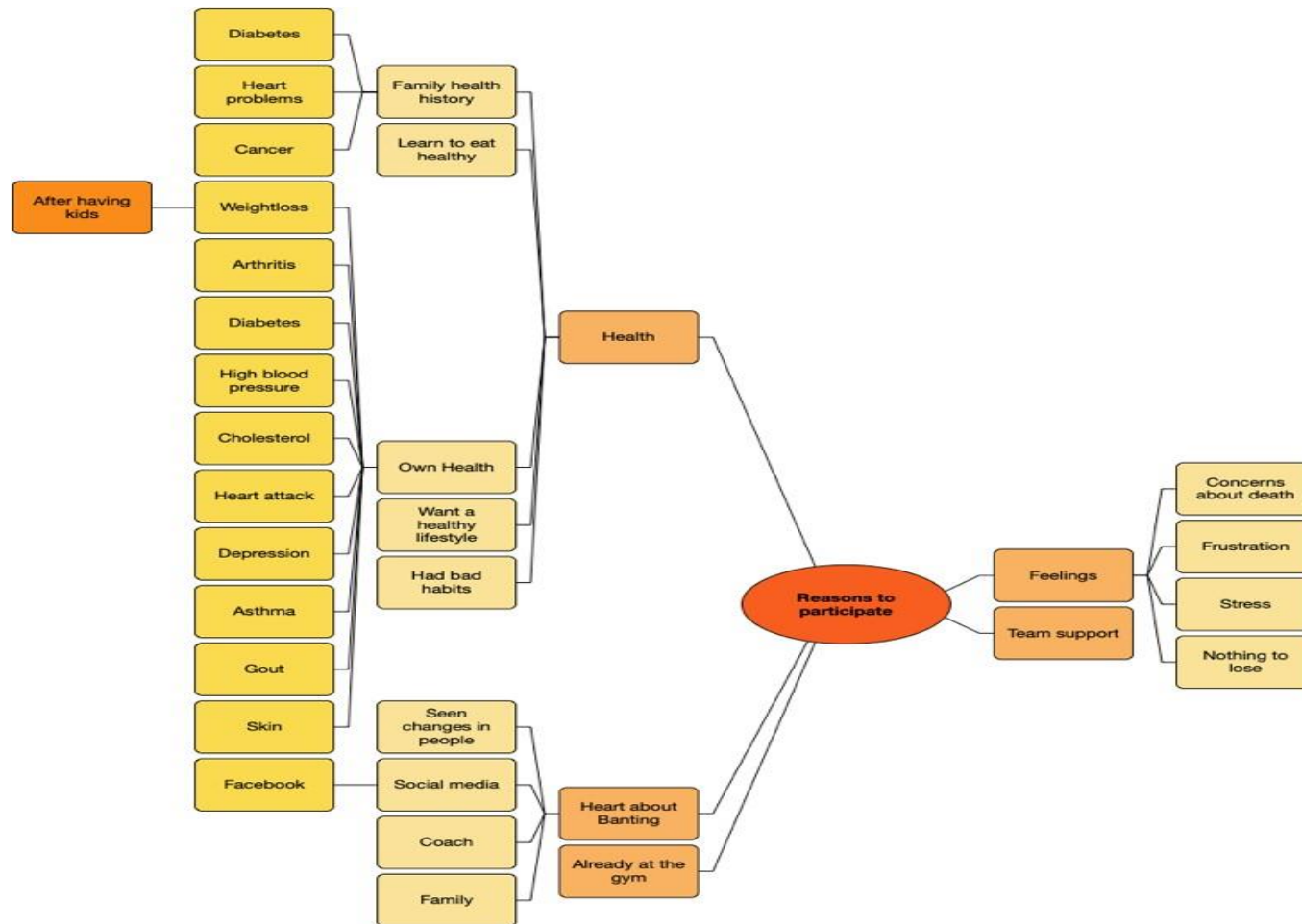
1. How would you describe your current diet?
2. Can you describe the type of foods and drinks that you generally consume?
  - a. What are the must-have staple foods in your household?
  - b. What are the reasons why do you eat these foods?
3. How would you best describe healthy living?
  - a. What things would healthy people do or how would they behave?
  - b. What do you and others do to stay healthy?
4. What does healthy eating mean to you?
  - a. What kind of food do you consider as healthy?
  - b. What kind of food do you consider as unhealthy?
5. Could you tell us about how the food you eat is generally prepared?
  - a. Who does the cooking in your household?
6. Where do you usually go to buy most of your food and drinks?
  - a. What aspects influence your food choices (quality, budget, distance)?
7. What do you understand as the Banting/low carb diet?
8. What are your thoughts about The Noakes Foundation or Eat Better South Africa?
9. How willing do you think women from your community will be to enrol in an education program to make dietary changes to improve their health?
10. What are your thoughts on enrolling yourself in such an education program (to make dietary changes to improve your health)?
  - a. Why would you take part in the program?
  - b. What are the things that make it difficult to make dietary changes?
  - c. What are the things that may make it easy to make dietary changes?

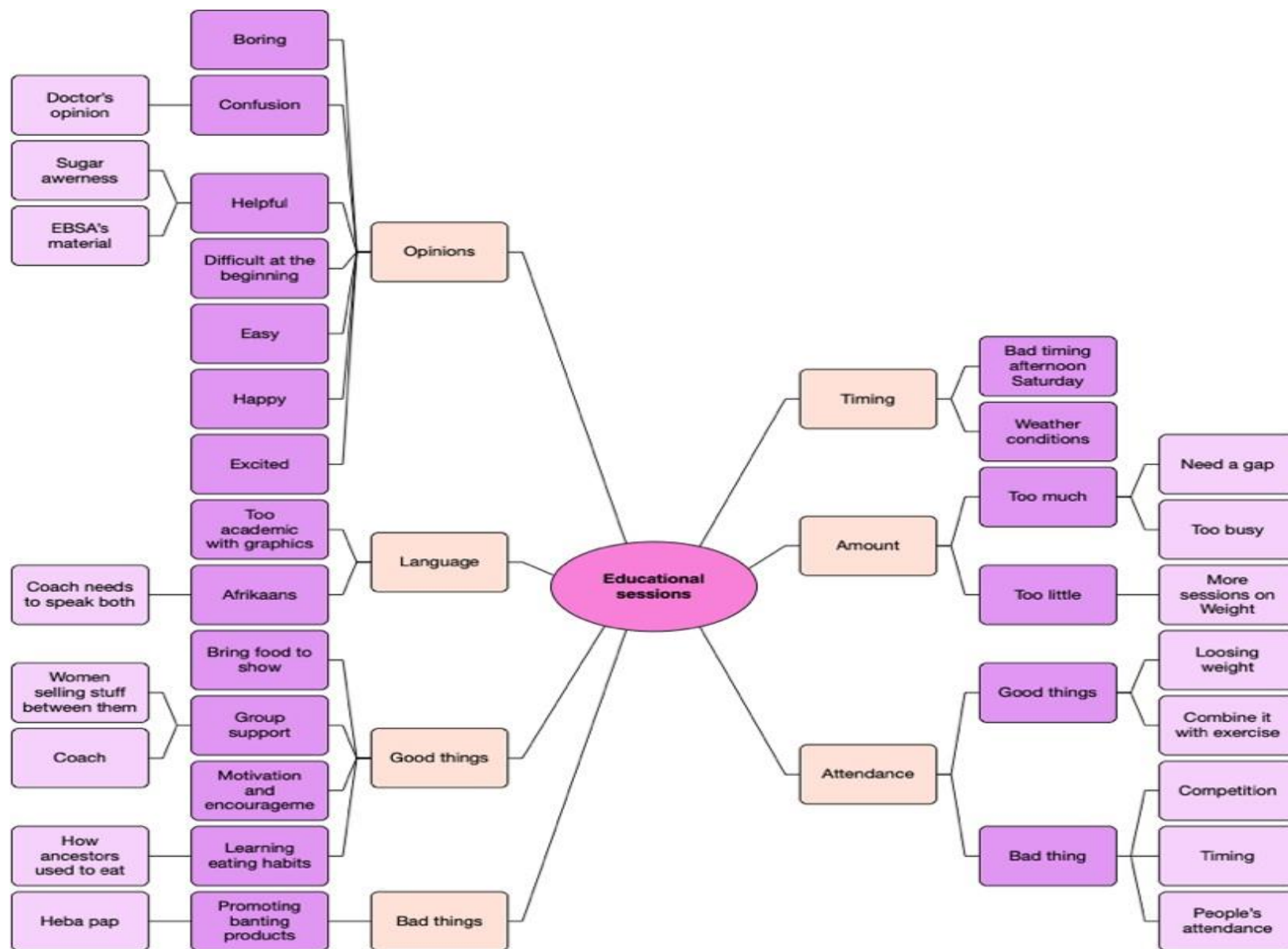


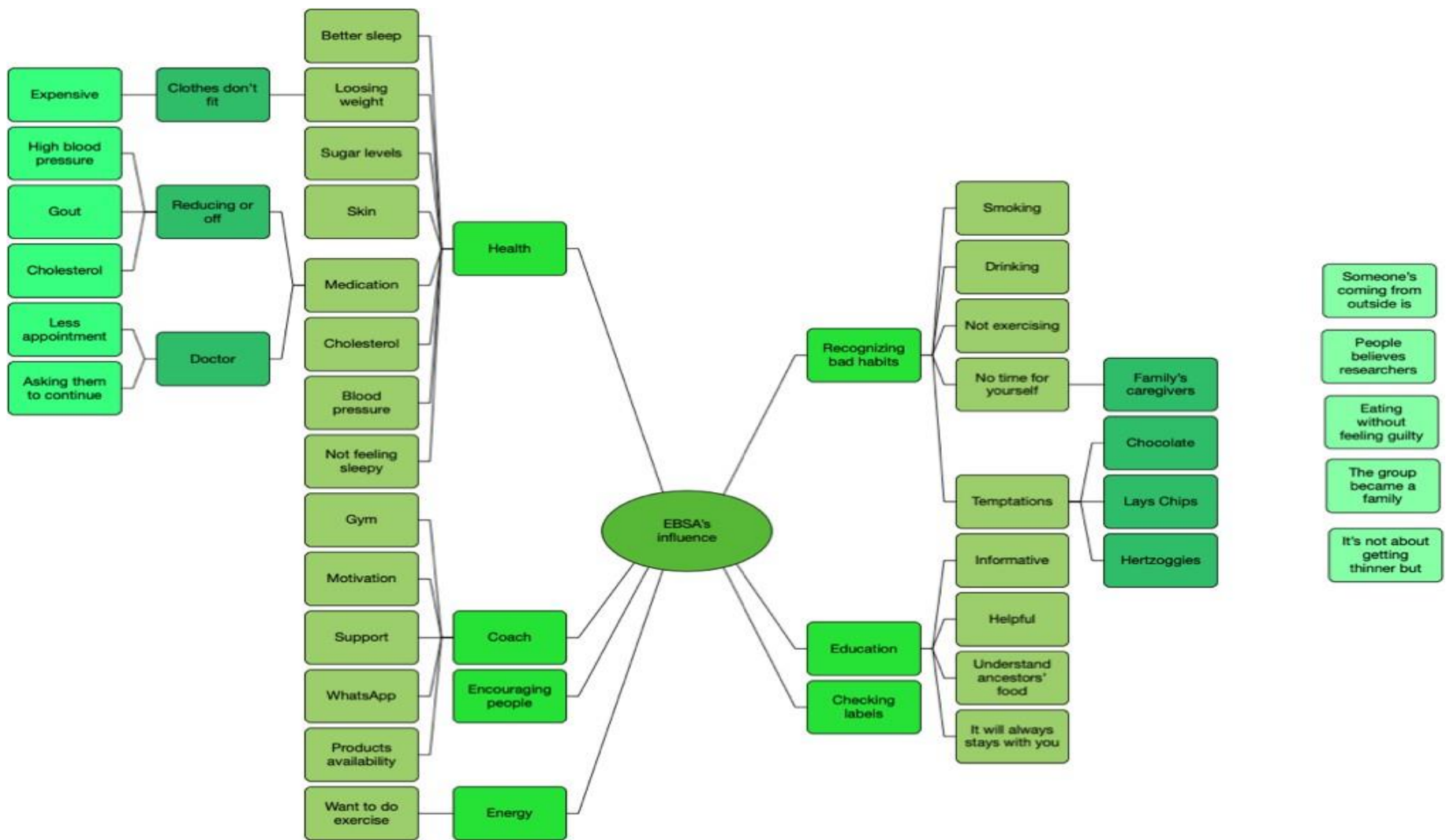
# APPENDIX G: THEMATIC MAPS

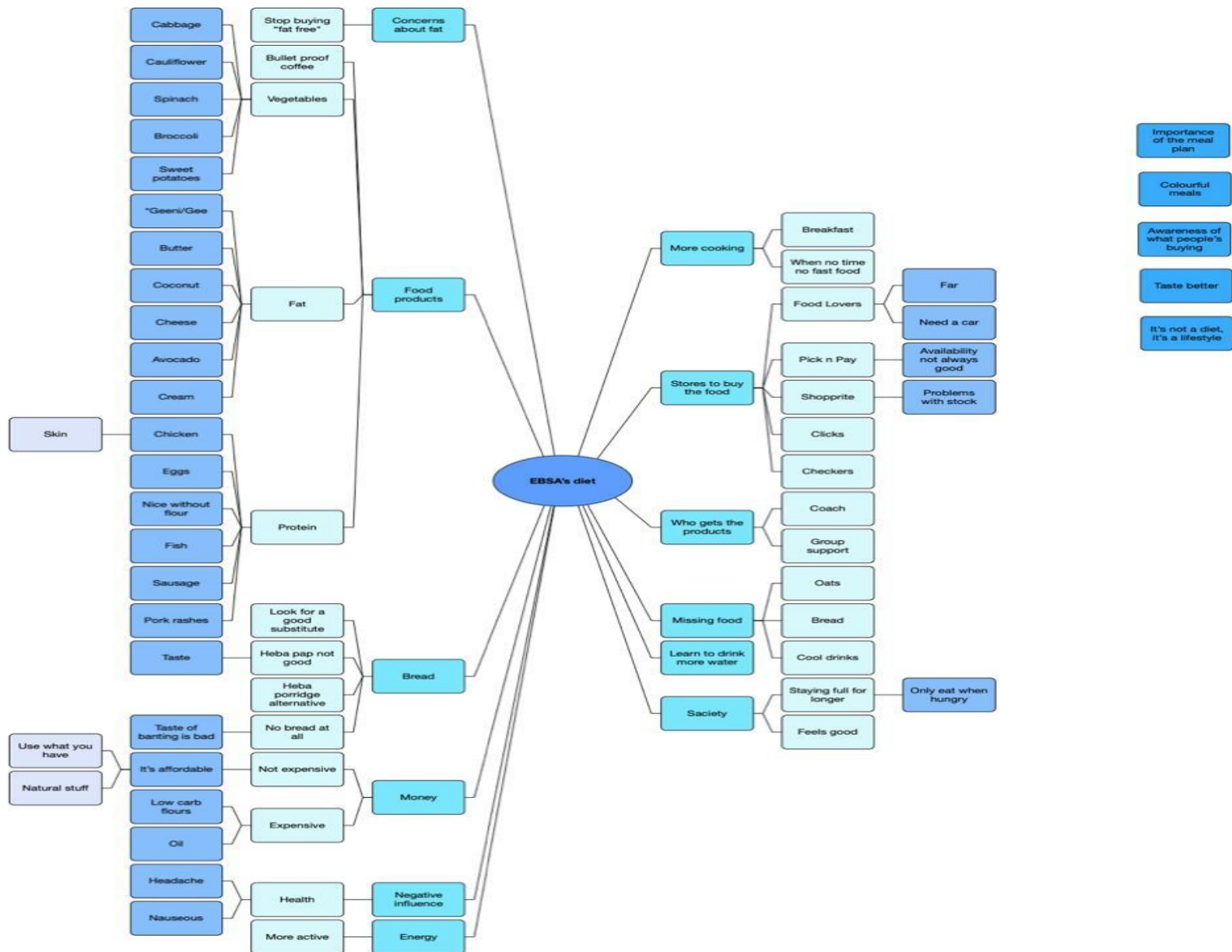
## APPENDIX G1

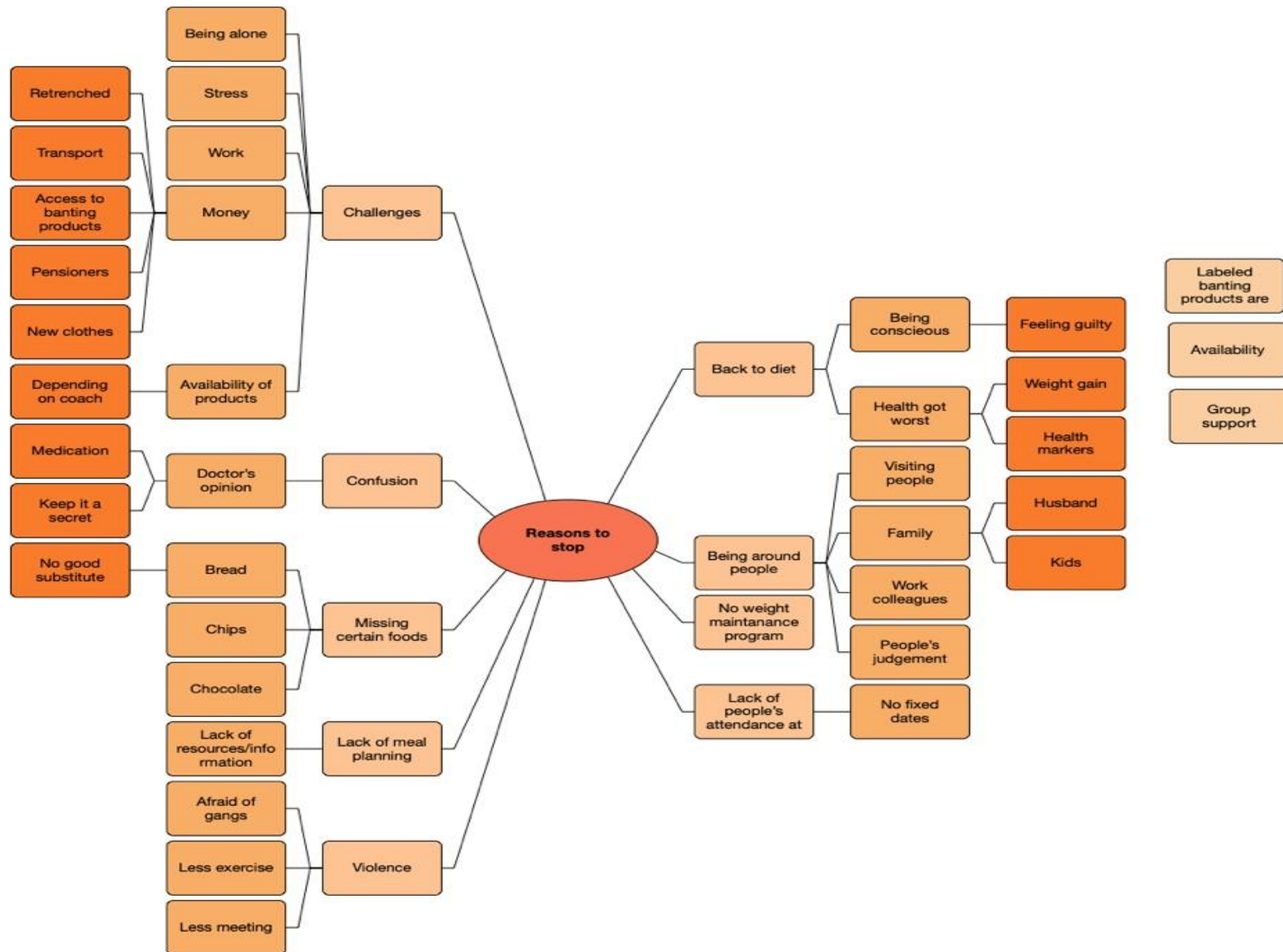
### Previous EBSA Participants Thematic Maps





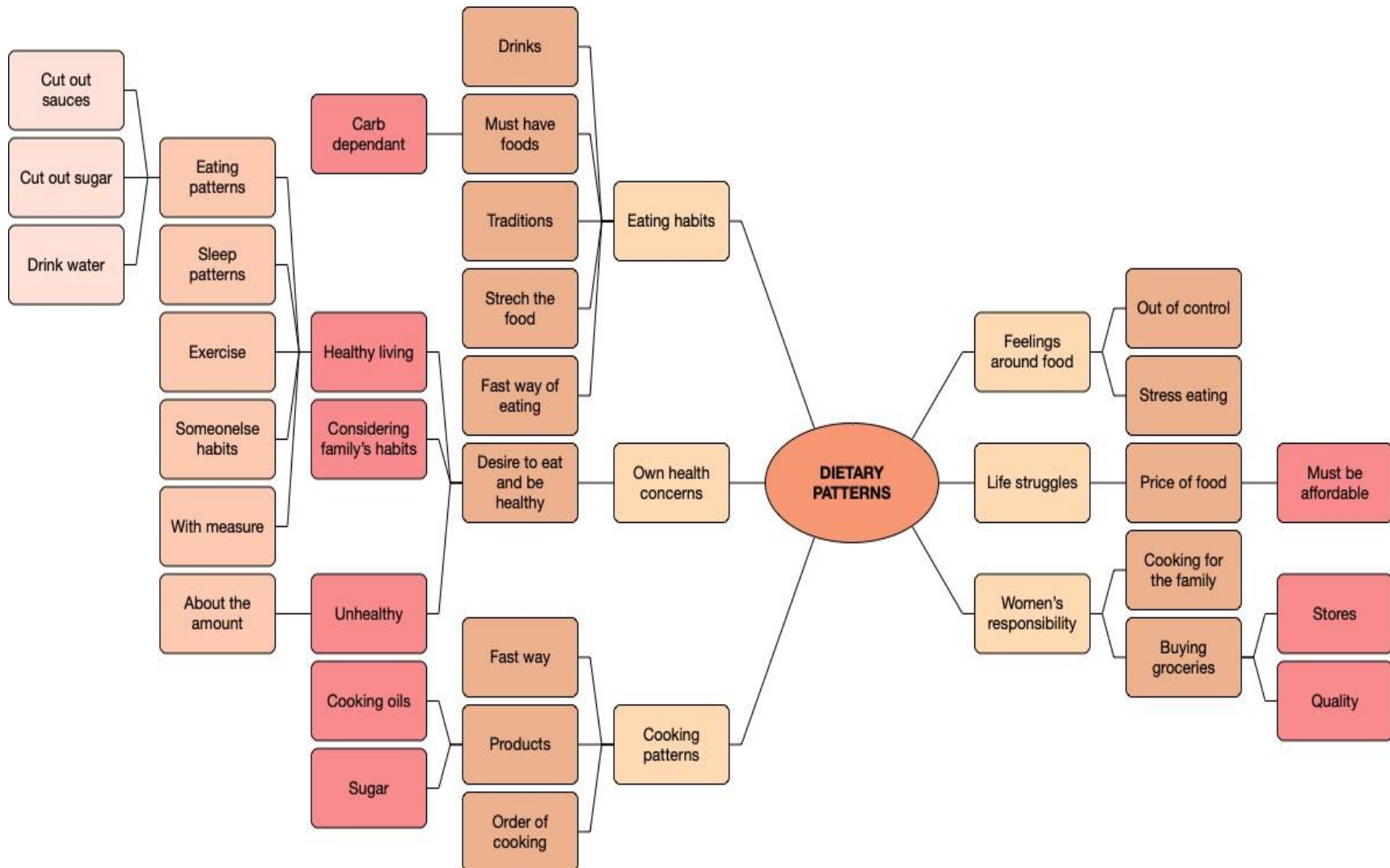




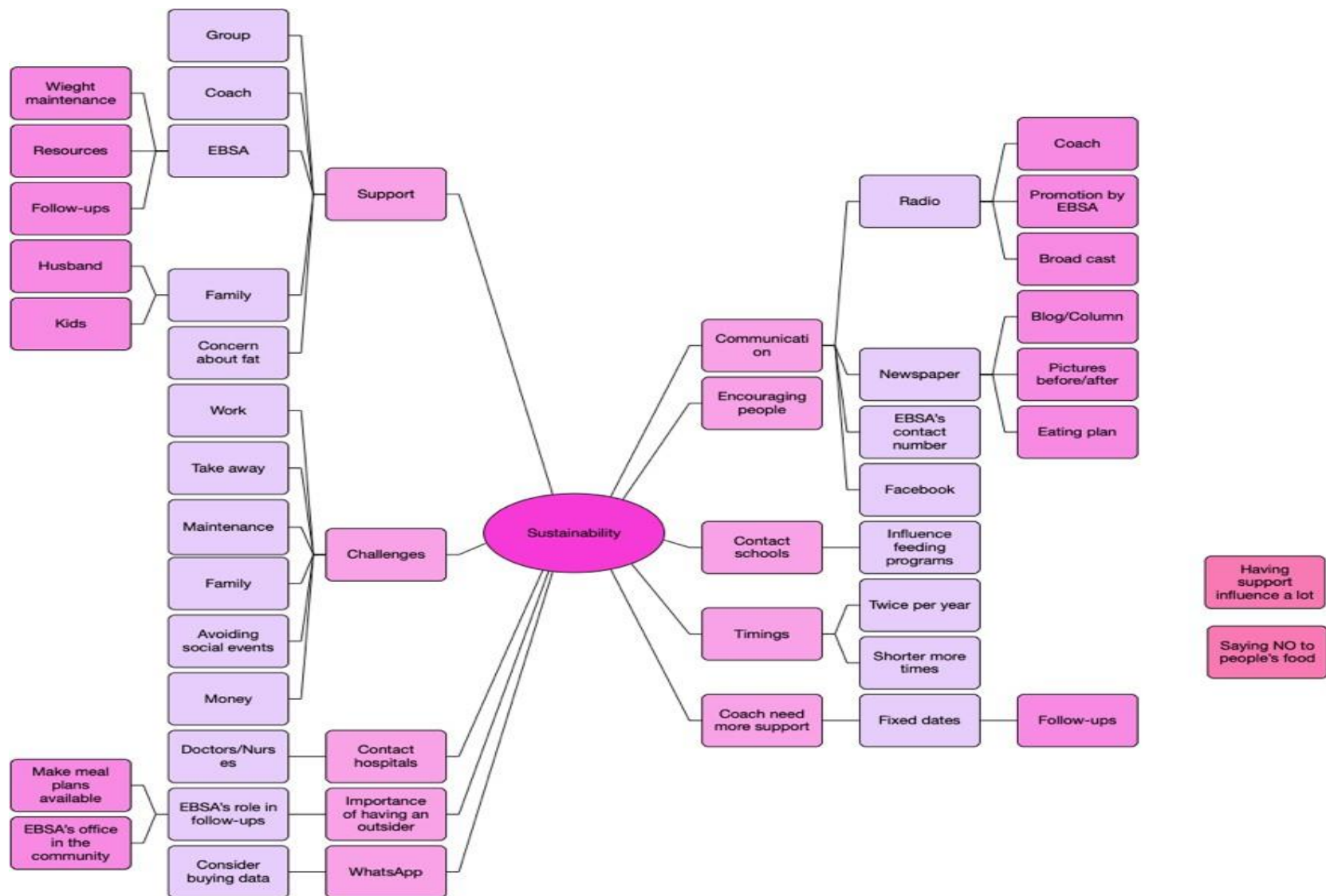


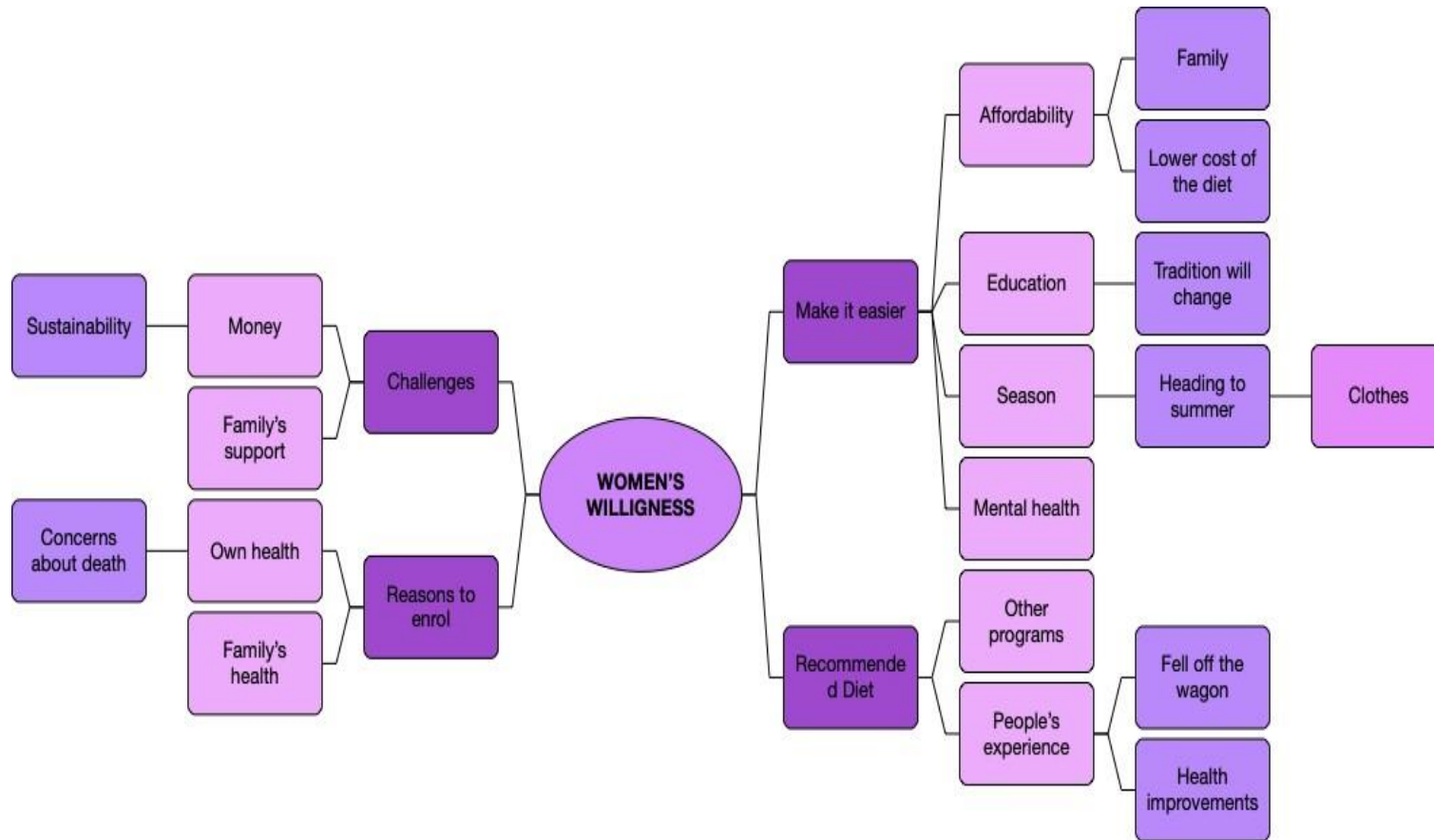
## APPENDIX G2

### Naïve-EBSA Participants Thematic maps











## APPENDIX H: EBSA NEW FRAMEWORK

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### Visit 2: Introduction to LCHF - 31 August 2019

| Duration (min) | Activity                                                                               | Resources                                                                                                                                                        | Facilitator                 |
|----------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| 30             | Weigh-in, measurements BP, Glucose testing, intake forms                               | Scale, measuring tape, data collection forms, BP machines, Glucose monitor + other (i.e. alcohol swabs, cotton, sharps bin, strips, needles), pens, intake forms | Educator<br>Coach<br>Nurses |
| 5.00           | Introduction and recap EBSA, TNF & study + important note NOT TO START LCHF THIS WEEK! | Presentation                                                                                                                                                     | Educator                    |
| 5.00           | Ice Breaker                                                                            |                                                                                                                                                                  | Educator                    |
| 15.00          | Sugar Demonstration                                                                    | Sugar Demonstration resources                                                                                                                                    | Educator<br>Coach           |
| 20.00          | Introduction to LCHF                                                                   | Presentation                                                                                                                                                     | Educator                    |
| 10.00          | Talk through summary guide, banting on a budget.                                       |                                                                                                                                                                  | Educator                    |
| 10.00          | Talk about setting goals                                                               |                                                                                                                                                                  | Educator                    |
| 10.00          | Feedback & discussion                                                                  | Summary guide                                                                                                                                                    | Educator                    |
| 5.00           | Wrap-up                                                                                | Feedback forms                                                                                                                                                   | Educator<br>Coach<br>Nurses |

**Visit 3: Chronic disease - 7 September 2019**

| Duration (min) | Activity                                                           | Resources                                                                                                                                                        | Facilitator                 |
|----------------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| 15.00          | Weigh-in, measurements BP, Glucose testing, intake forms           | Scale, measuring tape, data collection forms, BP machines, Glucose monitor + other (i.e. alcohol swabs, cotton, sharps bin, strips, needles), pens, intake forms | Educator<br>Coach<br>Nurses |
| 5.00           | Recap - feedback from week, touch on previous session              |                                                                                                                                                                  | Educator                    |
| 10.00          | Ice Breaker                                                        |                                                                                                                                                                  | Educator<br>Coach<br>Nurses |
| 30.00          | Presentation on chronic disease/metabolic syndrome/sugar addiction |                                                                                                                                                                  | Doctor                      |
| 10.00          | A&Q                                                                |                                                                                                                                                                  | Doctor<br>Educator          |
| 30.00          | Activity: Mindfulness & meditation                                 | Leaflet/doc with basic exercise                                                                                                                                  | Doctor                      |
| 10.00          | Feedback & discussion                                              |                                                                                                                                                                  | Educator                    |
| 10.00          | Wrap-up                                                            | Feedback forms                                                                                                                                                   | Doctor<br>Educator          |

**Visit 4: Meal planning & Shopping & exercise - 14 September 2019**

| Duration (min) | Activity | Resources | Facilitator |
|----------------|----------|-----------|-------------|
|----------------|----------|-----------|-------------|

|       |                                                       |                                                          |                             |
|-------|-------------------------------------------------------|----------------------------------------------------------|-----------------------------|
| 15.00 | Weigh-in, waist circumference, BP                     | Scale, measuring tape, data collection forms, BP machine | Educator<br>Coach<br>Nurses |
| 5.00  | Recap - feedback from week, touch on previous session |                                                          | Educator                    |
| 10.00 | Ice Breaker                                           |                                                          | Educator                    |
| 30.00 | Presentation on Meal planning & budget shopping       | Meal Plans, Banting on a Budget                          | Educator                    |
| 10.00 | A&Q                                                   |                                                          | Educator                    |
| 30.00 | Activity: Home Based Movement Demonstration           |                                                          | Educator                    |
| 10.00 | Feedback & discussion                                 |                                                          | Educator                    |
| 10.00 | Wrap-up                                               | Feedback forms                                           | Educator                    |

### **Visit 5: Social gatherings and practical lifestyle changes - 21 September 2019**

| Duration (min) | Activity                                                                                                          | Resources                                                | Facilitator                 |
|----------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------|
| 15.00          | Weigh-in, waist circumference, BP                                                                                 | Scale, measuring tape, data collection forms, BP machine | Educator<br>Coach<br>Nurses |
| 5.00           | Recap - feedback from week, touch on previous session                                                             |                                                          | Educator                    |
| 10.00          | Ice Breaker                                                                                                       |                                                          | Educator<br>Coach           |
| 30.00          | Presentation on Social gatherings and practical implementation and other troubleshoot i.e. clothes get too small. | Presentation & practical Hand-out                        | Educator                    |

|       |                                                            |                |                   |
|-------|------------------------------------------------------------|----------------|-------------------|
|       | Short demonstration on making some low carb snacks (Terry) |                |                   |
| 10.00 | A&Q                                                        |                | Educator<br>Coach |
| 30.00 | Activity: Role play                                        |                | Educator          |
| 10.00 | Feedback & discussion                                      |                | Educator<br>Coach |
| 10.00 | Wrap-up                                                    | Feedback forms | Educator          |

### **Visit 6: Sustainability - Moving forward - 28 September 2019**

| Duration (min) | Activity                                                | Resources                                                | Facilitators                |
|----------------|---------------------------------------------------------|----------------------------------------------------------|-----------------------------|
| 15.00          | Weigh-in, waist circumference, BP                       | Scale, measuring tape, data collection forms, BP machine | Educator<br>Coach<br>Nurses |
| 5.00           | Recap - feedback from week, touch on previous session   |                                                          |                             |
| 10.00          | Ice Breaker                                             |                                                          |                             |
| 30.00          | Feedback & discussion re progress made over past weeks. |                                                          |                             |
| 30.00          | Wrap-up                                                 | Feedback forms                                           |                             |

### **Award Ceremony - 5 October 2019**

# APPENDIX I: EBSA EXAMPLE MEAL PLAN

## 7 DAY BUDGET MEAL PLAN

Eat Better South Africa / Community outreach branch of The Noakes Foundation

Below you can find the daily meal plans. Every day covers three filling meals. Feel free to switch meals with other days. If a meal is too much, save the leftovers for another day. You can find the recipes on the following page. The serving size and it's nutritional values are given for every meal.

### # DAY 1



#### BREAKFAST: BANTING EGGS BENEDICT (1 SERVING)

- 2 TOMATO SLICES
- 2 STRIPS BACON
- 2 POACHED EGGS
- HOLLANDAISE SAUCE
- HERBS TO TASTE

Nutritional value  
Fat: 26g Carbs: 4g Protein: 17g



#### LUNCH: FISH BAKE (1 SERVING)

- 1 CAN SARDINES
- 1/2 TOMATO (CHOPPED)
- ¼ CUCUMBER (SLICED)
- ½ CUP CABBAGE (SHREDDED)
- 2 TBSP BUTTER
- 50 G OF FULL FAT CHEESE
- SALT / PEPPER

Nutritional value  
Fat: 40g Carbs: 8g Protein: 28g



#### SUPPER: BAKED STUFFED CABBAGE (3 SERVINGS)

- 1 WHOLE CABBAGE
- 100 G OF FULL FAT CHEESE
- 100 G CHOPPED BACON
- SPICES, BUTTER TO TASTE

Nutritional value  
Fat: 27.5g Carbs: 10.5g Protein: 18.07g

Total nutritional value  
Fat: 93.5g  
Carbs: 22.5g  
Protein: 43g

TOTAL PRICE OF TODAY  
33 RAND

## 7 DAY BUDGET MEAL PLAN

Eat Better South Africa / Community outreach branch of The Noakes Foundation

### # DAY 2



#### BREAKFAST: EGG MUG MUFFINS (1 SERVING)

- 2 EGGS
- 1/2 C. SPINACH
- 1/4 C BELL PEPPER
- SALT / PEPPER
- HERBS TO TASTE

Nutritional value  
Fat: 26g Carbs: 4g Protein: 17g



#### LUNCH: SPINACH SALAD (1 SERVING)

- 1 C. SPINACH
- 1 TO 2 BOILED EGGS
- ½ AVOCADO (CUBED OR SLICED)
- 2 STRIPS BACON (CRUMBLED)
- 50 G WHOLE FAT CHEESE
- SALT / PEPPER

Nutritional value  
Fat: 40g Carbs: 8g Protein: 28g



#### CAULIFLOWER RICE BOWL (3 SERVINGS)

- 1 C. CAULIFLOWER RICE
- ½ ONION
- ½ BELL PEPPER
- 1 GARLIC CLOVE
- 1 TBSP OLIVE OIL
- ½ TOMATO
- 375 G PORK SAUSAGE

Nutritional value  
Fat: 27.5g Carbs: 10.5g Protein: 18.07g

Total nutritional value  
Fat: 93.5g  
Carbs: 22.5g  
Protein: 43g

TOTAL PRICE OF TODAY  
31 RAND

# APPENDIX J: PILOT PARTICIPANTS'

## INFORMATION SHEET

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### PARTICIPANT INFORMATION SHEET

Dear health practitioners,

We are conducting a study called 'Qualitative evaluation of a nutrition education program for women: perspectives of community doctors.' If you meet our inclusion criteria, we would like to hear your opinion about health and nutrition. Below you will find more information about who we are and what is involved. Please feel free to contact us if you have any questions or would like to take part.

**What is the study about?** Eat Better South Africa (EBSA) is a non-profit organization which has run a number of nutrition education programs for women from low income communities. Their aim is to teach participants how to improve their health by choosing foods that are low in sugar and refined carbohydrates but high in fat. We are conducting research to evaluate the EBSA programs, with the aim to improve them. To do this, we need to take into account the perspectives of community doctors. Therefore, this study will interview doctors from the areas where EBSA has run or will run their programs.

**Are you eligible to take part?** You will be eligible to take part if you are a medical doctor and work in [community name] on at least on a monthly basis. You will need to be able to understand and speak English.

**What will be required of you?** You will meet with a UCT researcher at a time and place that is convenient for you for about an hour. The researcher will interview you by asking for your opinion on health and nutrition. We will not ask about facts so there are no right or wrong answers. If you don't want to answer a question or talk about a particular topic then you don't need to. You will also be asked to fill in a short questionnaire (age, occupation etc.).

**What will be done with the information collected?** The interviews will be recorded for sound (not video). They will then be transcribed, using codes if your names are mentioned. Anonymous transcriptions will be analysed according to standard qualitative research procedures. Themes of interest will be identified and some anonymous quotes may be used to add context to these themes. Results (but not the voice recordings or your names) will be presented to EBSA so they can improve their programs and may also be published in research and magazine articles and may be presented at public and scientific talks.

**Will my information be kept confidential?** All your information will be kept strictly anonymous. You will be given a study code that will be used instead of your name for all data we collect from the questionnaires and interviews. These codes, any personal identifiers, and the voice recordings will be stored in a password protected folder that only the study investigators will have access to. As soon as the voice recordings have been transcribed and double checked, they will be permanently deleted.

**What are the benefits of taking part?** You will be given the opportunity to share your opinion of the health and nutrition of people from the communities that you work in and any opinions you may have about the EBSA program. This might help us improve the EBSA program. We will share our study conclusions with you and you will also be given R100 to reimburse you for your transport costs.

**What are the risks of taking part?** There are no foreseeable risks in taking part in this study. You will be encouraged to speak honestly about the community's health and diet. For some people, these topics may be sensitive and may cause negative emotions. Please keep in mind that none of the investigators will judge you for anything that you say, and that your information will be anonymous to everyone else.

**Ethical considerations.** This study has been approved by the faculty of Health Sciences, Human Research Ethics Committee (UCT). You will only start this study once you have

confirmed that you understand what the study is about by signing the informed consent form on the day of the interview. Participation in the study is entirely voluntary and you have the right to withdraw from the study at any time. The investigator may also withdraw you from the study at any time should he/she believes it is in your best interests to do so, or you are found to be ineligible for the study.

**Please feel free to contact the UCT Human Research Ethics Committee if you have any queries:** Floor E53, Room 46, Old Main Building, Groote Schuur Hospital, Observatory, 7925.  
Phone: (021) 406 6338



# APPENDIX K: PILOT INFORMED CONSENT

## To be completed by participant at Visit 1:

By completing and signing this form, I hereby consent to participate in the study entitled:  
**A pilot evaluation of a nutrition education program in women from an under-resourced community.**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| 1. All the procedures and risks have been explained to me in a language that I understand.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Yes | No |
| 2. All my questions about the study have been answered for now but I am aware that I can ask questions about the study at any time.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Yes | No |
| 3. To the best of my knowledge, I am eligible for the study because I am: <ul style="list-style-type: none"> <li>• female</li> <li>• between the ages of 18 and 69</li> <li>• able to understand and speak English or Afrikaans</li> <li>• a resident of Ocean View</li> <li>• not pregnant</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Yes | No |
| 4. I understand that, if I take part in the study, I will be asked to meet 8 times in Ocean View for about 2 hours on a [Saturday morning], where I will: <ul style="list-style-type: none"> <li>• Take part in 5 group education sessions. At each session I will: <ul style="list-style-type: none"> <li>○ Have my blood pressure and weight measured</li> <li>○ Attend an interactive diet and health information session</li> </ul> </li> <li>• Take part in 2 health testing sessions. At each testing session I will: <ul style="list-style-type: none"> <li>○ Share personal information about my health and diet</li> <li>○ Give a blood sample from a vein in my arm</li> <li>○ Have my blood pressure and weight measured</li> <li>○ Wear an activity monitor for one week after the testing day</li> </ul> </li> <li>• Meet with an investigator for 20 minutes before and after the education session</li> <li>• Take part in one group discussion</li> </ul> | Yes | No |

|                                                                                                                                                                                                                                                                                                                                       |     |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| 5. I am aware that the dietary recommendations are just for me                                                                                                                                                                                                                                                                        | Yes | No |
| 6. I am aware that taking part in this study is voluntary and that I do not have to answer any questions or do anything that I don't want to. I am aware that I can stop taking part in the study at any point if I wish to.                                                                                                          | Yes | No |
| 7. I am aware that I may be withdrawn from the study if I do not follow the study procedures, if I am found to be not eligible or the investigators think it is best for me.                                                                                                                                                          | Yes | No |
| 8. I am aware that my blood sample and information will be stored at UCT under lock and key and will be analysed by the investigators, certified pathology laboratories or project collaborators in coded form so that I remain anonymous. I am aware that only the study investigators and study doctor will be able to identify me. | Yes | No |
| 9. If any of the blood that I provided for this research project is unused or leftover when the research is completed, I give permission for my samples to be stored indefinitely and used in future research of any type, which has been approved by an accredited HREC.                                                             | Yes | No |

**Participant Code:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Date of birth** \_\_\_\_\_ **Age:** \_\_\_\_\_

**Residential address:** \_\_\_\_\_

**Email address:** \_\_\_\_\_ **Phone number:** \_\_\_\_\_

### **EMERGENCY CONTACT DETAILS**

**Name and Surname:** \_\_\_\_\_ **Relation:** \_\_\_\_\_

**Home phone:** \_\_\_\_\_

\_\_\_\_\_  
Print name of participant

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**To be completed by study investigator:**

By signing this form below, I confirm that I have explained the study to the participant and did not force them in any way to agree to participate.

\_\_\_\_\_  
Print name of investigator

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

# APPENDIX L: PILOT BASELINE QUESTIONNAIRE

## Study Questionnaire: Pilot evaluation of a nutrition education program in women from an under resourced community

Please remember that the answers to this questionnaire will be kept strictly confidential and only the study investigators will be able to identify you. If I ask any question you do not want to answer, just let me know and I will go to the next question. You may also stop the interview at any time.

However, we hope you will participate in the survey because your answers are important to us.

Participant code: \_\_\_\_\_

Date: \_\_\_\_\_

Time: \_\_\_\_\_

Interviewer: \_\_\_\_\_

Consent has been read and obtained: \_\_\_\_\_

What is your first/ home language? \_\_\_\_\_

What other languages can you understand and speak? \_\_\_\_\_

| Household characteristics: To begin, we will start with questions about your household |                       |      |        |       |
|----------------------------------------------------------------------------------------|-----------------------|------|--------|-------|
| Questions and Filters                                                                  |                       | Code | ANSWER | Code  |
| What is the main source of drinking water for members of your household?               | Piped water           |      |        |       |
|                                                                                        | Piped into dwelling   | 11   |        |       |
|                                                                                        | Piped to yard/plot    | 12   |        |       |
|                                                                                        | Public tap/standpipe  | 13   |        |       |
|                                                                                        | Tube well or borehole | 21   |        | HV101 |
|                                                                                        | Dug well              |      |        |       |
|                                                                                        | Protected well        | 31   |        |       |
|                                                                                        | Unprotected well      | 32   |        |       |
|                                                                                        | Water from spring     |      |        |       |
|                                                                                        | Protected spring      | 41   |        |       |

|  |                                                   |    |  |
|--|---------------------------------------------------|----|--|
|  | Unprotected spring                                | 42 |  |
|  | Rainwater                                         | 51 |  |
|  | Tanker truck                                      | 61 |  |
|  | Cart with small tank                              | 71 |  |
|  |                                                   | 81 |  |
|  | Surface water (river/dam/lake/pond/stream/canal/) |    |  |
|  | Bottled water                                     | 91 |  |
|  | OTHER (specify) _____                             | 96 |  |

|                                                                        |                                   |     |    |  |       |
|------------------------------------------------------------------------|-----------------------------------|-----|----|--|-------|
| What kind of toilet facility do members of your household usually use? | Flush or pour flush toilet        |     |    |  | HV104 |
|                                                                        | Flush to piped sewer system       | 11  |    |  |       |
|                                                                        | Flush to septic tank              | 12  |    |  |       |
|                                                                        | Flush to pit latrine              | 13  |    |  |       |
|                                                                        | Flush to somewhere else           | 14  |    |  |       |
|                                                                        | Flush don't know where            | 15  |    |  |       |
|                                                                        | Pit latrine                       |     |    |  |       |
|                                                                        | Ventilated improved pit latrine   | 21  |    |  |       |
|                                                                        | Pit latrine with slab             | 22  |    |  |       |
|                                                                        | Pit latrine without slab/open pit | 23  |    |  |       |
|                                                                        | Composting toilet                 | 31  |    |  |       |
|                                                                        | Bucket toilet                     | 41  |    |  |       |
|                                                                        | Hanging toilet / hanging latrine  | 51  |    |  |       |
|                                                                        | No facility/bush/field            | 61  |    |  |       |
|                                                                        | OTHER (specify) _____             | 96  |    |  |       |
| Does your household have:                                              |                                   | YES | NO |  | HV105 |
|                                                                        | Electricity                       | 1   | 2  |  |       |
|                                                                        | Radio                             | 1   | 2  |  |       |
|                                                                        | Television                        | 1   | 2  |  |       |
|                                                                        | Cellular telephone                | 1   | 2  |  |       |

|                                                            |                                 |   |    |       |
|------------------------------------------------------------|---------------------------------|---|----|-------|
|                                                            | Non-mobile telephone (landline) | 1 | 2  |       |
|                                                            | Refrigerator                    | 1 | 2  |       |
|                                                            | Internet/wifi                   | 1 | 2  |       |
|                                                            | Washing machine                 | 1 | 2  |       |
|                                                            | Computer/laptop                 | 1 | 2  |       |
|                                                            | Stove                           | 1 | 2  |       |
|                                                            | Oven                            | 1 | 2  |       |
| What is the main material used for the floor in your home? | Natural floor                   |   |    |       |
|                                                            | Earth/sand                      |   | 11 |       |
|                                                            | Dung                            |   | 12 |       |
|                                                            | Rudimentary floor               |   |    |       |
|                                                            | Wood planks                     |   | 21 |       |
|                                                            | Palm/bamboo                     |   | 22 |       |
|                                                            | Finished floor                  |   |    |       |
|                                                            | Parquet or polished wood        |   | 31 |       |
|                                                            | Vinyl or asphalt strips         |   | 32 |       |
|                                                            | Ceramic tiles                   |   | 33 |       |
|                                                            | Cement                          |   | 34 |       |
|                                                            | Carpet                          |   | 35 |       |
|                                                            | Other (Specify) _____           |   | 96 |       |
|                                                            |                                 |   |    | HV106 |

|                                            |                   |    |  |       |
|--------------------------------------------|-------------------|----|--|-------|
| What are the walls of your home made from? | Natural walls     |    |  |       |
|                                            | No walls          | 11 |  |       |
|                                            | Cane/palm/trunks  | 12 |  |       |
|                                            | Dirt              | 13 |  |       |
|                                            | Rudimentary walls |    |  |       |
|                                            | Bamboo with mud   | 21 |  |       |
|                                            | Stone with mud    | 22 |  |       |
|                                            | Uncovered adobe   | 23 |  |       |
|                                            | Plywood           | 24 |  |       |
|                                            |                   |    |  | HV107 |

|                                                                    |                                 |        |        |
|--------------------------------------------------------------------|---------------------------------|--------|--------|
|                                                                    | Cardboard/carton                | 25     |        |
|                                                                    | Reused wood                     | 26     |        |
|                                                                    | Finished walls                  |        |        |
|                                                                    | Cement                          | 31     |        |
|                                                                    | Stone with lime/cement          | 32     |        |
|                                                                    | Bricks                          | 33     |        |
|                                                                    | Cement blocks                   | 34     |        |
|                                                                    | Covered adobe                   | 35     |        |
|                                                                    | Wood planks/shingles            | 36     |        |
|                                                                    | Other (Specify) _____           | 96     |        |
| How many rooms are in your household?                              |                                 |        | HV108a |
| How many rooms in this household are used for sleeping?            |                                 |        | HV108  |
| Do you personally own any of the following?                        |                                 | YES NO |        |
|                                                                    | Watch                           | 1 2    |        |
|                                                                    | Cell phone                      | 1 2    |        |
|                                                                    | Tablet/laptop                   | 1 2    |        |
|                                                                    | MP3 player or some Music player | 1 2    |        |
|                                                                    | Bicycle                         |        | HV109a |
|                                                                    | Motorcycle/scooter              | 1 2    |        |
|                                                                    | Animal-drawn cart               | 1 2    |        |
|                                                                    | Car/truck                       | 1 2    |        |
|                                                                    | Boat                            | 1 2    |        |
|                                                                    | Boat with motor                 | 1 2    |        |
|                                                                    |                                 | 1 2    |        |
| Other than you, which of these does someone in your household own? |                                 | YES NO |        |
|                                                                    | Watch                           | 1 2    |        |
|                                                                    | Cell phone                      | 1 2    |        |
|                                                                    | Tablet/laptop                   | 1 2    |        |
|                                                                    | MP3 player or some Music player | 1 2    |        |
|                                                                    | Bicycle                         | 1 2    | HV109  |

|  |                    |   |   |  |
|--|--------------------|---|---|--|
|  | Motorcycle/scooter | 1 | 2 |  |
|  | Animal-drawn cart  | 1 | 2 |  |
|  | Car/truck          | 1 | 2 |  |
|  | Boat               | 1 | 2 |  |
|  | Boat with motor    | 1 | 2 |  |

# WHO- STEPS QUESTIONNAIRE ON NON-COMMUNICABLE DISEASES:

In the next section we will be asking you some general questions about yourself and your lifestyle choices and habits.

| QUESTION                                                          | OPTION                       |    | ANSWER | CODE |
|-------------------------------------------------------------------|------------------------------|----|--------|------|
| <b>Demographic Information</b>                                    |                              |    |        |      |
| What is the <b>highest level of education</b> you have completed? | No formal schooling          | 1  |        | C5   |
|                                                                   | Less than primary school     | 2  |        |      |
|                                                                   | Primary school completed     | 3  |        |      |
|                                                                   | High school completed        | 5  |        |      |
|                                                                   | College/University completed | 6  |        |      |
|                                                                   | Post graduate degree         | 7  |        |      |
|                                                                   | Refused                      | 88 |        |      |
| What is your <i>ethnic / racial</i> <b>background</b> ?           | _____                        |    |        | C6   |
|                                                                   | Refused                      | 88 |        |      |
| What is your <b>marital status</b> ?                              | Never married                | 1  |        | C7   |
|                                                                   | Currently married            | 2  |        |      |
|                                                                   | Separated                    | 3  |        |      |
|                                                                   | Divorced                     | 4  |        |      |
|                                                                   | Widowed                      | 5  |        |      |
|                                                                   | Cohabiting                   | 6  |        |      |
|                                                                   | Refused                      | 88 |        |      |
|                                                                   | Government employee          | 1  |        | C8   |

|                                                                                                                             |                             |                                              |  |     |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------------------------------------------|--|-----|
| Do you have a job? Are you Paid for it? (Which of the following best describes your <b>main work</b> over the last year)    | Non-government employee     | 2                                            |  |     |
|                                                                                                                             | Self-employed               | 3                                            |  |     |
|                                                                                                                             | Non-paid (working)          | 4                                            |  |     |
|                                                                                                                             | Student                     | 5                                            |  |     |
|                                                                                                                             | Homemaker                   | 6                                            |  |     |
|                                                                                                                             | Retired                     | 7                                            |  |     |
|                                                                                                                             | Unemployed (able to work)   | 8                                            |  |     |
|                                                                                                                             | Unemployed (unable to work) | 9                                            |  |     |
|                                                                                                                             | Retrenched                  | 10                                           |  |     |
|                                                                                                                             | Refused                     | 88                                           |  |     |
| How many people in total, including yourself, live in your household?                                                       | Number of people            | <input type="text"/> If Not Known, Go to C11 |  | C9a |
| How many people older than 18 years, including yourself, live in your household on a regular basis (more than twice a week) | Number of people            | <input type="text"/> If Not Known, Go to C11 |  | C9  |

|                                                                                                                                                                                                                                                                                                                                      |                                        |                                                                                                       |      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------|------|
| <p>Within <b>the past year</b>, can you tell me what your average earnings have been? In other words, if you had to add up your income from all sources (e.g. investments, pension, social grants, stokvel and salaries) how much would it be?</p> <p><i>(RECORD ONLY ONE, NOT ALL 3 OPTIONS SUGGEST per Week, or per Month)</i></p> | Per week                               |  <i>Go to T1</i>   | C10a |
|                                                                                                                                                                                                                                                                                                                                      | OR per month                           |  <i>Go to T1</i> | C10b |
|                                                                                                                                                                                                                                                                                                                                      | OR per year                            |  <i>Go to T1</i> | C10c |
|                                                                                                                                                                                                                                                                                                                                      | Refused                                | 88                                                                                                    | C10d |
| <p>Can you give an estimate of the annual household income if I read some options to you? Is it less than...</p>                                                                                                                                                                                                                     | Up to R6 500                           | 1                                                                                                     | C11  |
|                                                                                                                                                                                                                                                                                                                                      | More than R6 500 but less than R14 000 | 2                                                                                                     |      |



(Present Card with brackets as a visual aid)

|                                         |    |  |
|-----------------------------------------|----|--|
| More than R14 000 but less than R28 000 | 3  |  |
| More than R28 000 but less than R71 500 | 4  |  |
| More than R71 500                       | 5  |  |
| Don't Know                              | 77 |  |
| Refused                                 | 88 |  |

| CORE: Tobacco Use                                                                                                       |              |                                                      |        |      |
|-------------------------------------------------------------------------------------------------------------------------|--------------|------------------------------------------------------|--------|------|
| Now I am going to ask you some questions about tobacco use.                                                             |              |                                                      |        |      |
| Question                                                                                                                | Response     |                                                      | ANSWER | Code |
| Do you <b>currently</b> smoke any <b>tobacco</b> products, such as cigarettes, cigars or pipes<br><i>(USE SHOWCARD)</i> | Yes          | 1                                                    |        | T1   |
|                                                                                                                         | No           | 2 <i>If No, go to T8</i>                             |        |      |
| Do you currently smoke tobacco products <b>daily</b> ?                                                                  | Yes          | 1                                                    |        | T2   |
|                                                                                                                         | No           | 2                                                    |        |      |
| How old were you when you <b>first started</b> smoking?                                                                 | Age (years)  | <input type="text"/> <i>If Known, go to T5a/T5aw</i> |        | T3   |
|                                                                                                                         | Don't know   | 77                                                   |        |      |
| Do you remember how long ago it was?<br><br><i>(RECORD ONLY 1, NOT ALL 3)</i>                                           | In Years     | <input type="text"/> <i>If Known, go to T5a/T5aw</i> |        | T4a  |
|                                                                                                                         | OR in Months | <input type="text"/> <i>If Known, go to T5a/T5aw</i> |        | T4b  |
| <i>Don't know</i> 77                                                                                                    | OR in Weeks  | <input type="text"/>                                 |        | T4c  |

|                                                                                           |        |         |
|-------------------------------------------------------------------------------------------|--------|---------|
| On average, <b>how many</b> of the following products do you smoke <b>each day/week</b> ? | DAILY↓ | WEEKLY↓ |
|-------------------------------------------------------------------------------------------|--------|---------|

|                                                                                                                           |                                                                 |                                                                                                                                      |  |                      |
|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--|----------------------|
| <p>(IF LESS THAN DAILY, RECORD WEEKLY)</p> <p>(RECORD FOR EACH TYPE, USE SHOWCARD)</p> <p>Don't Know 7777</p>             | Manufactured cigarettes                                         |                                                                                                                                      |  | T5a/T5aw             |
|                                                                                                                           | Hand-rolled cigarettes                                          |                                                                                                                                      |  | T5b/T5bw             |
|                                                                                                                           | Pipes full of tobacco                                           |                                                                                                                                      |  | T5c/T5cw             |
|                                                                                                                           | Cigars, cheroots, cigarillos                                    |                                                                                                                                      |  | T5d/T5dw             |
|                                                                                                                           | Number of Shisha sessions                                       |                                                                                                                                      |  | T5e/T5ew             |
|                                                                                                                           | Other (eg: e-cigarettes) If Other, go to T5other, else go to T6 |                                                                                                                                      |  | T5f/T5fw             |
|                                                                                                                           | Other (please specify):                                         | <div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div> |  | T5other/<br>T5otherw |
| During the past 12 months, have you tried to <b>stop smoking</b> ?                                                        | Yes                                                             | 1                                                                                                                                    |  | T6                   |
|                                                                                                                           | No                                                              | 2                                                                                                                                    |  |                      |
| During any visit to a doctor or other health worker in the past 12 months, were you advised to quit smoking tobacco?      | Yes                                                             | 1 If T2=Yes, go to T12; if T2=No, go to T9                                                                                           |  | T7                   |
|                                                                                                                           | No                                                              | 2 If T2=Yes, go to T12; if T2=No, go to T9                                                                                           |  |                      |
|                                                                                                                           | No visit during the past 12 months                              | 3 If T2=Yes, go to T12; if T2=No, go to T9                                                                                           |  |                      |
| In the past, did you <b>ever smoke</b> any tobacco products? (USE SHOWCARD)                                               | Yes                                                             | 1                                                                                                                                    |  | T8                   |
|                                                                                                                           | No                                                              | 2 If No, go to T12                                                                                                                   |  |                      |
| In the past, did you <b>ever smoke daily</b> ?                                                                            | Yes                                                             | 1 If T1=Yes, go to T12, else go to T10                                                                                               |  | T9                   |
|                                                                                                                           | No                                                              | 2 If T1=Yes, go to T12, else go to 10                                                                                                |  |                      |
| Do you <b>currently use</b> any <b>smokeless tobacco</b> products such as [snuff, chewing tobacco, betel]? (USE SHOWCARD) | Yes                                                             | 1                                                                                                                                    |  | T12                  |
|                                                                                                                           | No                                                              | 2 If No, go to T15                                                                                                                   |  |                      |
| Do you <b>currently use smokeless tobacco</b> products <b>daily</b> ?                                                     | Yes                                                             | 1                                                                                                                                    |  | T13                  |
|                                                                                                                           | No                                                              | 2                                                                                                                                    |  |                      |

| CORE: Alcohol Consumption                                                                                                                                  |                        |                            |        |      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------------------|--------|------|
| The next questions ask about the consumption of alcohol.                                                                                                   |                        |                            |        |      |
| Question                                                                                                                                                   | Response               |                            | ANSWER | Code |
| Have you <b>ever</b> consumed any alcohol such as beer, wine, spirits or <i>[add other local examples]</i> ?<br><br><i>(USE SHOWCARD OR SHOW EXAMPLES)</i> | Yes                    | 1                          |        | A1   |
|                                                                                                                                                            | No                     | 2 <i>If No, go to A16</i>  |        |      |
| Have you consumed any alcohol within the <b>past 12 months</b> ?                                                                                           | Yes                    | 1 <i>If Yes, go to A4</i>  |        | A2   |
|                                                                                                                                                            | No                     | 2                          |        |      |
| Have you stopped drinking due to health reasons, such as a negative impact on your health or on the advice of your doctor or other health worker?          | Yes                    | 1 <i>If Yes, go to A16</i> |        | A3   |
|                                                                                                                                                            | No                     | 2 <i>If No, go to A16</i>  |        |      |
| During the past 12 months, <b>how frequently</b> have you had at least one standard alcoholic drink?<br><br><i>(READ RESPONSES, USE SHOWCARD)</i>          | Daily                  | 1                          |        | A4   |
|                                                                                                                                                            | 5-6 days per week      | 2                          |        |      |
|                                                                                                                                                            | 3-4 days per week      | 3                          |        |      |
|                                                                                                                                                            | 1-2 days per week      | 4                          |        |      |
|                                                                                                                                                            | 1-3 days per month     | 5                          |        |      |
|                                                                                                                                                            | Less than once a month | 6                          |        |      |
|                                                                                                                                                            | Never                  | 7                          |        |      |
| Have you consumed any alcohol within the <b>past 30 days</b> ?                                                                                             | Yes                    | 1                          |        | A5   |
|                                                                                                                                                            | No                     | 2 <i>If No, go to A13</i>  |        |      |

|                                                                                                                                                               |                                      |                                                              |  |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|--------------------------------------------------------------|--|----|
| During the past 30 days, on how many <b>occasions</b> did you have at least one standard alcoholic drink?                                                     | Number<br><br>Don't know 77          | <input type="text"/> <input type="text"/> If Zero, go to A13 |  | A6 |
| During the past 30 days, when you drank alcohol, how many <b>standard drinks on average</b> did you have during one drinking occasion?<br><br>(USE SHOWCARD)  | Number<br><br>Don't know 77          | <input type="text"/> <input type="text"/>                    |  | A7 |
| During the past 30 days, what was the <b>largest number</b> of standard drinks you had on a single occasion, counting all types of alcoholic drinks together? | Largest number<br><br>Don't Know 77  | <input type="text"/> <input type="text"/>                    |  | A8 |
| During the past 30 days, how many times did you have<br><br><b>six or more</b> standard drinks in a single drinking occasion?                                 | Number of times<br><br>Don't Know 77 | <input type="text"/> <input type="text"/>                    |  | A9 |

|                                                                                                               |           |                                           |  |      |
|---------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------|--|------|
| During each of the <b>past 7 days</b> , how many standard drinks did you have each day?<br><br>(USE SHOWCARD) | Monday    | <input type="text"/> <input type="text"/> |  | A10a |
|                                                                                                               | Tuesday   | <input type="text"/> <input type="text"/> |  | A10b |
|                                                                                                               | Wednesday | <input type="text"/> <input type="text"/> |  | A10c |
|                                                                                                               | Thursday  | <input type="text"/> <input type="text"/> |  | A10d |
|                                                                                                               | Friday    | <input type="text"/> <input type="text"/> |  | A10e |
|                                                                                                               | Saturday  | <input type="text"/> <input type="text"/> |  | A10f |
|                                                                                                               | Sunday    | <input type="text"/> <input type="text"/> |  | A10g |
|                                                                                                               |           | Don't Know 77                             |  |      |
| EXPANDED: Alcohol Consumption                                                                                 |           |                                           |  |      |

|                                                                                                                                                                           |                                          |   |  |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---|--|-----|
| During the <b>past 12 months</b> , how often have you found that you were not able to stop drinking once you had started?                                                 | Daily or almost daily                    | 1 |  | A13 |
|                                                                                                                                                                           | Weekly                                   | 2 |  |     |
|                                                                                                                                                                           | Monthly                                  | 3 |  |     |
|                                                                                                                                                                           | Less than monthly                        | 4 |  |     |
|                                                                                                                                                                           | Never                                    | 5 |  |     |
| Have you ever had a situation where you could not fulfill your household responsibilities or work (failed to do what was normally expected from you) because of drinking? | Daily or almost daily                    | 1 |  | A14 |
|                                                                                                                                                                           | Weekly                                   | 2 |  |     |
|                                                                                                                                                                           | Monthly                                  | 3 |  |     |
|                                                                                                                                                                           | Less than monthly                        | 4 |  |     |
|                                                                                                                                                                           | Never                                    | 5 |  |     |
| During the <b>past 12 months</b> , how often have you needed a first drink in the morning to get yourself going after a heavy drinking session?                           | Daily or almost daily                    | 1 |  | A15 |
|                                                                                                                                                                           | Weekly                                   | 2 |  |     |
|                                                                                                                                                                           | Monthly                                  | 3 |  |     |
|                                                                                                                                                                           | Less than monthly                        | 4 |  |     |
|                                                                                                                                                                           | Never                                    | 5 |  |     |
| During the <b>past 12 months</b> , have you had family problems or problems with your partner due to <b>someone else's</b> drinking?                                      | Yes, more than monthly                   | 1 |  | A16 |
|                                                                                                                                                                           | Yes, monthly                             | 2 |  |     |
|                                                                                                                                                                           | Yes, several times but less than monthly | 3 |  |     |
|                                                                                                                                                                           | Yes, once or twice                       | 4 |  |     |
|                                                                                                                                                                           | No                                       | 5 |  |     |

#### CORE: Physical Activity

Next I am going to ask you about the time you spend doing different types of physical activity in a typical week. Physical activity is anything that you do that's active from sports to cleaning the house to gardening. Please answer these questions even if you do not consider yourself to be a physically active person.

Think first about the time you spend doing work. Think of work as the things that you have to do such as paid or unpaid work, study/training, household chores, harvesting food/crops, fishing or hunting for food, seeking employment. *[Insert other examples if needed]*. In answering the following questions 'vigorous-intensity activities' are activities that require hard physical effort and cause large increases in breathing or heart rate, 'moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate.

| Question                                                                                                                                                                                                                                                                   | Response        |                          | ANSWER | Code  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|--------|-------|
| <b>Work</b>                                                                                                                                                                                                                                                                |                 |                          |        |       |
| Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like <i>[carrying or lifting heavy loads, digging or construction work]</i> for at least 10 minutes continuously?<br><br><i>[INSERT EXAMPLES] (USE SHOWCARD)</i> | Yes             | 1                        |        | P1    |
|                                                                                                                                                                                                                                                                            | No              | 2 <i>If No, go to P4</i> |        |       |
| In a typical week, on how many days do you do vigorous-intensity activities as part of your work?                                                                                                                                                                          | Number of days  | <input type="text"/>     |        | P2    |
| How much time do you spend doing vigorous-intensity activities at work on a typical day?                                                                                                                                                                                   | Hours : minutes |                          |        | P3    |
|                                                                                                                                                                                                                                                                            |                 | hrs                      | mins   | (a-b) |
| Does your work involve moderate-intensity activity, that causes small increases in breathing or heart rate such as brisk walking <i>[or carrying light loads]</i> for at least 10 minutes continuously?<br><br><i>[INSERT EXAMPLES] (USE SHOWCARD)</i>                     | Yes             | 1                        |        | P4    |
|                                                                                                                                                                                                                                                                            | No              | 2 <i>If No, go to P7</i> |        |       |
| In a typical week, on how many days do you do moderate-intensity activities as part of your work?                                                                                                                                                                          | Number of days  | <input type="text"/>     |        | P5    |

|                                                                                                                                                                                                                                                      |                    |                      |                         |             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------|-------------------------|-------------|
| How much time do you spend doing moderate-intensity activities at work on a typical day?                                                                                                                                                             | Hours :<br>minutes |                      |                         | P6          |
|                                                                                                                                                                                                                                                      |                    | hrs                  | mins                    | (a-b)       |
| <b>Travel to and from places</b>                                                                                                                                                                                                                     |                    |                      |                         |             |
| The next questions exclude the physical activities at work that you have already mentioned.                                                                                                                                                          |                    |                      |                         |             |
| Now I would like to ask you about the usual way you travel to and from places. For example to work, for shopping, to market, to place of worship. <i>[Insert other examples if needed]</i>                                                           |                    |                      |                         |             |
| Do you walk or use a bicycle ( <i>pedal cycle</i> ) for at least 10 minutes continuously to get to and from places?                                                                                                                                  | Yes                | 1                    |                         | P7          |
|                                                                                                                                                                                                                                                      | No                 | 2                    | <i>If No, go to P10</i> |             |
| In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?                                                                                                                           | Number of days     | <input type="text"/> |                         | P8          |
| How much time do you spend walking or bicycling for travel on a typical day?                                                                                                                                                                         | Hours :<br>minutes |                      |                         | P9          |
|                                                                                                                                                                                                                                                      |                    | hrs                  | mins                    | (a-b)       |
| <b>CORE: Physical Activity, Continued</b>                                                                                                                                                                                                            |                    |                      |                         |             |
| <b>Question</b>                                                                                                                                                                                                                                      | <b>Response</b>    |                      |                         | <b>Code</b> |
| <b>Recreational activities</b>                                                                                                                                                                                                                       |                    |                      |                         |             |
| The next questions exclude the work and transport activities that you have already mentioned.                                                                                                                                                        |                    |                      |                         |             |
| Now I would like to ask you about sports, fitness and recreational activities (leisure), <i>[Insert relevant terms]</i> .                                                                                                                            |                    |                      |                         |             |
| Do you do any vigorous-intensity sports, fitness or recreational ( <i>leisure</i> ) activities that cause large increases in breathing or heart rate like <i>[running or football]</i> for at least 10 minutes continuously? ( <i>USE SHOWCARD</i> ) | Yes                | 1                    |                         | P10         |

|                                                                                                                                                                                                                                                                                                                             |                 |                      |      |           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|------|-----------|
|                                                                                                                                                                                                                                                                                                                             | No              | 2 If No, go to P13   |      |           |
| In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational ( <i>leisure</i> ) activities?                                                                                                                                                                                             | Number of days  | <input type="text"/> |      | P11       |
| How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?                                                                                                                                                                                                            | Hours : minutes | hrs                  | mins | P12 (a-b) |
| Do you do any moderate-intensity sports, fitness or recreational ( <i>leisure</i> ) activities that cause a small increase in breathing or heart rate such as brisk walking, [ <i>cycling, swimming, volleyball</i> ] for at least 10 minutes continuously?<br><br>(USE SHOWCARD)                                           | Yes             | 1                    |      | P13       |
|                                                                                                                                                                                                                                                                                                                             | No              | 2 If No, go to P16   |      |           |
| In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational ( <i>leisure</i> ) activities?                                                                                                                                                                                             | Number of days  | <input type="text"/> |      | P14       |
| How much time do you spend doing moderate-intensity sports, fitness or recreational ( <i>leisure</i> ) activities on a typical day?                                                                                                                                                                                         | Hours : minutes |                      |      | P15 (a-b) |
|                                                                                                                                                                                                                                                                                                                             |                 | hrs                  | mins |           |
| <b>EXPANDED: Physical Activity</b>                                                                                                                                                                                                                                                                                          |                 |                      |      |           |
| <b>Sedentary behaviour</b>                                                                                                                                                                                                                                                                                                  |                 |                      |      |           |
| The following question is about sitting or reclining at work, at home, getting to and from places, or with friends including time spent sitting at a desk, sitting with friends, traveling in car, bus, train, reading, playing cards or watching television, but do not include time spent sleeping.<br><br>(USE SHOWCARD) |                 |                      |      |           |
| How much time do you usually spend sitting or reclining on a typical day?                                                                                                                                                                                                                                                   | Hours : minutes |                      |      | P16 (a-b) |
|                                                                                                                                                                                                                                                                                                                             |                 | hrs                  | mins |           |

|                                                                                    |                 |   |  |             |
|------------------------------------------------------------------------------------|-----------------|---|--|-------------|
| <b>CORE: History of Raised Blood Pressure</b>                                      |                 |   |  |             |
| <b>Question</b>                                                                    | <b>Response</b> |   |  | <b>Code</b> |
| Have you ever had your blood pressure measured by a doctor or other health worker? | Yes             | 1 |  | H1          |



|                                                                                                                                       |     |   |                              |  |     |
|---------------------------------------------------------------------------------------------------------------------------------------|-----|---|------------------------------|--|-----|
|                                                                                                                                       | No  | 2 | <i>If No, go to Diabetes</i> |  |     |
| Have you ever been told by a doctor or other health worker that you have raised blood pressure or hypertension?                       | Yes |   | 1                            |  | H2a |
|                                                                                                                                       | No  | 2 | <i>If No, go to Diabetes</i> |  |     |
| Were you first told in the past 12 months?                                                                                            | Yes |   | 1                            |  | H2b |
|                                                                                                                                       | No  |   | 2                            |  |     |
| In the past two weeks, have you taken any drugs (medication) for raised blood pressure prescribed by a doctor or other health worker? | Yes |   | 1                            |  | H3  |
|                                                                                                                                       | No  |   | 2                            |  |     |
| Have you ever seen a traditional healer for raised blood pressure or hypertension?                                                    | Yes |   | 1                            |  | H4  |
|                                                                                                                                       | No  |   | 2                            |  |     |
| Are you currently taking any herbal or traditional remedy for your raised blood pressure?                                             | Yes |   | 1                            |  | H5  |
|                                                                                                                                       | No  |   | 2                            |  |     |

| CORE: History of Diabetes                                                                                                |     |   |                         |     |
|--------------------------------------------------------------------------------------------------------------------------|-----|---|-------------------------|-----|
| QUESTION                                                                                                                 |     |   | ANSWER                  |     |
| Have you ever had your blood sugar measured by a doctor or other health worker?                                          | Yes |   | 1                       | H6  |
|                                                                                                                          | No  | 2 | <i>If No, go to H12</i> |     |
| Have you ever been told by a doctor or other health worker that you have raised blood sugar or diabetes?                 | Yes |   | 1                       | H7a |
|                                                                                                                          | No  | 2 | <i>If No, go to H12</i> |     |
| Were you first told in the past 12 months?                                                                               | Yes |   | 1                       | H7b |
|                                                                                                                          | No  |   | 2                       |     |
| In the past two weeks, have you taken any drugs (medication) for diabetes prescribed by a doctor or other health worker? | Yes |   | 1                       | H8  |

|                                                                                              |     |   |  |     |
|----------------------------------------------------------------------------------------------|-----|---|--|-----|
|                                                                                              | No  | 2 |  |     |
| Are you currently taking insulin for diabetes prescribed by a doctor or other health worker? | Yes | 1 |  | H9  |
|                                                                                              | No  | 2 |  |     |
| Have you ever seen a traditional healer for diabetes or raised blood sugar?                  | Yes | 1 |  | H10 |
|                                                                                              | No  | 2 |  |     |
| Are you currently taking any herbal or traditional remedy for your diabetes?                 | Yes | 1 |  | H11 |
|                                                                                              | No  | 2 |  |     |

| CORE: History of Raised Total Cholesterol                                                                  |          |                    |        |      |
|------------------------------------------------------------------------------------------------------------|----------|--------------------|--------|------|
| Question                                                                                                   | Response |                    | ANSWER | Code |
| Have you ever had your cholesterol (fat levels in your blood) measured by a doctor or other health worker? | Yes      | 1                  |        | H12  |
|                                                                                                            | No       | 2 If No, go to H17 |        |      |
| Have you ever been told by a doctor or other health worker that you have raised cholesterol?               | Yes      | 1                  |        | H13a |
|                                                                                                            | No       | 2 If No, go to H17 |        |      |
| Were you first told in the past 12 months?                                                                 | Yes      | 1                  |        | H13b |

|                                                                                                                                                   |     |   |  |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|--|-----|
| In the past two weeks, have you taken any oral treatment (medication) for raised total cholesterol prescribed by a doctor or other health worker? | Yes | 1 |  | H14 |
|                                                                                                                                                   | No  | 2 |  |     |
| Have you ever seen a traditional healer for raised cholesterol?                                                                                   | Yes | 1 |  | H15 |
|                                                                                                                                                   | No  | 2 |  |     |
| Are you currently taking any herbal or traditional remedy for your raised cholesterol?                                                            | Yes | 1 |  | H16 |
|                                                                                                                                                   | No  | 2 |  |     |

| CORE: History of Cardiovascular Diseases                                                                                                                                       |          |   |        |      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---|--------|------|
| Question                                                                                                                                                                       | Response |   | ANSWER | Code |
| Have you ever had a heart attack or chest pain from heart disease (angina) or a stroke (cerebrovascular accident or incident)?                                                 | Yes      | 1 |        | H17  |
|                                                                                                                                                                                | No       | 2 |        |      |
| Are you currently taking disprin (aspirin) regularly to prevent or treat heart disease?                                                                                        | Yes      | 1 |        | H18  |
|                                                                                                                                                                                | No       | 2 |        |      |
| Are you currently taking statins which is medicine for high cholesterol (Lovastatin/Simvastatin/Atorvastatin or any other statin) regularly to prevent or treat heart disease? | Yes      | 1 |        | H19  |

| MEDICATION USE AND OTHER CONDITIONS                                                                 |
|-----------------------------------------------------------------------------------------------------|
| The following quick questions involve any medication use and other medical conditions you may have. |

|                                                                                                                                                    |                                                                                                                    |                                |   |      |
|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------|---|------|
| Has a medical professional (doctor, nurse, community health worker) told you that you have any other medical conditions not mentioned above? (Y/N) | <u>YES</u><br>1                                                                                                    | <u>NO</u><br>2 If no go to MC3 | - | MC01 |
| If yes, what were they?                                                                                                                            |                                                                                                                    |                                |   | MC02 |
| Are you taking any other medications not mention already?                                                                                          | <u>YES</u><br>1                                                                                                    | <u>NO</u><br>2                 | - | MC03 |
| If yes, what were they? Or what are they for? (Specify)                                                                                            |                                                                                                                    |                                |   | MC04 |
| Do you practice contraception/ birth control?                                                                                                      | <u>YES</u><br>1                                                                                                    | <u>NO</u><br>2                 | - | MC05 |
| If yes, do you use any of these methods?                                                                                                           | Hormonal (the pill)<br>Injection<br>Intrauterine device (copper T, Mirena)<br>Spermicide gels<br>Prefer not to say | 1<br>2<br>3<br>4<br>5          |   | MC06 |

| Household Food Insecurity Access Scale: We would like to ask a few questions about the adequacy of food in your household |                                               |                               |   |      |
|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------------------|---|------|
| In the past four weeks, did you worry that your household would not have enough food?                                     | <u>YES</u><br>0                               | <u>NO</u><br>1 (Skip to V270) | - | V268 |
| If yes, how often did this happen?                                                                                        | Rarely (once or twice in the past four weeks) |                               | 1 | V269 |

|                                                                                                                                                    |                                                                                                                                                                    |   |      |
|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|------|
|                                                                                                                                                    | Sometimes (three to ten times in the past four weeks) 2<br>Often (more than ten times in the past four weeks) 3                                                    |   |      |
| In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?          | <u>YES</u> <u>NO</u><br>0 1 (Skip to V272)                                                                                                                         | - | V270 |
| If yes, how often did this happen?                                                                                                                 | Rarely (once or twice in the past four weeks) 1<br>Sometimes (three to ten times in the past four weeks) 2<br>Often (more than ten times in the past four weeks) 3 |   | V271 |
| In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?                         | <u>YES</u> <u>NO</u><br>0 1 (Skip to V274)                                                                                                                         | - | V272 |
| If yes, how often did this happen?                                                                                                                 | Rarely (once or twice in the past four weeks) 1<br>Sometimes (three to ten times in the past four weeks) 2<br>Often (more than ten times in the past four weeks) 3 |   | V273 |
| In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources? | <u>YES</u> <u>NO</u><br>0 1 (Skip to V276)                                                                                                                         | - | V274 |
| If yes, how often did this happen?                                                                                                                 | Rarely (once or twice in the past four weeks) 1<br>Sometimes (three to ten times in the past four weeks) 2<br>Often (more than ten times in the past four weeks) 3 |   | V275 |
| In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?     | <u>YES</u> <u>NO</u><br>0 1 (Skip to V278)                                                                                                                         | - | V276 |
|                                                                                                                                                    | Rarely (once or twice in the past four weeks) 1                                                                                                                    |   | V277 |

|                                                                                                                                             |                                                                                                                                                                                   |   |      |
|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|------|
| If yes, how often did this happen?                                                                                                          | <p>Sometimes (three to ten times in the past four weeks) 2</p> <p>Often (more than ten times in the past four weeks) 3</p>                                                        |   |      |
| In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?           | <p><u>YES</u> NO</p> <p>0 1 (Skip to V280)</p>                                                                                                                                    | - | V278 |
|                                                                                                                                             | <p>Rarely (once or twice in the past four weeks) 1</p> <p>Sometimes (three to ten times in the past four weeks) 2</p> <p>Often (more than ten times in the past four weeks) 3</p> |   | V279 |
| In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?               | <p><u>YES</u> NO</p> <p>0 1 (Skip to V282)</p>                                                                                                                                    | - | V280 |
|                                                                                                                                             | <p>Rarely (once or twice in the past four weeks) 1</p> <p>Sometimes (three to ten times in the past four weeks) 2</p> <p>Often (more than ten times in the past four weeks) 3</p> |   | V281 |
| In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?                      | <p><u>YES</u> <u>NO</u></p> <p>0 1 (Skip to V284)</p>                                                                                                                             | - | V282 |
| If yes, how often?                                                                                                                          | <p>Rarely (once or twice in the past four weeks) 1</p> <p>Sometimes (three to ten times in the past four weeks) 2</p> <p>Often (more than ten times in the past four weeks) 3</p> |   | V283 |
| In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food? | <p><u>YES</u> <u>NO</u></p> <p>0 1 (End)</p>                                                                                                                                      | - | V284 |
| If yes, how often?                                                                                                                          | <p>Rarely (once or twice in the past four weeks) 1</p>                                                                                                                            |   | V285 |

|  |                                                       |   |  |
|--|-------------------------------------------------------|---|--|
|  | Sometimes (three to ten times in the past four weeks) | 2 |  |
|  | Often (more than ten times in the past four weeks)    | 3 |  |

| ECONOMIC/SHOPPING BEHAVIOUR: Finally, we would just like to ask you a few questions around food and where and why you buy it |                                                                                                       |                                |   |      |
|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------|---|------|
| Do you usually buy groceries for the household?                                                                              | <u>YES</u><br>1                                                                                       | <u>NO</u><br>2 If no go to MC3 | - | EC01 |
| If Yes, how often do you do go food shopping?                                                                                | Every day<br>2-3 times per week<br>Once a week<br>Once a month bulk buy with a small top up purchases |                                |   | EC02 |
| If yes, what is important for you in deciding what food to buy?                                                              | Healthy food                                                                                          | 1                              |   | EC03 |
| List the 3 most important things from the following:                                                                         | Price                                                                                                 | 2                              |   |      |
|                                                                                                                              | Taste                                                                                                 | 3                              |   |      |
|                                                                                                                              | Distance to travel to purchase                                                                        | 4                              |   |      |
|                                                                                                                              | Brand of food/ shop                                                                                   | 5                              |   |      |
|                                                                                                                              | Environmental impact                                                                                  | 6                              |   |      |
|                                                                                                                              | Food that your household likes                                                                        | 7                              |   |      |
|                                                                                                                              | Other _____ (Specify)                                                                                 | 8                              |   |      |
| What shops do you/ your household buy food from most often?List the 3 most common shops from the following:                  | Pick 'n Pay                                                                                           | 1                              |   | EC04 |
|                                                                                                                              | USave                                                                                                 | 2                              |   |      |
|                                                                                                                              | Checkers                                                                                              | 3                              |   |      |
|                                                                                                                              | Food Lovers Market                                                                                    | 4                              |   |      |
|                                                                                                                              | Woolworths                                                                                            | 5                              |   |      |
|                                                                                                                              | Shoprite                                                                                              | 6                              |   |      |
|                                                                                                                              | Fruit and Veg                                                                                         | 7                              |   |      |
|                                                                                                                              | local Farm outlets                                                                                    | 8                              |   |      |

|                                                                   |                                     |                |   |      |
|-------------------------------------------------------------------|-------------------------------------|----------------|---|------|
|                                                                   | Street Vendors                      | 9              |   |      |
|                                                                   | Local supermarket                   | 10             |   |      |
|                                                                   | Other (Specify)_____                | 11             |   |      |
|                                                                   | Don't know                          | 12             |   |      |
| Do you cook for your household?                                   | <u>YES</u><br>1 if yes skip to EC07 | <u>NO</u><br>2 | - | EC05 |
| If not, who cooks for you?                                        |                                     |                |   | EC06 |
| How many people does the cook of the household normally cook for? |                                     |                |   | EC07 |

END QUESTIONNAIRES







|                                                  | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|--------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Low carb bread (1 slice / half roll)             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Regular crackers / savoury biscuits (3 crackers) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Seed/ low carb crackers (3 crackers)             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**A3. Thinking back over the past month, on average, how often have you eaten the portion in brackets of the following foods?**

**e.g. If you eat 7 portions but only on one day of the week, select 1 per day or if you eat half a portion every day, select 3-4 per week**

|                                                                                   | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|-----------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Regular breakfast cereal/ granola e.g. All bran (1 cup / 250 ml)                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Low carb breakfast cereal/ granola e.g. All bran (1 cup / 250 ml)                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Porridge/ cooked oats (1 cup / 250 ml)                                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| FutureLife (1 cup / 250 ml)                                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Added sugar to cereals / oats (1 teaspoon)                                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Pasta / noodles (1 cup cooked)                                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Rice (1 cup cooked)                                                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Pap / mielie pap/ miele rice/ samp (1 cup cooked)                                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Maltabella/ mabele (1 cup cooked)                                                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Heba pap (1 cup cooked)                                                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Millet, cous cous, sorghum, teff, buckwheat, amaranth, barley, rye (1 cup cooked) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Quinoa (1 cup cooked)                                                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |



**A4. Thinking back over the past month, on average, how often have you eaten the portion in brackets of the following foods?**

**e.g. If you eat 7 portions but only on one day of the week, select 1 per day or if you eat half a portion every day, select 3-4 per week**

|                                                                                                                 | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|-----------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Potatoes (1 medium or 1/2 cup cooked)                                                                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Starchy veg - sweet potato / butternut / carrots / corn (1/2 cup cooked or 2 cups soup)                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Non-starchy veg - broccoli / spinach / cabbage / salad greens etc. (1/2 cup cooked or 1 cup raw or 2 cups soup) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Olives (small hand full: 10 small / 5 large)                                                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Avocado (1/2 fruit)                                                                                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Banana / grapes (1 small banana / 17 grapes)                                                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Berries (1 cup)                                                                                                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fresh fruit excluding the above - e.g. apples etc (1 tennis ball sized / 2 golf ball sized fruit)               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Dried fruit (3 pieces)                                                                                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Jam (1 tablespoon)                                                                                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**A5. Thinking back over the past month, on average, how often have you eaten the portion in brackets of the following foods?**

**e.g. If you eat 7 portions but only on one day of the week, select 1 per day or if you eat half a portion every day, select 3-4 per week**

|                                                                | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|----------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Fatty red meat - beef / lamb / pork etc (1 palm-sized portion) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lean red meat - trimmed of fat (1 palm-sized portion)          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fatty poultry - with skin (1 palm-sized portion)               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lean poultry - skin removed (1 palm-sized portion)             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| How often was the poultry crumbed?                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |



|                                                                                                             | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|-------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Bacon / sausages (3 rashers /<br>1 sausage)                                                                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Organ meats (e.g. liver,<br>kidneys, brain, head) (1/2<br>cup)                                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fresh/ frozen fish (1 palm-<br>sized portion)                                                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Canned fish -<br>sardines/pilchards - with<br>sauce eaten (1 can)                                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Canned fish -<br>sardines/pilchards - with oil<br>eaten (1 can)                                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Canned fish -<br>sardine/pilchards - without<br>sauce/ oil (1 can)                                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Canned tuna - with oil (1<br>can)                                                                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Canned tuna - without oil (1<br>can)                                                                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Dried fish/ bikkoms (half<br>palm-sized portion)                                                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fish paste (1 tablespoon)                                                                                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| How often was fish breaded /<br>battered?                                                                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Shellfish (1 palm-sized<br>portion)                                                                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Eggs (1 egg)                                                                                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Biltong/ droewors (handful)                                                                                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lunch meats - salami /<br>sandwich ham / chicken roll/<br>polony (1 slice, including in<br>sandwich/gatsby) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Protein shake/ powder (e.g.<br>whey, casein, soy, pea, hemp)<br>(1 serving)                                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Bone broth or homemade<br>stock - with added salt (1<br>cup)                                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |



**A6. Thinking back over the past month, on average, how often have you eaten the portion in brackets of the following foods?**

**e.g. If you eat 7 portions but only on one day of the week, select 1 per day or if you eat half a portion every day, select 3-4 per week**

|                                                                 | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|-----------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Full cream milk - including in<br>tea / coffee (1 cup / 250 ml) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Low fat milk - including in<br>tea / coffee (1 cup / 250 ml)    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fat free milk - including in<br>tea / coffee (1 cup / 250 ml)   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Maas/ buttermilk (1 cup / 250<br>ml)                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cream / sour cream (1<br>tablespoon)                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Powdered coffee creamer/<br>milk e.g. cremora (1 tsp)           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Full fat plain yoghurt (1 cup /<br>250 ml)                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fat free / low fat plain<br>yoghurt (1 cup / 250 ml)            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Full fat flavoured / sweetened<br>yoghurt (1 cup / 250 ml)      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Low fat flavoured /<br>sweetened yoghurt (1 cup /<br>250 ml)    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Hard cheese (1 matchbox<br>sized portion)                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Soft cheese (1 tablespoons)                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cottage cheese (4<br>tablespoons or 1/4 cup)                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**A7. Thinking back over the past month, on average, how often have you eaten the portion in brackets of the following foods?**

**e.g. If you eat 7 portions but only on one day of the week, select 1 per day or if you eat half a portion every day, select 3-4 per week**

|                                     | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|-------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Butter (1 tablespoon)               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Margarine (1 tablespoon)            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Ghee (1 tablespoon)                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lard / animal fat (1<br>tablespoon) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |



|                                                     | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|-----------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Medium Chain Triglyceride (MCT) oil (1 tablespoon)  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Coconut oil (1 tablespoon)                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Coconut milk / cream (2 tablespoons)                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Coconut flakes / desiccated coconut (2 tablespoons) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Olive oil (1 tablespoon)                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sunflower oil (1 tablespoon)                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Canola oil (1 tablespoon)                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Holsum (cooking fat from palm oil) (1 tablespoon)   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other oil (1 tablespoon)                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Salad dressing (1 tablespoon)                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Mayonnaise (1 tablespoon)                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cheese/ sandwich spread (1 tablespoon)              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**A8. Thinking back over the past month, on average, how often have you eaten the portion in brackets of the following foods?**

**e.g. If you eat 7 portions but only on one day of the week, select 1 per day or if you eat half a portion every day, select 3-4 per week**

|                                           | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|-------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Baked beans (1/2 cup)                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Soya beans (1/2 cup cooked)               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other beans - kidney etc (1/2 cup cooked) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Soya milk (1 cup / 250ml)                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Almond milk (1/2 cup)                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Soya meat substitutes (palm-sized)        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Peas (1/2 cup cooked)                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lentils (1/2 cup cooked)                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Peanuts (1 small handful / 30 g)          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |



|                                                            | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Cashews (1 small handful / 30 g)                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Macadamia nuts / pecans / walnuts (1 small handful / 30 g) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other nuts - e.g. almonds (1 small handful / 30 g)         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sweetened nut butter (1 tablespoon)                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Unsweetened nut butter (1 tablespoon)                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Seeds (small handful / 30 g)                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**A9. Thinking back over the past month, on average, how often have you eaten the portion in brackets of the following foods?**

**e.g. If you eat 7 portions but only on one day of the week, select 1 per day or if you eat half a portion every day, select 3-4 per week**

|                                                                   | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|-------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Fruit juice (1 glass / 300 ml)                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Regular soft drink (1 can / 340 ml)                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Juice concentrate or "squash" (1 glass/ 300ml diluted)            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Diet soft drink (1 can / 340 ml)                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Energy drink (1 can / 375 ml)                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sports energy drink (1 bottle / 500 ml)                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Regular beer (1 can / 340 ml)                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lite beer (1 can / 340 ml)                                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Wine (1 med glass / 175 ml)                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fortified wine, muscadell, liqueur (half glass / 100 ml)          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Alcoholic coolers/ ciders - e.g. Savannah (bottle / 300 ml)       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Spirits - e.g. whiskey, vodka, gin etc. (1 shot/ 25ml)            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Hot chocolate / Milo/ other sweetened milk drink (1 cup / 250 ml) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |



|                                              | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|----------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Added sugar to hot beverages<br>(1 teaspoon) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**A10. Thinking back over the past month, on average, how often have you eaten the portion in brackets of the following foods?**

**e.g. If you eat 7 portions but only on one day of the week, select 1 per day or if you eat half a portion every day, select 3-4 per week**

|                                                                  | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Regular pizza (1 medium 30<br>cm pizza)                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Low carb pizza (1 medium<br>30 cm pizza)                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Samosa (2 small/ 1 large)                                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| French fries/ hot chips (1 cup<br>/ 250 ml, including in gatsby) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Pies (1 pie)                                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Popcorn (1 cup)                                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Crisps (1 small packet)                                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**A11. Thinking back over the past month, on average, how often have you eaten the portion in brackets of the following foods?**

**e.g. If you eat 7 portions but only on one day of the week, select 1 per day or if you eat half a portion every day, select 3-4 per week**

|                                                                    | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|--------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Sauces e.g. tomato, BBQ,<br>chutney (1 tablespoon)                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Salt / salt based seasoning (1<br>pinch/ 1/8th of a teaspoon)      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Stock cubes or powdered<br>stock (1/2 cube or 1<br>teaspoon)       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| marmite / bovril (vegetable/<br>meat based spread) (1<br>teaspoon) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |





**A12. Thinking back over the past month, on average, how often have you eaten the portion in brackets of the following foods?**

**e.g. If you eat 7 portions but only on one day of the week, select 1 per day or if you eat half a portion every day, select 3-4 per week**

|                                                                          | 0                        | 1 or less<br>per month   | 2 - 3 per<br>month       | 1 - 2 per<br>week        | 3 - 4 per<br>week        | 5 - 6 per<br>week        | 1 per day                | 2 - 3 per<br>day         | more than<br>3 per day   |
|--------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Pudding dessert - e.g. ice cream (2 scoops) / pudding (1/2 cup)          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Pastries / croissants etc. (1 item)                                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Slice of cake / muffin / brownie / waffle / pancake / milk tart (1 item) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Doughnut/ koeksister (1 medium)                                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sweet biscuits (1 biscuit)                                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Rusks (1 rusk)                                                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sweets (1 packet / 50g)                                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Milk chocolate (1/2 slab / 1 individual-sized bar / 40 - 50 g)           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Dark chocolate (1/2 slab / 40 - 50 g)                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Honey / syrup/ agave (1 teaspoon)                                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sweeteners (1 teaspoon)                                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**Thank you for completing the questionnaire. You may close this window.**

## APPENDIX N: 24-HOUR FOOD RECALL

---

Name: \_\_\_\_\_

Day: \_\_\_\_\_

Code: \_\_\_\_\_

Interviewer: \_\_\_\_\_

Supplements (brand/dosage/time/how often): \_\_\_\_\_

| Time | Comment<br>(meal/<br>Snack/drink) | Food<br>Item | Detailed<br>description of<br>food &<br>preparation | Brand | Detailed description<br>of portion size | Code | Weight |
|------|-----------------------------------|--------------|-----------------------------------------------------|-------|-----------------------------------------|------|--------|
|      |                                   |              |                                                     |       |                                         |      |        |
|      |                                   |              |                                                     |       |                                         |      |        |
|      |                                   |              |                                                     |       |                                         |      |        |
|      |                                   |              |                                                     |       |                                         |      |        |
|      |                                   |              |                                                     |       |                                         |      |        |
|      |                                   |              |                                                     |       |                                         |      |        |
|      |                                   |              |                                                     |       |                                         |      |        |

Compared to what you normally eat and drink in one day, was this:

\_\_\_\_\_ More than usual    \_\_\_\_\_ Less than usual    \_\_\_\_\_ Same as usual

# APPENDIX O: ACTIGRAPHS

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## ACTIGRAPH FORM

Code:

Name:

Issue Date:

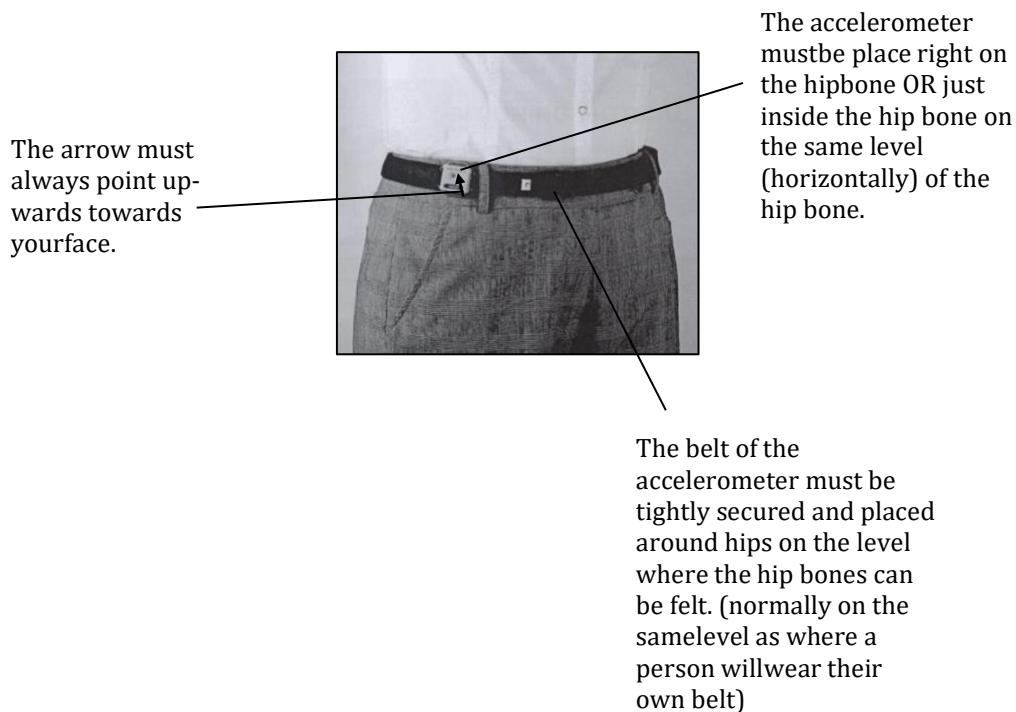
Return Date:

| Day | Wake up time | Shower time | Bed time | Notes |
|-----|--------------|-------------|----------|-------|
| 1   | -            |             |          |       |
| 2   |              |             |          |       |
| 3   |              |             |          |       |
| 4   |              |             |          |       |
| 5   |              |             |          |       |
| 6   |              |             |          |       |
| 7   |              |             |          |       |
| 8   |              |             | -        |       |

## INSTRUCTIONS

- **ONLY** take off the accelerometer when bathing or showering, or when your body will be in contact with water, e.g. in swimming pool, river. The accelerometer is **NOT** water resistant and will stop functioning if submersed in water.
- If possible sleep with the accelerometer on, however if uncomfortable you may remove when you go to bed. **Do Not forget** to put it on first thing in the morning.
- Please ensure that the accelerometer is fitted in the right position and direction.
- When taking the accelerometer off in the case of bathing, swimming or showering, take off the whole belt. **DO NOT** take off the accelerometer from its belt at any time.

- **DO NOT** wear the belt with the accelerometer as your normal belt – inside the belt braces of your pants. This will prevent you from forgetting it on the pants when you take the pants off or change clothes.
- With your **NEXT APPOINTMENT** – we will remove the accelerometer from you hip and you will **NOT** have to wear it anymore.
- Please refer to the picture for the correct placement and positioning of the accelerometer.
- Please phone if you have any problems with your accelerometer OR have questions OR need assistance.



# APPENDIX P: FOLLOW-UP INFORMATION AND INFORMED CONSENT

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## Visit 10 INFORMATION AND CONSENT FORM

Long term follow-up testing of the study entitled: A pilot evaluation of a nutrition education program in women from an under-resourced community

**What is this document about?** You are currently part of the EBSA program and UCT research study in Ocean View. The information we collected from the health tests and interviews so far is very interesting and will certainly help us improve future EBSA programs. It will help us even more if we can understand the long-term health of participants from this program. We would therefore like to ask you to come back for another short visit, which will take place about 6 months after the program ended. During the visit we will repeat some but not all of the health tests we did before. This document is to explain what is involved.

**What will happen during the visit?** The visit will take place on a Saturday morning around the middle of March 2020 and will take about an hour of your time. At the visit:

- We will measure your blood pressure with a cuff around your arm (10 min);
- We will ask you questions about foods you have eaten in the past 4 weeks (15 min),
- A nurse will take a blood sample from a vein in your arm using a needle (10 min).
- We will measure your height, weight and waist circumference (5 min)

Please note that we will **not** do the three 24-hour recalls (where we asked what you ate the previous day), the long baseline questionnaire, nor the physical activity monitoring (wearing the belt for a week). You will need to arrive without having eaten or drunk anything except water on the morning of the visit. In other words, the last time that you eat must be between 8 pm and 10 pm the night before you come in. You will also be asked

not to do heavy exercise for 24 hours before the visit and not to take medication on the morning of the visit. After the first few tests, you will be given a snack and can take any prescribed medication. At the end of the visit you will be given R100 for your time and expenses.

**Do I have to take part in this visit?** This visit is voluntary, which means that you do not have to take part if you don't want to. However it will be valuable for us to understand the long term effects of the EBSA program if you do take part. We still want you to come to this visit, even if you were not able to follow the recommended diet or if you didn't stay part of the EBSA group. We also want you to come even if you think your weight and health has got worse since the program ended.

**What are the risks for taking part in this visit?** The health risks for taking part in this visit are very small. When we take the blood sample, you will feel a small prick from the needle, and may not like the idea of having blood taken. There is also a small chance that the area where blood was taken will be sensitive and bruised for a couple of days. There is a very tiny chance of the area becoming infected. We will make sure to keep these risks minimal by using trained and experienced staff and sterile, single-use equipment.

**What are the benefits for taking part in this visit?** We will give you all your health test results and will explain what they mean. You are welcome to take these extra tests if you see a doctor in the future. You may also feel happy to know that you are helping us improve the program for others. You will also receive R100 to pay you back for your transport costs and time. A light snack and refreshments like coffee, tea and water will be provided during the visit.

**To be completed by the participant:** By completing and signing this form, I hereby consent to taking part in Visit 10 of the study entitled: A pilot evaluation of a nutrition education program in women from an under-resourced community.

|                                                                                                                                                                                                                                                                                                                                                                                     |     |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| 10. All the procedures and risks have been explained to me in a language that I understand.                                                                                                                                                                                                                                                                                         | Yes | No |
| 11. All my questions about the visit have been answered for now but I am aware that I can ask questions about the study at any time.                                                                                                                                                                                                                                                | Yes | No |
| 12. I understand that, if I take part in the visit, I will be asked to meet in or near Ocean View for about 1 hour on a Saturday morning in March, where I will: <ul style="list-style-type: none"> <li>○ Have my blood pressure and weight measured</li> <li>○ Share personal information about my health and diet</li> <li>○ Give a blood sample from a vein in my arm</li> </ul> | Yes | No |
| 13. I am aware that taking part in this visit is voluntary and that I do not have to answer any questions or do anything that I don't want to.                                                                                                                                                                                                                                      | Yes | No |
| 14. I am aware that I may be withdrawn from the study if I do not follow the study procedures, if I am found to be not eligible or the investigators think it is best for me.                                                                                                                                                                                                       | Yes | No |
| 15. I am aware that my information will be stored at UCT under lock and key and will be analysed by the investigators or project collaborators in coded form so that I remain anonymous. I am aware that only the study investigators and study doctor will be able to identify me.                                                                                                 | Yes | No |
| 16. I am aware that my blood sample will be sent to a certified pathology laboratory for some health tests. They will store it for a short period (~ 1 month) in case tests need to be repeated and will then destroy and discard the sample.                                                                                                                                       | Yes | No |

**Participant Code:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Date of birth** \_\_\_\_\_

**Age:**

\_\_\_\_\_

**Residential**

**address:**

\_\_\_\_\_

**Email address:** \_\_\_\_\_

**Phone number:** \_\_\_\_\_

**EMERGENCY CONTACT DETAILS**

**Name and Surname:** \_\_\_\_\_

**Relation:** \_\_\_\_\_

**Home phone:** \_\_\_\_\_

\_\_\_\_\_

Print name of participant

\_\_\_\_\_

Signature

\_\_\_\_\_

Date

**To be completed by study investigator:** By signing this form below, I confirm that I have explained the study to the participant and did not force them in any way to agree to participate.

\_\_\_\_\_

Print name of investigator

\_\_\_\_\_

Signature

\_\_\_\_\_

Date



# APPENDIX Q: FGDs INFORMATION AND INFORMED CONSENT

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## FGD INFORMATION AND CONSENT FORM

Visit 8 of the study entitled: A pilot evaluation of a nutrition education program in women from an under-resourced community

Below is some information that is specific to the focus group discussion (FGD) that will take place during visit 8 (2 hours, [dates])

**What will happen?** We will have a discussion in groups of 6-10 women from the study, to find out what they thought of the EBSA program. The discussion will be voice recorded so that we can listen to it again later. We will then type out what was said, using codes whenever your names are mentioned. We will then analyse the interviews and give feedback to EBSA so they can improve their programs. The results (but not the voicerecordings or your names) may also be published in research and magazine articles and may be presented at public and scientific talks. You will receive R100 for taking part and refreshments like coffee, tea and water will be provided.

**What are the risks for taking part?** The discussion topics may stir strong emotions in you and others in the group (e.g. sadness or anger). The group will be asked to respect the privacy of the other group members by not repeating anything that was said in the FGD. However it is important to understand that some participants may talk about the discussion outside of the visit, even if we ask them not to. Please keep in mind that neither us, nor EBSA will judge you or the group for anything that you say.

**Do you have to take part or answer questions?** This discussion is entirely voluntary and you don't have to answer any questions you don't want to. You can also leave the discussion at any time you like. However, we would prefer it if you take part in the discussion if you have taken part in the EBSA program because we are very interested in what you have to say.

By completing and signing this form, I hereby consent to taking part in a FGD as part of the study entitled: A pilot evaluation of a nutrition education program in women from an under-resourced community.

|                                                                                                                                                                                                                                                                                                                                     |     |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| 1. The details of the discussion and the risks involved have been explained to me in a language that I understand.                                                                                                                                                                                                                  | Yes | No |
| 2. I am aware that taking part is voluntary and that I do not have to answer any questions or do anything that I don't want to. I am aware that I can stop taking part in the discussion at any point if I wish to.                                                                                                                 | Yes | No |
| 3. I am aware that I may be withdrawn from the discussion if I do not follow the discussion rules or the investigators think it is best for me.                                                                                                                                                                                     | Yes | No |
| 4. I am aware that discussion will be recorded, written out in coded form and stored at UCT under lock and key. It will be analysed by the investigators, translators or project collaborators in coded form so that I remain anonymous. I am aware that only the study investigators and study doctor will be able to identify me. | Yes | No |

**Participant Code:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Date of birth** \_\_\_\_\_ **Age:** \_\_\_\_\_

**Residential** \_\_\_\_\_ **address:** \_\_\_\_\_

**Email address:** \_\_\_\_\_

**Phone number:** \_\_\_\_\_

### EMERGENCY CONTACT DETAILS

**Name and Surname:** \_\_\_\_\_

**Relation:** \_\_\_\_\_

**Home phone:** \_\_\_\_\_

|                           |           |       |
|---------------------------|-----------|-------|
| _____                     | _____     | _____ |
| Print name of participant | Signature | Date  |

**To be completed by study investigator:**

By signing this form below, I confirm that I have explained the study to the participant and did not force them in any way to agree to participate.

|                            |           |       |
|----------------------------|-----------|-------|
| _____                      | _____     | _____ |
| Print name of investigator | Signature | Date  |

# APPENDIX R: IDIs INFORMATION AND INFORMED CONSENT

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## IDI INFORMATION AND CONSENT FORM

Visit 9 of the study entitled: A pilot evaluation of a nutrition education program in women from an under-resourced community

Below is some information that is specific to the in depth interview (IDI) that will take place during visit 9 (1 hour, [dates])

**What will happen?** You may be asked to take part in a one on one interview, to find out what you thought of the EBSA program. The interview will be voice recorded so that we can listen to it again later. We will then type out what was said, using codes whenever your names are mentioned. We will then analyse the interviews and give feedback to EBSA so they can improve their programs. The results (but not the voice recordings or your names) may also be published in research and magazine articles and may be presented at public and scientific talks. You will receive R100 for taking part and refreshments like coffee, tea and water will be provided.

**What are the risks for taking part?** There is a small chance that the interview topics may stir strong emotions in you. Please keep in mind that neither us, nor EBSA will judge you for anything that you say.

**Do you have to take part or answer questions?** This interview is entirely voluntary and you don't have to answer any questions you don't want to. You can also leave the interview at any time you like.

**To be completed by the participant:** By completing and signing this form, I hereby consent to taking part in an IDI as part of the study entitled: A pilot evaluation of a nutrition education program in women from an under-resourced community.

|                                                                                                                                                                                                                                                                                                                                    |     |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| 1. The details of the discussion and the risks involved have been explained to me in a language that I understand.                                                                                                                                                                                                                 | Yes | No |
| 1. I am aware that taking part is voluntary and that I do not have to answer any questions or do anything that I don't want to. I am aware that I can stop taking part in the discussion at any point if I wish to.                                                                                                                | Yes | No |
| 2. I am aware that the interview will be stopped if I do not follow the interview rules or the investigators think it is best for me.                                                                                                                                                                                              | Yes | No |
| 3. I am aware that interview will be recorded, written out in coded form and stored at UCT under lock and key. It will be analysed by the investigators, translators or project collaborators in coded form so that I remain anonymous. I am aware that only the study investigators and study doctor will be able to identify me. | Yes | No |

**Participant Code:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Date of birth** \_\_\_\_\_ **Age:** \_\_\_\_\_

**Residential address:** \_\_\_\_\_

**Email address:** \_\_\_\_\_ **Phone number:** \_\_\_\_\_

### **EMERGENCY CONTACT DETAILS**

**Name and Surname:** \_\_\_\_\_

**Relation:** \_\_\_\_\_ **Home phone:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Print name of participant

Signature

Date

**To be completed by study investigator:** By signing this form below, I confirm that I have explained the study to the participant and did not force them in any way to agree to participate.

Print name of investigator

Signature

Date

# APPENDIX S: QUALITATIVE DATA QUESTIONS

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## APPENDIX S1

### First set of FGDs open-ended questions with probes.

1. Why did you decide to take part in the EBSA program?
  - 1.1. What did you hope to learn/ what did you hope to gain?
  - 1.2. What did you hope would change?
2. What did you think of the way that the program was presented?
  - 2.1. What helped you/made it easy to understand the new information?
  - 2.2. What was difficult to understand? What do you think made it difficult to understand?
  - 2.3. Which part/parts did you enjoy most? Which part/parts did you enjoy least?
3. What do you think of the amount of sessions that you had to attend?
  - 3.1. What did you think of the length of each session?
  - 3.2. What did you think of the sessions taking place every Saturday?
  - 3.3. What do you think of the time of year that the session took place?
  - 3.4. Was there anything in particular that made it difficult for you to attend the sessions?
4. What were some of the things that motivated you to come to the sessions?
5. In your experience, how did the EBSA program affect your life?
  - 5.1. Have you noticed any difference in how you feel, do or buy?
  - 5.2. What do you think/feel about these changes?
  - 5.3. What did the other people in your life think/ feel about these changes?
6. Tell me what you learned about food in the programme
  - 6.1. What did you stop eating because of what you learned in the programme? Do you miss them?

- 6.2. What did you start eating because of what you learned in the programme?
7. What other changes have you made to improve your health since taking part in the program?
8. When/ where was it the most difficult to follow the...EBSA diet/lifestyle?
9. Have you told your doctor about the EBSA programme/ some of the changes that you have made? What did she/he think about it?
10. What do you think will happen with your new...lifestyle/ diet... now that the sessions are over?
- 10.1. Can you think of any obstacles? / Are you worried about anything?
11. What do you think could be improved from the EBSA sessions?
- 11.1. What additional information do you feel you need?
12. What kind of follow-up on the EBSA program do you think would be helpful?

## **APPENDIX S2**

### **Key informants IDIs open-ended questions.**

1. Could you describe your situation before the program? How did you feel about yourself and your health problems?
2. What were your expectations for the EBSA program?
3. How would you describe your experience with the EBSA program?
4. What factors had the biggest influences in this EBSA program (current personal situation, mental health, health status, group dynamics, new educator/new EBSA program)?
5. Which type of support did you have from people around you during the program? What do people around you think about your health status now?
6. Who do you think that has to follow the lifestyle that EBSA recommended? Do you think it is safe for everyone including children?
7. You got reimbursed for your time and transport to be part of the study; how did this influenced you? What are the reasons for that?
8. You mentioned during the group discussion that:
  - 8.1. you are type 1 diabetic, an autoimmune disease that has no cure yet. Have you experienced health benefits? How do you feel about your medication now?
  - 8.2. you decided that your whole family would eat the way you eat, why did you decide that? Are there any differences in your family's health since they've changed their diets?
  - 8.3. it would have been great to have your children and relatives in one of the sessions, why would you think that it would be important to have that?
  - 8.4. you have been appointed as a group coach this year; how do you feel about it? What is it that you would need from EBSA to become a coach?
9. If there was another EBSA program, what could be improved?



10. What are the challenges that you expect you're going to face to follow the recommended diet now that the program has ended?

## **APPENDIX S3**

### **Second set of FGDs open-ended questions with probes.**

1. During our last discussion, the support of like-minded people was mentioned as a reason for enrolling and staying part of the EBSA program. Is the WhatsApp group an important part of that support system? Why?
  - 1.1. Is there anything that you would like to change about the WhatsApp group?
  - 1.2. What would happen if more people were added to the WhatsApp group?
  - 1.3. Are there any challenges around the cost of data? If yes, how do you think it can be addressed?
2. Are there ways that you support each other outside of the WhatsApp group?
  - 2.1. Do you have suggestions for alternative ways to support each other?
3. What did you think about the questionnaires that you filled out as part of the programme?
  - 3.1. Why do you think it is part of the programme?
  - 3.2. Was it easy to understand? Did you have enough support to answer it effectively?
  - 3.3. What do you think of the time of year that the session took place?
  - 3.4. How did you feel about filling out the questionnaires?
4. What did you think of the blood tests and other health measurements?
5. How did you feel about the EBSA nurses?
6. How important are the educators to the success of the program?
  - 6.1. What are the qualities of the facilitators that you appreciated most?
7. How do you feel about the reimbursements that you received as part of the programme?
8. Do you think you play a role in passing on the knowledge that you have gained?
  - 8.1. Have you encouraged other people to follow the lifestyle? Who and how?
9. Can you tell us about your eating habits now? What will we find in your fridge?

- 9.1.           What is in your shopping bag and how often do you go shopping?
- 10.    You mentioned in our previous group discussion that this is a lifestyle and not a diet. Who do you think is this lifestyle meant for?
- 10.1.           Who should be encouraged to follow this lifestyle/ who will it benefit?
- 11.    How did you manage your new lifestyle during the holidays?
- 11.1.           What did you find the most challenging during the holidays?
- 12.    What are the realities that you face in Ocean View? How do these realities affect the programme and your engagement?
- 12.1.           Does the violence and gangs have any effect on your ability to follow the programme?
- 13.    What other health and lifestyle programmes do you have access to?

## **APPENDIX S4**

### **EBSA team IDIs open-ended questions.**

1. What is EBSA? What's its purpose?
2. What sort of person is EBSA program for? Was Ocean View different? What are their needs?
3. How would you describe your role at EBSA? How would you describe your role at the EBSA Ocean View program?
4. Having had the experience from other EBSA programs, what did you expect from this one?
5. What was your experience in this Ocean View program? Were there any high risk participants in this program? How did you monitor them?
6. Assuming resources weren't an issue, what sort of medical support do you think this program would need?
7. What do you think are the major health problems/ diseases in Ocean View? What are your thoughts about NCDs like obesity, diabetes, cardiovascular disease in Ocean View?
8. What role do you think nutrition plays in chronic diseases in under-resourced communities like Ocean View?
9. How would you describe participants' habitual diets before the program? Why do you think they ate this way?
10. How do you think that taking part of the EBSA program affects these participants? What do you think that is about the EBSA program that causes these changes?
11. What do you expect is going to happen to participant's health now that the program has finished?
12. What do you think that EBSA can improve for the next program?

# APPENDIX T: PILOT DATA ANALYSIS

## APPENDIX T1

**Table T1. Descriptive and statistical analysis of 24h food recall intake pre and post EBSA program (n=32).**

|                                 | <b>Cals (kcal)</b> | <b>Fat (g)</b> | <b>Sat (g)</b> | <b>Carbs (g)</b> | <b>Fiber (g)</b> | <b>Sugar (g)</b> | <b>Prot (g)</b> |
|---------------------------------|--------------------|----------------|----------------|------------------|------------------|------------------|-----------------|
| <b>Pre Mean</b>                 | 1576.5             | 73.3           | 26.6           | 168.6            | 12.9             | 58               | 64.2            |
| <b>Pre Standard Deviation</b>   | 465.17             | 28.9           | 16.7           | 63.81            | 5.86             | 27.5             | 23.7            |
| <b>Pre 1st Quartile</b>         | 1274.9             | 53             | 15.9           | 123.7            | 9.4              | 42.5             | 51.4            |
| <b>Pre Median</b>               | 1433.7             | 66.8           | 21.9           | 151.7            | 11.9             | 54               | 62.7            |
| <b>Pre 3rd Quartile</b>         | 1954.2             | 91.4           | 30             | 212.8            | 17.2             | 71.1             | 73.1            |
| <b>Pre IQR</b>                  | 679.25             | 38.4           | 14.1           | 89.05            | 7.75             | 28.6             | 21.7            |
| <b>Pre Max</b>                  | 2512.7             | 146            | 87.7           | 310.4            | 31.8             | 130              | 137             |
| <b>Pre Min</b>                  | 755                | 26.6           | 9.2            | 76.2             | 4.2              | 12.3             | 23.9            |
| <b>Post Mean</b>                | 1018.4             | 63.7           | 26             | 54.1             | 8.4              | 21.98            | 59              |
| <b>Post Standard Deviation</b>  | 198.56             | 14.5           | 10.5           | 32.3             | 3.18             | 17.34            | 17.1            |
| <b>Post 1st Quartile</b>        | 892.3              | 52             | 18.7           | 32               | 6.28             | 11.48            | 47.4            |
| <b>Post Median</b>              | 1012.9             | 63.7           | 24.1           | 45.8             | 8.2              | 17.15            | 56.1            |
| <b>Post 3rd Quartile</b>        | 1163.2             | 73.3           | 34.1           | 64.2             | 9.7              | 26.35            | 65.4            |
| <b>Post IQR</b>                 | 270.9              | 21.3           | 15.4           | 32.2             | 3.43             | 14.88            | 18              |
| <b>Post Max</b>                 | 1485               | 93.7           | 51.7           | 170              | 16.3             | 89.8             | 105             |
| <b>Post Min</b>                 | 580.3              | 27.8           | 8.6            | 14.1             | 3.2              | 2.6              | 33.1            |
| <b>Diff. Mean</b>               | -558.1             | -9.55312       | -0.56875       | -114.494         | -4.46563         | -36.0219         | -5.1875         |
| <b>Diff. Standard Deviation</b> | 473.7              | 27.5712        | 14.84262       | 70.25609         | 6.56838          | 31.66661         | 29.37668        |
| <b>Shapiro W</b>                | 0.969              | 0.973          | 0.902          | 0.990            | 0.964            | 0.971            | 0.946           |
| <b>Shapiro p value</b>          | 0.472              | 0.594          | 0.007          | 0.988            | 0.359            | 0.515            | 0.114           |
| <b>Parametric</b>               | TRUE               | TRUE           | FALSE          | TRUE             | TRUE             | TRUE             | TRUE            |
| <b>Levene F</b>                 | 12.288998          | 11.028425      | 0.950994       | 9.793201         | 5.803927         | 5.97059          | 1.235679        |
| <b>Levene p value</b>           | 0.000852784        | 0.00150713     | 0.333256       | 0.00266968       | 0.018974         | 0.0174067        | 0.270597        |
| <b>Levene significance</b>      | FALSE              | FALSE          | TRUE           | FALSE            | FALSE            | FALSE            | TRUE            |
| <b>T-test T</b>                 | -                  | -              | -              | -                | -                | -                | 0.999           |
| <b>T-test p value</b>           | -                  | -              | -              | -                | -                | -                | 0.326           |
| <b>T-test significance</b>      | -                  | -              | -              | -                | -                | -                | FALSE           |
| <b>Wilcoxon W</b>               | -                  | -              | 242            | -                | -                | -                | -               |
| <b>Wilcoxon p value</b>         | -                  | -              | 0.688          | -                | -                | -                | -               |
| <b>Wilcoxon significance</b>    | -                  | -              | FALSE          | -                | -                | -                | -               |
| <b>Welch T</b>                  | 6.242074           | 1.679548       | -              | 9.056438         | 3.818052         | 6.267531         | -               |

|                           |            |           |            |             |             |            |       |
|---------------------------|------------|-----------|------------|-------------|-------------|------------|-------|
| <b>Welch p value</b>      | 1.79189e-7 | 0.0998737 | -          | 8.79097e-12 | 0.000386994 | 7.11643e-8 | -     |
| <b>Welch significance</b> | TRUE       | FALSE     | -          | TRUE        | TRUE        | TRUE       | -     |
| <b>Cohen's d</b>          | 1.18       | 0.346     | 0.0383     | 1.63        | 0.680       | 1.14       | 0.177 |
| <b>Cohen effect</b>       | Large      | Medium    | Very small | Large       | Very small  | Small      | Small |

## APPENDIX T2

**Table T2. FFQ before and after EBSA program (n=32) Serves per week.**

|                     | Sugar<br>contai<br>ning<br>sweet<br>ener | Sweet<br>ened<br>drinks | Swe<br>ets   | Fast<br>food | Veget<br>able<br>oils/<br>fats | Brea<br>d.<br>cere<br>al &<br>grai<br>ns | Starc<br>hy<br>veg | Non<br>caloric<br>sweet<br>eners | Low<br>carb<br>prod<br>ucts | Fruit        | Bean<br>s<br>and<br>legu<br>mes | Nuts<br>&<br>seed<br>s | Che<br>ese   | Milk<br>.<br>crea<br>m &<br>yogh<br>urt | Non<br>starc<br>hy<br>veg | Oliv<br>es &<br>avo | Ani<br>mal.<br>coco<br>nut<br>and<br>olive<br>oil/<br>fats | Red<br>meat  | Poul<br>try  | Eggs         | Fish         |
|---------------------|------------------------------------------|-------------------------|--------------|--------------|--------------------------------|------------------------------------------|--------------------|----------------------------------|-----------------------------|--------------|---------------------------------|------------------------|--------------|-----------------------------------------|---------------------------|---------------------|------------------------------------------------------------|--------------|--------------|--------------|--------------|
| <b>Pre_mean</b>     | 14.64                                    | 5.51                    | 9.37         | 5.15         | 9.37                           | 20.75                                    | 4.55               | 1.14                             | 0.09                        | 9.49         | 3.7                             | 2.96                   | 5.01         | 12.63                                   | 2.41                      | 3.37                | 10.28                                                      | 7.08         | 2.71         | 4.2          | 2.6          |
| <b>Pre_sd</b>       | 19.2                                     | 12.2                    | 9.53         | 6.84         | 11                             | 15.81                                    | 2.78               | 5.06                             | 0.35                        | 9.27         | 3.65                            | 3.76                   | 5.93         | 9.83                                    | 2.91                      | 4.26                | 11.15                                                      | 5.31         | 1.4          | 4.81         | 2.99         |
| <b>Post_mean</b>    | 1.39                                     | 0.42                    | 2            | 0.76         | 3.37                           | 1.17                                     | 1.76               | 1.67                             | 2.15                        | 3.58         | 2.25                            | 2.64                   | 4.47         | 11.57                                   | 5.3                       | 3.68                | 17.42                                                      | 8.19         | 3            | 15.05        | 2            |
| <b>Post_sd</b>      | 4.62                                     | 1.5                     | 3.09         | 0.98         | 8.26                           | 1.94                                     | 1.26               | 5.23                             | 2.73                        | 4.08         | 3.51                            | 2.61                   | 4.23         | 11.03                                   | 4.49                      | 3.91                | 12.3                                                       | 6.45         | 1.7          | 7.38         | 1.54         |
| <b>Pre_median</b>   | 5.81                                     | 1.62                    | 7.8          | 2.77         | 7                              | 17.14                                    | 4                  | 0                                | 0                           | 7.06         | 2.89                            | 1.56                   | 2.12         | 9.75                                    | 1.5                       | 1.85                | 7                                                          | 5.35         | 2.5          | 2.5          | 1.98         |
| <b>Pre_iqr</b>      | 22.13                                    | 2.5                     | 7.39         | 4.73         | 8.38                           | 17.11                                    | 2.39               | 0                                | 0                           | 11.03        | 3.12                            | 3.06                   | 4.38         | 11.27                                   | 1                         | 1.52                | 17.04                                                      | 5.32         | 0.28         | 4            | 2.65         |
| <b>Post_median</b>  | 0                                        | 0                       | 1.28         | 0.58         | 0.12                           | 0.12                                     | 1.5                | 0                                | 1.5                         | 1.85         | 1.5                             | 1.68                   | 2.5          | 8.08                                    | 4                         | 2.5                 | 15.5                                                       | 6.91         | 2.5          | 17.5         | 1.5          |
| <b>Post_iqr</b>     | 0                                        | 0                       | 2.42         | 1.16         | 1.75                           | 1.5                                      | 1.92               | 0                                | 2.42                        | 4.17         | 1.94                            | 3.69                   | 5.5          | 10.68                                   | 4.5                       | 2.5                 | 13.71                                                      | 4.31         | 1.81         | 2.62         | 1.96         |
| <b>Shapiro_stat</b> | 0.8238<br>93                             | 0.4495<br>38            | 0.810<br>064 | 0.739<br>344 | 0.8891<br>62                   | 0.908<br>998                             | 0.897<br>442       | 0.4475<br>95                     | 0.661<br>342                | 0.806<br>24  | 0.974<br>187                    | 0.874<br>78            | 0.932<br>411 | 0.965<br>743                            | 0.801<br>543              | 0.882<br>235        | 0.931<br>602                                               | 0.896<br>931 | 0.900<br>376 | 0.894<br>606 | 0.800<br>646 |
| <b>Shapiro_p</b>    | 0.0001<br>19                             | 7.62E-<br>10            | 6.34<br>E-05 | 3.56<br>E-06 | 0.0033<br>18                   | 0.010<br>578                             | 0.005<br>334       | 7.29E-<br>10                     | 2.41E<br>-07                | 5.35<br>E-05 | 0.621<br>916                    | 0.001<br>5             | 0.045<br>733 | 0.390<br>906                            | 4.36<br>E-05              | 0.002<br>253        | 0.043<br>409                                               | 0.005<br>178 | 0.006<br>331 | 0.004<br>527 | 4.19<br>E-05 |
| <b>Parametric</b>   | FALS<br>E                                | FALS<br>E               | FAL<br>SE    | FAL<br>SE    | FALS<br>E                      | FAL<br>SE                                | FAL<br>SE          | FALSE                            | FAL<br>SE                   | FAL<br>SE    | TRU<br>E                        | FAL<br>SE              | FAL<br>SE    | TRU<br>E                                | FAL<br>SE                 | FAL<br>SE           | FAL<br>SE                                                  | FAL<br>SE    | FAL<br>SE    | FAL<br>SE    | FAL<br>SE    |

|                              |                   |                    |                    |                    |                    |                     |                    |                      |                    |                    |                    |                    |                    |                     |                    |               |                |                      |                      |                      |                     |
|------------------------------|-------------------|--------------------|--------------------|--------------------|--------------------|---------------------|--------------------|----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------|--------------------|---------------|----------------|----------------------|----------------------|----------------------|---------------------|
| <b>T-test_stat</b>           | -                 | -                  | -                  | -                  | -                  | -                   | -                  | -                    | -                  | -                  | 2.719<br>34        | -                  | -                  | 0.489<br>256        | -                  | -             | -              | -                    | -                    | -                    | -                   |
| <b>T-test_p</b>              | -                 | -                  | -                  | -                  | -                  | -                   | -                  | -                    | -                  | -                  | 0.010<br>62        | -                  | -                  | 0.628<br>105        | -                  | -             | -              | -                    | -                    | -                    | -                   |
| <b>T-test_significance</b>   | -                 | -                  | -                  | -                  | -                  | -                   | -                  | -                    | -                  | -                  | TRUE               | -                  | -                  | FALSE               | -                  | -             | -              | -                    | -                    | -                    | -                   |
| <b>Wilcoxon_stat</b>         | 30                | 25                 | 35                 | 19                 | 61.5               | 0                   | 11                 | 5.5                  | 0                  | 66                 | -                  | 200.5              | 229.5              | -                   | 35                 | 196.5         | 152            | 202.5                | 122.5                | 20                   | 177                 |
| <b>Wilcoxon_p</b>            | 8.11E-05          | 5E-05              | 1.85E-05           | 7.2E-06            | 0.002184           | 7.95E-07            | 7.63E-06           | 0.290497             | 7.98E-06           | 0.000615           | -                  | 0.954584           | 0.716841           | -                   | 0.000196           | 0.458593      | 0.036206       | 0.250119             | 0.429076             | 7.49E-06             | 0.381032            |
| <b>Wilcoxon_significance</b> | TRUE              | TRUE               | TRUE               | TRUE               | TRUE               | TRUE                | TRUE               | FALSE                | TRUE               | TRUE               | -                  | FALSE              | FALSE              | -                   | TRUE               | FALSE         | TRUE           | FALSE                | FALSE                | TRUE                 | FALSE               |
| <b>Cohen's d</b>             | 0.710305647782917 | 0.4490449923311087 | 0.9389777755473268 | 0.7012813903270656 | 1.2378296032022365 | 0.46773549286785115 | 1.1666339325740591 | -0.07256608637169816 | 0.6892998995564960 | 0.2064564960406342 | 0.7284464787410825 | 0.0409515780410825 | 0.0644264595744916 | -0.8169152720595465 | 0.1151041257601719 | -0.5555334649 | -0.06258726106 | -0.48687134079682504 | -0.17382913261892619 | -0.09793971136049977 | -1.2760482024084119 |
| <b>Cohen effect</b>          | medium            | medium             | large              | medium             | large              | medium              | large              | medium               | medium             | medium             | medium             | medium             | medium             | medium              | medium             | medium        | medium         | medium               | medium               | medium               | medium              |

## APPENDIX T3

**Table T3. FFQ before and after EBSA program (n=21) Serves per week.**

|                                             | Sugar<br>contai<br>ning<br>sweet<br>ener | Sweet<br>ened<br>drinks | Swe<br>ets | Fast<br>food | Veget<br>able<br>oils/<br>fats | Brea<br>d.<br>cere<br>al &<br>grai<br>ns | Starc<br>hy<br>veg | Non<br>caloric<br>sweet<br>eners | Low<br>carb<br>prod<br>ucts | Fruit      | Bean<br>s<br>and<br>legu<br>mes | Nuts<br>&<br>seed<br>s | Che<br>ese | Milk<br>.<br>crea<br>m &<br>yogh<br>urt | Non<br>starc<br>hy<br>veg | Oliv<br>es &<br>avo | Ani<br>mal.<br>coco<br>nut<br>and<br>olive<br>oil/<br>fats | Red<br>meat | Poul<br>try | Eggs  | Fish  |
|---------------------------------------------|------------------------------------------|-------------------------|------------|--------------|--------------------------------|------------------------------------------|--------------------|----------------------------------|-----------------------------|------------|---------------------------------|------------------------|------------|-----------------------------------------|---------------------------|---------------------|------------------------------------------------------------|-------------|-------------|-------|-------|
| <b>Pre Mean</b>                             | 10.9                                     | 2.5                     | 8.3        | 4.4          | 8.1                            | 18.5                                     | 2.7                | 1.7                              | 0.1                         | 8.6        | 3.9                             | 3.6                    | 4.6        | 12.9                                    | 3.1                       | 4.6                 | 11.3                                                       | 6.9         | 3.3         | 4.5   | 2.1   |
| <b>Pre Standard<br/>Deviation</b>           | 17.9                                     | 3.0                     | 5.5        | 5.4          | 9.6                            | 13.9                                     | 2.1                | 6.2                              | 0.4                         | 9.9        | 2.7                             | 4.2                    | 5.2        | 9.4                                     | 3.6                       | 4.9                 | 12.2                                                       | 5.0         | 1.6         | 4.8   | 1.9   |
| <b>Post Mean</b>                            | 0.1                                      | 0.1                     | 1.4        | 0.4          | 1.5                            | 0.9                                      | 2.1                | 2.5                              | 2.9                         | 2.3        | 0.9                             | 2.8                    | 5.4        | 12.3                                    | 6.7                       | 3.2                 | 20                                                         | 9.4         | 3.4         | 15.6  | 2.0   |
| <b>Post<br/>Standard<br/>Deviation</b>      | 0.3                                      | 0.3                     | 1.8        | 0.5          | 2.6                            | 2                                        | 1.5                | 6.3                              | 3.2                         | 2.6        | 2                               | 2.9                    | 3.7        | 12.7                                    | 4.9                       | 2.3                 | 11.6                                                       | 7.1         | 1.7         | 5.8   | 1.8   |
| <b>Follow-up<br/>Mean</b>                   | 3.4                                      | 2.4                     | 2.6        | 1.9          | 3.2                            | 7.2                                      | 2.4                | 1.9                              | 0.7                         | 1.8        | 2.8                             | 2.6                    | 4.3        | 11.1                                    | 2.7                       | 1.3                 | 16.6                                                       | 6.3         | 2.5         | 12.6  | 1.6   |
| <b>Follow-up<br/>Standard<br/>Deviation</b> | 7.8                                      | 7.9                     | 2.9        | 2.4          | 4.8                            | 12.1                                     | 2.2                | 4.3                              | 1.6                         | 2          | 2.6                             | 3.2                    | 3.9        | 8.5                                     | 2.3                       | 1.5                 | 11.6                                                       | 3.5         | 1.7         | 9.6   | 1.6   |
| <b>Diff mean<br/>follow pre</b>             | -7.5                                     | 5.4                     | -5.4       | -2.5         | -4.9                           | -11.3                                    | -0.3               | 0.2                              | 0.6                         | -6.8       | -1.1                            | -1                     | -0.3       | -1.5                                    | -0.4                      | -3.3                | 5.3                                                        | -0.6        | -0.8        | 8.1   | -0.5  |
| <b>Diff mean<br/>follow post</b>            | 3.3                                      | 7.8                     | -1.5       | 1.5          | 1.7                            | 6.3                                      | 0.3                | -0.6                             | -2.2                        | -0.5       | 1.9                             | -0.2                   | -1.1       | -1.2                                    | -4                        | -1.9                | -3.4                                                       | -3.1        | -0.9        | -3    | -0.4  |
| <b>Diff mean<br/>post pre</b>               | -10.8                                    | -2.4                    | -6.9       | -1.5         | -6.6                           | -17.6                                    | -0.6               | 0.8                              | 2.8                         | -6.3       | -3                              | -0.8                   | 0.8        | -0.6                                    | 3.6                       | -1.4                | 8.7                                                        | 2.5         | 0.1         | 11.1  | -0.1  |
| <b>Mauchly's W</b>                          | 0.469                                    | 0.328                   | 0.528      | 0.444        | 0.445                          | 0.720                                    | 0.969              | 0.877                            | 0.416                       | 9.270      | 0.577                           | 0.953                  | 0.866      | 0.985                                   | 0.823                     | 0.468               | 0.941                                                      | 0.766       | 0.998       | 0.842 | 0.958 |
| <b>Mauchly's p</b>                          | <0.001                                   | <0.001                  | 0.02       | <0.0<br>01   | <0.00<br>1                     | 0.044                                    | 0.744              | 0.288                            | <0.00<br>1                  | <0.0<br>01 | 0.005                           | 0.632                  | 0.256      | 0.867                                   | 0.157                     | <0.0<br>01          | 0.559                                                      | 0.08        | 0.084       | 0.195 | 0.666 |



|                             |                               |                               |                               |                               |                               |                               |           |               |                               |                               |                               |           |           |           |                                                                                                              |                               |                                                                                                              |           |                                                                                                             |                                                                                                              |                   |
|-----------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-----------|---------------|-------------------------------|-------------------------------|-------------------------------|-----------|-----------|-----------|--------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------|
| Significance                | FAL<br>SE                     | FALS<br>E                     | FAL<br>SE                     | FAL<br>SE                     | FALS<br>E                     | FAL<br>SE                     | TRU<br>E  | TRUE          | FAL<br>SE                     | FAL<br>SE                     | FAL<br>SE                     | TRU<br>E  | TRU<br>E  | TRU<br>E  | TRU<br>E                                                                                                     | FAL<br>SE                     | TRU<br>E                                                                                                     | TRU<br>E  | TRU<br>E                                                                                                    | TRU<br>E                                                                                                     | TRU<br>E          |
| ANOVA_F                     | -                             | -                             | -                             | -                             | -                             | -                             | 0.757     | 0.125         | -                             | -                             | -                             | 0.558     | 0.423     | 0.434     | 7.53                                                                                                         | -                             | 3.78                                                                                                         | 2.24      | 3.46                                                                                                        | 12.4                                                                                                         | 0.822             |
| ANOVA_p                     | -                             | -                             | -                             | -                             | -                             | -                             | 0.476     | 0.883         | -                             | -                             | -                             | 0.577     | 0.658     | 0.651     | 0.002                                                                                                        | -                             | 0.031                                                                                                        | 0.119     | 0.041                                                                                                       | <0.0<br>01                                                                                                   | 0.447             |
| Significance                | -                             | -                             | -                             | -                             | -                             | -                             | FAL<br>SE | FALSE         | -                             | -                             | -                             | FAL<br>SE | FAL<br>SE | FAL<br>SE | TRU<br>E                                                                                                     | -                             | TRU<br>E                                                                                                     | FAL<br>SE | TRU<br>E                                                                                                    | TRU<br>E                                                                                                     | FAL<br>SE         |
| Partial eta square          | -                             | -                             | -                             | -                             | -                             | -                             | 0.019     | 0.004         | -                             | -                             | -                             | 0.019     | 0.021     | 0.021     | 0.194                                                                                                        | -                             | 0.088                                                                                                        | 0.101     | 0.147                                                                                                       | 0.318                                                                                                        | 0.039             |
| Significance                | -                             | -                             | -                             | -                             | -                             | -                             | Smal<br>l | Very<br>small | -                             | -                             | -                             | Smal<br>l | Smal<br>l | Smal<br>l | Med<br>ium                                                                                                   | -                             | Smal<br>l                                                                                                    | Larg<br>e | Larg<br>e                                                                                                   | Larg<br>e                                                                                                    | Very<br>smal<br>l |
| Tukey significance          | -                             | -                             | -                             | -                             | -                             | -                             | -         | -             | -                             | -                             | -                             | -         | -         | -         | Pre-<br>post<br>(p=0.<br>007)<br>Pre-<br>follo<br>w<br>(p=0.<br>953)<br>Post-<br>follo<br>w<br>(p=0.<br>003) | -                             | Pre-<br>post<br>(p=0.<br>025)<br>Pre-<br>follo<br>w<br>(p=0.<br>229)<br>Post-<br>follo<br>w<br>(p=0.<br>546) | -         | Pre-<br>post<br>(p=0.<br>945)<br>Pre-<br>follo<br>w<br>(p=0.<br>102)<br>Post-<br>follo<br>w<br>(p=0.<br>05) | Pre-<br>post<br>(p<0.<br>001)<br>Pre-<br>follo<br>w<br>(p=0.<br>003)<br>Post-<br>follo<br>w<br>(p=0.<br>416) | -                 |
| Friedman X2                 | 22.4                          | 25.6                          | 29.6                          | 18.3                          | 10.1                          | 36.6                          | -         | -             | 25.3                          | 18.5                          | 10.9                          | -         | -         | -         | -                                                                                                            | 9.12                          | -                                                                                                            | -         | -                                                                                                           | -                                                                                                            | -                 |
| Friedman p value            | <0.001                        | <0.001                        | <0.0<br>01                    | <0.0<br>01                    | 0.007                         | <0.0<br>01                    | -         | -             | <0.00<br>1                    | <0.0<br>01                    | 0.004                         | -         | -         | -         | -                                                                                                            | 0.010                         | -                                                                                                            | -         | -                                                                                                           | -                                                                                                            | -                 |
| Significance                | TRUE                          | TRUE                          | TRU<br>E                      | TRU<br>E                      | TRUE                          | TRU<br>E                      | -         | -             | TRU<br>E                      | TRU<br>E                      | TRU<br>E                      | -         | -         | -         | -                                                                                                            | TRU<br>E                      | -                                                                                                            | -         | -                                                                                                           | -                                                                                                            | -                 |
| Durbin Conover significance | Pre-<br>post<br>(p<0.0<br>01) | Pre-<br>post<br>(p<0.0<br>01) | Pre-<br>post<br>(p<0.<br>001) | Pre-<br>post<br>(p<0.<br>001) | Pre-<br>post<br>(p=0.0<br>01) | Pre-<br>post<br>(p<0.<br>001) | -         | -             | Pre-<br>post<br>(p<0.<br>001) | Pre-<br>post<br>(p<0.<br>001) | Pre-<br>post<br>(p<0.<br>001) | -         | -         | -         | -                                                                                                            | Pre-<br>post<br>(p=0.<br>786) | -                                                                                                            | -         | -                                                                                                           | -                                                                                                            | -                 |

|  |                                                                     |                                                                     |                                                                             |                                                                             |                                                                             |                                                                             |  |  |                                                                             |                                                                             |                                                                             |  |  |  |  |                                                                             |  |  |  |  |  |
|--|---------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|--|--|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|--|--|--|--|-----------------------------------------------------------------------------|--|--|--|--|--|
|  | Pre-<br>follow<br>(p<0.0<br>01)<br>Post-<br>follow<br>(p=0.0<br>54) | Pre-<br>follow<br>(p<0.0<br>01)<br>Post-<br>follow<br>(p=0.0<br>01) | Pre-<br>follo<br>w<br>(p<0.<br>001)<br>Post-<br>follo<br>w<br>(p=0.<br>002) | Pre-<br>follo<br>w<br>(p<0.<br>013)<br>Post-<br>follo<br>w<br>(p=0.<br>006) | Pre-<br>follo<br>w<br>(p<0.1<br>49)<br>Post-<br>follo<br>w<br>(p=0.0<br>46) | Pre-<br>follo<br>w<br>(p<0.<br>001)<br>Post-<br>follo<br>w<br>(p<0.<br>001) |  |  | Pre-<br>follo<br>w<br>(p=0.<br>021)<br>Post-<br>follo<br>w<br>(p<0.<br>001) | Pre-<br>follo<br>w<br>(p<0.<br>001)<br>Post-<br>follo<br>w<br>(p=0.<br>755) | Pre-<br>follo<br>w<br>(p=0.<br>194)<br>Post-<br>follo<br>w<br>(p=0.<br>022) |  |  |  |  | Pre-<br>follo<br>w<br>(p=0.<br>009)<br>Post-<br>follo<br>w<br>(p=0.<br>004) |  |  |  |  |  |
|--|---------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|--|--|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|--|--|--|--|-----------------------------------------------------------------------------|--|--|--|--|--|

## APPENDIX T4

**Table T4. Descriptive and statistical analysis of blood pressure and body measurements pre-intervention and post-intervention (n=32).**

|                                 | Systolic (mmHg) | Diastolic (mmHg) | Heart Rate (bpm) | Weight (kg) | BMI (kg/m2) | Waist Circumference (cm) |
|---------------------------------|-----------------|------------------|------------------|-------------|-------------|--------------------------|
| <b>Pre Mean</b>                 | 139.7           | 91.6             | 73               | 91.7        | 35.3        | 116.2                    |
| <b>Pre Standard Deviation</b>   | 20.9            | 11.0             | 11.5             | 25.7        | 9.5         | 23.4                     |
| <b>Pre 1st Quartile</b>         | 122.8           | 84.3             | 64.9             | 72.8        | 29.1        | 102                      |
| <b>Pre Median</b>               | 138             | 90.8             | 72.5             | 88.4        | 33.5        | 112                      |
| <b>Pre 3rd Quartile</b>         | 154.1           | 97.6             | 79.4             | 109.1       | 39.5        | 132.3                    |
| <b>Pre IQR</b>                  | 31.3            | 13.3             | 14.5             | 36.2        | 10.4        | 30.2                     |
| <b>Pre Max</b>                  | 176             | 117.5            | 98.7             | 146.4       | 55.8        | 166                      |
| <b>Pre Min</b>                  | 104.7           | 70.7             | 55               | 49.5        | 19.6        | 80                       |
| <b>Post Mean</b>                | 127.4           | 84.0             | 72.8             | 88.7        | 34.2        | 108.0                    |
| <b>Post Standard Deviation</b>  | 13.5            | 8.4              | 10.8             | 24.9        | 9.2         | 19.7                     |
| <b>Post 1st Quartile</b>        | 116.9           | 76.2             | 64.5             | 68.0        | 26.4        | 91.7                     |
| <b>Post Median</b>              | 128.8           | 83.3             | 72               | 86.0        | 32.6        | 107                      |
| <b>Post 3rd Quartile</b>        | 133.7           | 88.2             | 81.4             | 105.6       | 38.7        | 118.2                    |
| <b>Post IQR</b>                 | 16.75           | 12               | 16.9             | 37.6        | 26.9        | 16.7                     |
| <b>Post Max</b>                 | 156             | 101              | 97               | 143         | 55          | 147                      |
| <b>Post Min</b>                 | 104             | 72               | 56               | 52          | 21          | 79                       |
| <b>Diff. Mean</b>               | -12.3           | -7.7             | -0.2             | -3.0        | -1.1        | -8.2                     |
| <b>Diff. Standard Deviation</b> | 15.6            | 10.1             | 9.4              | 2.1         | 0.8         | 6.9                      |
| <b>Shapiro W</b>                | 0.980286658     | 0.931253791      | 0.967635572      | 0.980931044 | 0.981049418 | 0.939768612              |

|                              |             |             |             |             |             |             |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>Shapiro p value</b>       | 0.807905376 | 0.04244718  | 0.436835438 | 0.826185048 | 0.8294819   | 0.073743545 |
| <b>Parametric</b>            | TRUE        | FALSE       | TRUE        | TRUE        | TRUE        | TRUE        |
| <b>Levene F</b>              | 8.302341    | 1.770227    | 0.451882    | 0.0254559   | 0.022728    | 1.00446     |
| <b>Levene p value</b>        | 0.00543209  | 0.188227    | 0.50394     | 0.873755    | 0.880656    | 0.320129    |
| <b>Levene significance</b>   | TRUE        | TRUE        | TRUE        | TRUE        | TRUE        | TRUE        |
| <b>T-test T</b>              | 4.475594008 | -           | 0.098047451 | 7.886513873 | 7.903106321 | 6.858942729 |
| <b>T-test p value</b>        | 9.5942E-05  | -           | 0.922525842 | 6.67729E-09 | 6.3889E-09  | 1.09426E-07 |
| <b>T-test significance</b>   | TRUE        | -           | FALSE       | TRUE        | TRUE        | TRUE        |
| <b>Wilcoxon W</b>            | -           | 416         | -           | -           | -           | -           |
| <b>Wilcoxon p value</b>      | -           | 0.000167013 | -           | -           | -           | -           |
| <b>Wilcoxon significance</b> | -           | TRUE        | -           | -           | -           | -           |
| <b>Cohen's d</b>             | 0.699123    | 0.776562    | 0.017928    | 0.120967    | 0.117632    | 0.389181    |
| <b>Cohen effect</b>          | Medium      | Medium      | Very small  | Very small  | Very small  | Small       |

## APPENDIX T5

**Table T5. Descriptive and statistical analysis of blood pressure and body measurements pre-intervention. post-intervention and follow-up intervention (n=21).**

|                                | <b>Systolic (mmHg)</b> | <b>Diastolic (mmHg)</b> | <b>Heart Rate (bpm)</b> | <b>Weight (kg)</b> | <b>BMI (kg/m2)</b> | <b>Waist Circumference (cm)</b> |
|--------------------------------|------------------------|-------------------------|-------------------------|--------------------|--------------------|---------------------------------|
| <b>Pre Mean</b>                | 139.1                  | 90.5                    | 74.7                    | 86.4               | 33.4               | 112.3                           |
| <b>Pre Standard Deviation</b>  | 20.4                   | 9.4                     | 12.6                    | 21.6               | 8.2                | 20.8                            |
| <b>Pre 1st Quartile</b>        | 121.3                  | 85                      | 65.3                    | 73.3               | 28.6               | 99                              |
| <b>Pre Median</b>              | 131.3                  | 89.3                    | 78.3                    | 82.4               | 32.3               | 110                             |
| <b>Pre 3rd Quartile</b>        | 154                    | 97.3                    | 82.5                    | 97.7               | 37.2               | 124.7                           |
| <b>Pre IQR</b>                 | 32.67                  | 12.3                    | 17.2                    | 24.4               | 8.7                | 25.7                            |
| <b>Pre Max</b>                 | 175.67                 | 107                     | 98.7                    | 138.0              | 52.6               | 166                             |
| <b>Pre Min</b>                 | 114.67                 | 76                      | 55                      | 49.4               | 19.6               | 86                              |
| <b>Post Mean</b>               | 127.9                  | 84.8                    | 71.4                    | 83.7               | 32.4               | 104.1                           |
| <b>Post Standard Deviation</b> | 14.1                   | 8.4                     | 10.4                    | 20.6               | 7.8                | 16.9                            |
| <b>Post 1st Quartile</b>       | 116.7                  | 78.7                    | 62                      | 69.1               | 26.1               | 87.5                            |
| <b>Post Median</b>             | 129                    | 86                      | 70.3                    | 80.9               | 32.5               | 105.3                           |
| <b>Post 3rd Quartile</b>       | 133                    | 88.7                    | 76.3                    | 94.5               | 35.5               | 112                             |
| <b>Post IQR</b>                | 16.3                   | 10                      | 14.3                    | 25.3               | 9.5                | 24.5                            |
| <b>Post Max</b>                | 156.3                  | 101.3                   | 90.3                    | 133.9              | 51.0               | 142                             |

|                                     |                                                                   |                                                                   |                                                                   |                                                                     |                                                                     |                                                                    |
|-------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------|
| <b>Post Min</b>                     | 104                                                               | 71.7                                                              | 56                                                                | 51.9                                                                | 20.5                                                                | 80.5                                                               |
| <b>Follow-up Mean</b>               | 128.420476                                                        | 87.5947619                                                        | 73.7780952                                                        | 80,8214286                                                          | 31,3970729                                                          | 105,714286                                                         |
| <b>Follow-up Standard Deviation</b> | 20.7265524                                                        | 10.3717012                                                        | 10.7464862                                                        | 17,840891                                                           | 6,67883188                                                          | 18,7513809                                                         |
| <b>Follow-up 1st Quartile</b>       | 117.67                                                            | 83                                                                | 70                                                                | 65,3                                                                | 26,8169671                                                          | 90                                                                 |
| <b>Follow-up Median</b>             | 125                                                               | 88                                                                | 73                                                                | 80,3                                                                | 31,6556247                                                          | 105                                                                |
| <b>Follow-up 3rd Quartile</b>       | 133.5                                                             | 92                                                                | 79.67                                                             | 93,4                                                                | 33,9125133                                                          | 115                                                                |
| <b>Follow-up IQR</b>                | 15.83                                                             | 9                                                                 | 9.67                                                              | 28,1                                                                | 7,09554619                                                          | 25                                                                 |
| <b>Follow-up Max</b>                | 182                                                               | 113.67                                                            | 92                                                                | 119,9                                                               | 45,6866331                                                          | 150                                                                |
| <b>Follow-up Min</b>                | 94.33                                                             | 69.33                                                             | 50                                                                | 54,1                                                                | 21,39947                                                            | 81                                                                 |
| <b>Diff mean follow pre</b>         | -10,627143                                                        | -2,927619                                                         | -0,8961905                                                        | -5,5761905                                                          | -2,0105236                                                          | -6,587619                                                          |
| <b>Diff standard deviation</b>      | 14,133604                                                         | 8,52331503                                                        | 8,52396473                                                        | 5,54523712                                                          | 2,14331944                                                          | 5,34885212                                                         |
| <b>Diff mean follow post</b>        | 1,0552381                                                         | 3,14095238                                                        | 2,27095238                                                        | -2,5380952                                                          | -0,9589554                                                          | 1,57571429                                                         |
| <b>Diff standard deviation</b>      | 16,4450356                                                        | 7,34682782                                                        | 4,64660403                                                        | 4,73890559                                                          | 1,82245072                                                          | 3,71199215                                                         |
| <b>Diff mean post pre</b>           | -11,158571                                                        | -5,7433333                                                        | -3,2942857                                                        | -2,7190476                                                          | -1,0515682                                                          | -8,1633333                                                         |
| <b>Diff standard deviation</b>      | 14,0775453                                                        | 6,67569123                                                        | 7,62351072                                                        | 2,20104953                                                          | 0,85147419                                                          | 6,99333063                                                         |
| <b>Mauchly's W</b>                  | 0.961                                                             | 0.914                                                             | 0.631                                                             | 0.321                                                               | 0.375                                                               | 0.552                                                              |
| <b>Mauchly's p</b>                  | 0.687                                                             | 0.427                                                             | 0.013                                                             | <0.001                                                              | <0.001                                                              | 0.004                                                              |
| <b>Significance</b>                 | TRUE                                                              | TRUE                                                              | FALSE                                                             | FALSE                                                               | FALSE                                                               | FALSE                                                              |
| <b>ANOVA_F</b>                      | 7.54                                                              | 6.10                                                              | -                                                                 | -                                                                   | -                                                                   | -                                                                  |
| <b>ANOVA_p</b>                      | 0.002                                                             | 0.005                                                             | -                                                                 | -                                                                   | -                                                                   | -                                                                  |
| <b>Significance</b>                 | TRUE                                                              | TRUE                                                              | -                                                                 | -                                                                   | -                                                                   | -                                                                  |
| <b>Partial eta square</b>           | 0.274                                                             | 0.234                                                             | -                                                                 | -                                                                   | -                                                                   | -                                                                  |
| <b>Significance</b>                 | Medium                                                            | Medium                                                            | -                                                                 | -                                                                   | -                                                                   | -                                                                  |
| <b>Tukey significance</b>           | Pre-post (p=0.001)<br>Pre-follow (p=0.002)<br>Post-follow (0.871) | Pre-post (p=0.001)<br>Pre-follow (p=0.189)<br>Post-follow (0.213) | -                                                                 | -                                                                   | -                                                                   | -                                                                  |
| <b>Friedman X2</b>                  | -                                                                 | -                                                                 | 2.67                                                              | 20.7                                                                | 18.7                                                                | 24.5                                                               |
| <b>Friedman p value</b>             | -                                                                 | -                                                                 | 0.264                                                             | <0.001                                                              | <0.001                                                              | <0.001                                                             |
| <b>Significance</b>                 | -                                                                 | -                                                                 | FALSE                                                             | TRUE                                                                | TRUE                                                                | TRUE                                                               |
| <b>Durbin Conover significance</b>  | -                                                                 | -                                                                 | Pre-post (p=0.220)<br>Pre-follow (p=0.757)<br>Post-follow (0.128) | Pre-post (p=<0.001)<br>Pre-follow (p=<0.001)<br>Post-follow (0.041) | Pre-post (p=<0.001)<br>Pre-follow (p=<0.001)<br>Post-follow (0.135) | Pre-post (p=<0.001)<br>Pre-follow (p=<0.001)<br>Post-follow (0.05) |

## APPENDIX T6

**Table T6. Descriptive and statistical analysis of blood markers pre-intervention and post-intervention (n=32).**

|                          | ggt        | alt        | ast       | chol      | ldl        | hdl        | nonhdl     | chol hdl ratio | trig       | crp        | hba1c %    | hba1c      | glu        | Ins (n=31) | HOMA (n=31) | Quicki     |
|--------------------------|------------|------------|-----------|-----------|------------|------------|------------|----------------|------------|------------|------------|------------|------------|------------|-------------|------------|
| Pre Mean                 | 29.6       | 18.8       | 20.3      | 5.4       | 3.2        | 1.5        | 3.9        | 3.8            | 1.4        | 8.3        | 6.2        | 44.2       | 5.6        | 12.3       | 3.2         | 0.3        |
| Pre Standard Deviation   | 20.3       | 7.4        | 5.3       | 1.3       | 1.2        | 0.4        | 1.3        | 1.2            | 0.8        | 8.1        | 1.3        | 14.4       | 1.5        | 8.2        | 2.6         | 0.0        |
| Pre 1st Quartile         | 15         | 14         | 16        | 4.4       | 2.4        | 1.2        | 3.1        | 3.1            | 0.8        | 1.8        | 5.6        | 38         | 4.8        | 6.6        | 1.4         | 0.3        |
| Pre Median               | 24         | 18         | 19        | 5.2       | 3.0        | 1.3        | 3.4        | 3.4            | 1.1        | 6          | 6          | 42         | 5.2        | 9.6        | 2.2         | 0.3        |
| Pre 3rd Quartile         | 34         | 21         | 24        | 6.1       | 3.7        | 1.7        | 4.5        | 4.2            | 1.8        | 12.7       | 6.3        | 45.7       | 5.9        | 15.9       | 4.1         | 0.4        |
| Pre IQR                  | 19         | 7          | 8         | 1.7       | 1.4        | 0.5        | 1.4        | 1.1            | 1.0        | 10.9       | 0.7        | 7.7        | 1.1        | 9.3        | 2.7         | 0.1        |
| Pre Max                  | 103        | 45         | 35        | 8.4       | 6.2        | 2.7        | 6.5        | 7.1            | 3.7        | 35.4       | 12.3       | 111        | 12.1       | 38.2       | 11.2        | 0.4        |
| Pre Min                  | 9          | 9          | 14        | 3.3       | 1.4        | 1          | 1.8        | 1.7            | 0.6        | 0          | 4.9        | 30         | 4.1        | 2.7        | 0.8         | 0.3        |
| Post Mean                | 24         | 15.8       | 19        | 5.5       | 3.5        | 1.5        | 4.0        | 4.0            | 1.1        | 7.3        | 5.9        | 40.9       | 5.6        | 9.9        | 2.5         | 0.3        |
| Post Standard Deviation  | 12.1       | 5.3        | 4.7       | 1.4       | 1.2        | 0.4        | 1.3        | 1.2            | 0.6        | 8.8        | 1.1        | 12.0       | 1.7        | 6.8        | 2.1         | 0.0        |
| Post 1st Quartile        | 15.7       | 12         | 15.7      | 4.5       | 2.9        | 1.2        | 3.4        | 3.1            | 0.7        | 0.8        | 5.4        | 36         | 4.8        | 4.7        | 1.0         | 0.3        |
| Post Median              | 15.2       | 6.2        | 5.7       | 1.4       | 1          | 0.5        | 1.2        | 1.7            | 0.6        | 8.6        | 0.6        | 6.2        | 1.0        | 8.3        | 2.2         | 0.1        |
| Post 3rd Quartile        | 31         | 18.2       | 21.5      | 5.9       | 3.9        | 1.6        | 4.6        | 4.8            | 1.3        | 9.5        | 6.0        | 42.2       | 5.8        | 13         | 3.3         | 0.4        |
| Post IQR                 | 21.5       | 14.5       | 18.5      | 5.5       | 3.3        | 1.4        | 3.7        | 3.5            | 0.9        | 4.2        | 5.7        | 39.5       | 5.1        | 7.8        | 2.3         | 0.3        |
| Post Max                 | 58         | 30         | 35        | 9.5       | 7.3        | 2.4        | 7.6        | 6.7            | 3.8        | 31         | 10.9       | 96         | 13.3       | 31.2       | 10.8        | 0.3        |
| Post Min                 | 9          | 8          | 12        | 3.2       | 1.3        | 0.8        | 1.9        | 2.2            | 0.4        | 0          | 4.7        | 28         | 3.9        | 1.4        | 0.2         | 0.2        |
| Diff. Mean               | -5.625     | -3.0625    | -1.34375  | 0.14375   | 0.315625   | -0.03125   | 0.175      | 0.14375        | -0.3125    | -1.003125  | -0.3125    | -3.3125    | 4.1633E-17 | -2.3625    | -0.61       | 0.01396875 |
| Diff. Standard Deviation | 10.1528639 | 6.09567536 | 6.5432032 | 0.7409399 | 0.68913662 | 0.18911935 | 0.71572206 | 0.58195305     | 0.37567144 | 6.46491695 | 0.24983866 | 2.75256479 | 0.52301853 | 4.90041144 | 1.60609123  | 0.03394824 |
| Shapiro W                | 0.72965    | 0.879741   | 0.938428  | 0.976364  | 0.971708   | 0.946265   | 0.985365   | 0.944706       | 0.942868   | 0.780789   | 0.70204    | 0.711646   | 0.980932   | 0.314305   | 0.317452    | 0.922893   |
| Shapiro p value          | 2.49E-06   | 0.001964   | 0.067565  | 0.689169  | 0.547817   | 0.112848   | 0.9317     | 0.101878       | 0.090322   | 1.81E-05   | 9.33E-07   | 1.3E-06    | 0.826225   | 4.08E-11   | 4.34E-11    | 0.024926   |
| Parametric               | FALSE      | FALSE      | TRUE      | TRUE      | TRUE       | TRUE       | TRUE       | TRUE           | TRUE       | FALSE      | FALSE      | FALSE      | TRUE       | FALSE      | FALSE       | FALSE      |
| Levene F                 | 1.659915   | 0.904082   | 0.54055   | 0.0194521 | 0.0476972  | 0.0340286  | 0.0122604  | 0.00711962     | 1.831473   | 0.00270117 | 0.150418   | 0.175861   | 0.144879   | 0.314466   | 0.302747    | 1.737211   |

|                       |          |          |          |            |          |            |            |          |          |            |          |          |            |          |          |            |
|-----------------------|----------|----------|----------|------------|----------|------------|------------|----------|----------|------------|----------|----------|------------|----------|----------|------------|
| Levene p value        | 0.202402 | 0.345382 | 0.464977 | 0.88953    | 0.827837 | 0.854248   | 0.912191   | 0.933028 | 0.180868 | 0.958717   | 0.699464 | 0.676404 | 0.704779   | 0.577076 | 0.584208 | 0.192342   |
| Levene significance   | TRUE     | TRUE     | TRUE     | TRUE       | TRUE     | TRUE       | TRUE       | TRUE     | TRUE     | TRUE       | TRUE     | TRUE     | TRUE       | TRUE     | TRUE     | TRUE       |
| T-test T              | -        | -        | 1.161724 | -1.09749   | -2.59084 | 0.934736   | -1.38315   | -1.39732 | 4.70562  | -          | -        | -        | -4.5E-16   | -        | -        | -          |
| T-test p value        | -        | -        | 0.254214 | 0.28088    | 0.014465 | 0.357149   | 0.176501   | 0.17224  | 4.99E-05 | -          | -        | -        | 1          | -        | -        | -          |
| T-test significance   | -        | -        | FALSE    | FALSE      | TRUE     | FALSE      | FALSE      | FALSE    | TRUE     | -          | -        | -        | FALSE      | -        | -        | -          |
| Wilcoxon W            | 379      | 303      | -        | -          | -        | -          | -          | -        | -        | 110        | 0        | 0        | -          | 100      | 157      | 137.5      |
| Wilcoxon p value      | 0.000488 | 0.00598  | -        | -          | -        | -          | -          | -        | -        | 0.020092   | 7.55E-07 | 6.92E-07 | -          | 0.011058 | 0.045415 | 0.01799    |
| Wilcoxon significance | TRUE     | TRUE     | -        | -          | -        | -          | -          | -        | -        | TRUE       | TRUE     | TRUE     | -          | TRUE     | TRUE     | TRUE       |
| Cohen's d             | 0.554    | 0.502    | 0.259533 | 0.074023   | 0.25     | 0          | 0.076923   | 0.166667 | 0.424264 | 0.118242   | 0.249136 | 0.248973 | 0          | 0.318615 | 0.296201 | 0          |
| Cohen effect          | Medium   | Medium   | Small    | Very small | Small    | Very small | Very small | Small    | Small    | Very small | Small    | Small    | Very small | Small    | Small    | Very small |

## APPENDIX T7

**Table T7. Descriptive and statistical analysis of blood tests markers pre-intervention. post-intervention and follow-up intervention (n=21).**

|                        | ggt      | alt      | ast      | s_chol   | s_ldl    | s_hdl    | s_nonhdl | chol_hdl_ratio | trig     | crp      | hba1c_%  | hba1c_ifcc | p_glu    | ins_f    | HOMA_index | Quicki_index |
|------------------------|----------|----------|----------|----------|----------|----------|----------|----------------|----------|----------|----------|------------|----------|----------|------------|--------------|
| Pre Mean               | 29.9     | 18.1     | 20.4     | 5.461905 | 3.333333 | 1.542857 | 3.919048 | 3.714286       | 1.266667 | 8.033333 | 6.252381 | 44.85714   | 5.8      | 12.01905 | 3.149048   | 0.336762     |
| Pre Standard Deviation | 20.33294 | 6.248809 | 5.936971 | 1.425299 | 1.285042 | 0.445614 | 1.354481 | 1.062208       | 0.549848 | 8.799223 | 1.498539 | 16.38684   | 1.708215 | 8.186307 | 2.558138   | 0.032633     |
| Pre 1st Quartile       | 19       | 14       | 16       | 4.4      | 2.4      | 1.2      | 3.1      | 3              | 0.8      | 1.7      | 5.6      | 38         | 5        | 6.7      | 1.45       | 0.311        |
| Pre Median             | 24       | 17       | 19       | 5.3      | 3        | 1.4      | 3.6      | 3.5            | 1.1      | 4.8      | 5.9      | 41         | 5.2      | 9.6      | 2.19       | 0.339        |

|                                  |              |              |              |              |              |              |              |          |              |              |              |          |              |              |          |          |
|----------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------|--------------|--------------|--------------|----------|--------------|--------------|----------|----------|
| <b>Pre 3rd Quartile</b>          | 34           | 20           | 24           | 6.5          | 4.1          | 1.8          | 4.5          | 4.1      | 1.7          | 12.3         | 6.2          | 44       | 6.1          | 15.1         | 4.05     | 0.362    |
| <b>Pre IQR</b>                   | 15           | 6            | 8            | 2.1          | 1.7          | 0.6          | 1.4          | 1.1      | 0.9          | 10.6         | 0.6          | 6        | 1.1          | 8.4          | 2.6      | 0.051    |
| <b>Pre Max</b>                   | 103          | 32           | 35           | 8.4          | 6.2          | 2.7          | 6.5          | 6        | 2.4          | 35.4         | 12.3         | 111      | 12.1         | 38.2         | 11.2     | 0.389    |
| <b>Pre Min</b>                   | 13           | 9            | 14           | 3.3          | 1.4          | 1            | 1.8          | 1.7      | 0.6          | 0            | 4.9          | 30       | 4.4          | 2.7          | 0.92     | 0.274    |
| <b>Post Mean</b>                 | 23.9         | 15.3         | 19.1         | 5.7095<br>24 | 3.7571<br>43 | 1.5          | 4.20952<br>4 | 3.97619  | 0.9761<br>9  | 6.9          | 5.94285<br>7 | 41.57143 | 5.7619<br>05 | 8.9333<br>33 | 2.297143 | 0.353952 |
| <b>Post Standard Deviation</b>   | 12.177<br>46 | 5.6137<br>59 | 5.0821<br>82 | 1.5433<br>42 | 1.3071<br>23 | 0.4483<br>3  | 1.34123<br>3 | 1.06438  | 0.3806<br>64 | 9.2366<br>66 | 1.23595      | 13.52617 | 1.9860<br>71 | 5.6826<br>34 | 1.557148 | 0.041142 |
| <b>Post 1st Quartile</b>         | 15           | 12           | 16           | 4.5          | 2.9          | 1.2          | 3.4          | 3.1      | 0.7          | 0            | 5.4          | 36       | 4.8          | 4            | 0.96     | 0.321    |
| <b>Post Median</b>               | 21           | 14           | 18           | 5.6          | 3.3          | 1.4          | 3.7          | 3.7      | 0.8          | 3.4          | 5.7          | 39       | 5.2          | 7.3          | 2.29     | 0.337    |
| <b>Post 3rd Quartile</b>         | 34           | 18           | 21           | 5.9          | 4            | 1.9          | 4.8          | 4.7      | 1.1          | 7.9          | 6            | 42       | 5.9          | 11.5         | 3.25     | 0.386    |
| <b>Post IQR</b>                  | 19           | 6            | 5            | 1.4          | 1.1          | 0.7          | 1.4          | 1.6      | 0.4          | 7.9          | 0.6          | 6        | 1.1          | 7.5          | 2.29     | 0.065    |
| <b>Post Max</b>                  | 58           | 30           | 35           | 9.5          | 7.3          | 2.4          | 7.6          | 6.3      | 1.9          | 31           | 10.9         | 96       | 13.3         | 22.3         | 5.84     | 0.441    |
| <b>Post Min</b>                  | 9            | 9            | 13           | 3.5          | 2            | 0.8          | 2.3          | 2.5      | 0.4          | 0            | 4.8          | 29       | 4.2          | 2.4          | 0.45     | 0.297    |
| <b>Follow Mean</b>               | 24.5         | 14.9         | 17.5         | 5.5238<br>1  | 3.5714<br>29 | 1.4714<br>29 | 4.05238<br>1 | 3.92381  | 1.0666<br>67 | 6.9428<br>57 | 6.12381      | 43.47619 | 6.0476<br>19 | 10.914<br>29 | 3.608571 | 0.342524 |
| <b>Follow Standard Deviation</b> | 10.975<br>51 | 5.6294<br>29 | 4.0819       | 1.2165<br>13 | 0.9721<br>85 | 0.4208<br>83 | 1.07406<br>7 | 1.025136 | 0.5082<br>65 | 8.0232<br>52 | 1.81794      | 19.77529 | 3.1353<br>82 | 7.9014<br>1  | 5.412804 | 0.038762 |
| <b>Follow 1st Quartile</b>       | 19           | 10           | 13           | 4.9          | 3.1          | 1.2          | 3.3          | 3.1      | 0.7          | 0            | 5.5          | 37       | 4.9          | 6.9          | 1.31     | 0.322    |
| <b>Follow Median</b>             | 21           | 14           | 18           | 5.3          | 3.5          | 1.3          | 3.9          | 3.5      | 0.9          | 4            | 5.8          | 40       | 5.2          | 8.5          | 2.01     | 0.344    |
| <b>Follow 3rd Quartile</b>       | 30           | 20           | 20           | 6.6          | 4.4          | 1.8          | 4.7          | 4.5      | 1.4          | 10.3         | 6.1          | 43       | 6.3          | 12.2         | 3.2      | 0.367    |
| <b>Follow IQR</b>                | 11           | 10           | 7            | 1.7          | 1.3          | 0.6          | 1.4          | 1.4      | 0.7          | 10.3         | 0.6          | 6        | 1.4          | 5.3          | 1.89     | 0.045    |
| <b>Follow Max</b>                | 52           | 26           | 25           | 7.7          | 5.6          | 2.5          | 6.3          | 5.9      | 2.4          | 25.9         | 13.8         | 127      | 19.3         | 33.2         | 25.47    | 0.405    |
| <b>Follow Min</b>                | 12           | 5            | 11           | 3.1          | 1.6          | 1            | 1.9          | 2.6      | 0.5          | 0            | 4.8          | 29       | 4.1          | 3            | 0.73     | 0.249    |
| <b>Diff mean post pre</b>        | -6           | -2.8         | -1.2         | 0.2          | 0.4          | -0.0         | 0.3          | 0.3      | -0.3         | -1.1         | -0.3         | -3.3     | -0.0         | -3.1         | -0.8     | 0.0      |
| <b>Diff standard deviation</b>   | 10.5         | 4.9          | 6.9          | 0.8          | 0.6          | 0.2          | 0.7          | 0.4      | 0.4          | 7.3          | 0.3          | 3.1      | 0.5          | 5.7          | 1.9      | 0.0      |
| <b>Diff mean follow pre</b>      | -5.4         | -3.1         | -2.9         | 0.1          | 0.2          | -0.1         | 0.1          | 0.2      | -0.2         | -1.1         | -0.13        | -1.4     | 0.2          | -1           | 0.46     | 0        |

|                             |                                       |                                                               |            |            |                                                               |            |            |                                                               |                                                               |            |                                        |                                                               |       |            |                                                               |                                                               |
|-----------------------------|---------------------------------------|---------------------------------------------------------------|------------|------------|---------------------------------------------------------------|------------|------------|---------------------------------------------------------------|---------------------------------------------------------------|------------|----------------------------------------|---------------------------------------------------------------|-------|------------|---------------------------------------------------------------|---------------------------------------------------------------|
| Diff standard deviation     | 11.4                                  | 5.5                                                           | 4.8        | 1          | 0.9                                                           | 0.2        | 0.9        | 0.5                                                           | 0.4                                                           | 7.9        | 0.44                                   | 4.7                                                           | 1.7   | 7.4        | 5.51                                                          | 0                                                             |
| Diff mean follow post       | -0.1                                  | -0.4                                                          | -1.7       | -0.19      | -0.2                                                          | -0.03      | -0.2       | -0.05                                                         | 0.1                                                           | 0.04       | 0.2                                    | 1.9                                                           | 0.29  | 2          | 1.31                                                          | -0.01                                                         |
| Diff standard deviation     | 5.18                                  | 4.7                                                           | 5.9        | 0.77       | 0.68                                                          | 0.14       | 0.7        | 0.593                                                         | 0.3                                                           | 7.9        | 0.7                                    | 7                                                             | 1.43  | 7          | 4.97                                                          | 0.03                                                          |
| Mauchly's W                 | 0.310                                 | 0.964                                                         | 0.838      | 0.081      | 0.821                                                         | 0.968      | 0.846      | 0.713                                                         | 0.985                                                         | 0.990      | 0.246                                  | 0.279                                                         | 0.242 | 0.910      | 0.297                                                         | 0.997                                                         |
| Mauchly's p                 | <.001                                 | 0.707                                                         | 0.186      | 0.301      | 0.153                                                         | 0.731      | 0.204      | 0.040                                                         | 0.869                                                         | 0.909      | <.001                                  | <.001                                                         | <.001 | 0.408      | <.001                                                         | 0.971                                                         |
| Significance                | FALSE                                 | TRUE                                                          | TRUE       | TRUE       | TRUE                                                          | TRUE       | TRUE       | FALSE                                                         | TRUE                                                          | TRUE       | FALSE                                  | FALSE                                                         | FALSE | TRUE       | FALSE                                                         | TRUE                                                          |
| ANOVA_F                     | -                                     | 4.89221                                                       | 2.53       | 0.97       | 3.43                                                          | 2.24       | 1.41       | -                                                             | 7.45                                                          | 0.293      | -                                      | -                                                             | -     | 2.29       | -                                                             | 3.31                                                          |
| ANOVA_p                     | -                                     | 0.01257                                                       | 0.0916     | 0.3877     | 0.0422                                                        | 0.1202     | 0.2552     | -                                                             | 0.0018                                                        | 0.748      | -                                      | -                                                             | -     | 0.1141     | -                                                             | 0.0466                                                        |
| Significance                | -                                     | TRUE                                                          | FALSE      | FALSE      | TRUE                                                          | FALSE      | FALSE      | -                                                             | TRUE                                                          | FALSE      | -                                      | -                                                             | -     | FALSE      | -                                                             | TRUE                                                          |
| Partial eta square          | -                                     | 0.197                                                         | 0.112      | 0.046      | 0.146                                                         | 0.101      | 0.066      | -                                                             | 0.271                                                         | 0.014      | -                                      | -                                                             | -     | 0.103      | -                                                             | 0.142                                                         |
| Significance                | -                                     | Very small                                                    | Very small | Very small | Very small                                                    | Very small | Very small | -                                                             | Small                                                         | Very small | -                                      | -                                                             | -     | Very small | -                                                             | Very small                                                    |
| Tukey significance          | -                                     | Pre-post (0.041)<br>Pre-follow (0.018)<br>Post-follow (0.936) | -          | -          | Pre-post (0.033)<br>Pre-follow (0.317)<br>Post-follow (0.493) | -          | -          | -                                                             | Pre-post (0.001)<br>Pre-follow (0.034)<br>Post-follow (0.475) | -          | -                                      | -                                                             | -     | -          | -                                                             | Pre-post (0.040)<br>Pre-follow (0.402)<br>Post-follow (0.100) |
| Friedman                    | 11.9                                  | -                                                             | -          | -          | -                                                             | -          | -          | 10.4                                                          | -                                                             | -          | 24.0                                   | 24.0                                                          | 0.469 | -          | -                                                             | -                                                             |
| Friedman                    | 0.003                                 |                                                               |            |            |                                                               |            |            | 0.006                                                         |                                                               |            | <.001                                  | <.001                                                         | 0.791 |            | 0.010                                                         |                                                               |
| Significance                | TRUE                                  |                                                               |            |            |                                                               |            |            | TRUE                                                          |                                                               |            | TRUE                                   | TRUE                                                          | FALSE |            | TRUE                                                          |                                                               |
| Durbin Conover significance | Pre-post (0.001)<br>Pre-follow (0.03) |                                                               |            |            |                                                               |            |            | Pre-post (0.001)<br>Pre-follow (0.059)<br>Post-follow (0.101) |                                                               |            | Pre-post (0.001)<br>Pre-follow (0.001) | Pre-post (0.001)<br>Pre-follow (0.001)<br>Post-follow (0.044) |       |            | Pre-post (0.002)<br>Pre-follow (0.022)<br>Post-follow (0.399) |                                                               |



|  |                        |  |  |  |  |  |  |  |  |  |                        |  |  |  |  |  |
|--|------------------------|--|--|--|--|--|--|--|--|--|------------------------|--|--|--|--|--|
|  | Post-follow<br>(0.651) |  |  |  |  |  |  |  |  |  | Post-follow<br>(0.044) |  |  |  |  |  |
|--|------------------------|--|--|--|--|--|--|--|--|--|------------------------|--|--|--|--|--|

## APPENDIX T8

**Table T8. Descriptive and statistical analysis of the physical activity and sleep behaviours (n=28).**

|                                 | Sedentary (%) | Light (%)  | Moderate (%) | Vigorous (%) | Sleep (hr) |
|---------------------------------|---------------|------------|--------------|--------------|------------|
| <b>Pre Mean</b>                 | 52.5          | 44.4       | 3.1          | 0.1          | 7.9        |
| <b>Pre Standard Deviation</b>   | 10.6          | 9.7        | 2.0          | 0.1          | 0.7        |
| <b>Pre 1st Quartile</b>         | 45.4          | 35.7       | 1.5          | 0            | 7.4        |
| <b>Pre Median</b>               | 51.0          | 44.6       | 2.7          | 0            | 7.9        |
| <b>Pre 3rd Quartile</b>         | 61.8          | 49.1       | 4.5          | 0.1          | 8.1        |
| <b>Pre IQR</b>                  | 16.4          | 13.5       | 3.0          | 0.1          | 0.7        |
| <b>Pre Max</b>                  | 7.5           | 64.3       | 7.7          | 0.6          | 9.5        |
| <b>Pre Min</b>                  | 32.6          | 27.2       | 0.2          | 0            | 6.6        |
| <b>Post Mean</b>                | 55.6          | 41.4       | 3.0          | 0.1          | 8.0        |
| <b>Post Standard Deviation</b>  | 11.0          | 9.8        | 2.4          | 0.2          | 1.0        |
| <b>Post 1st Quartile</b>        | 49.9          | 36.6       | 1.4          | 0            | 7.4        |
| <b>Post Median</b>              | 57.1          | 40.4       | 2.5          | 0            | 7.8        |
| <b>Post 3rd Quartile</b>        | 62.3          | 46.4       | 4.2          | 0.1          | 8.6        |
| <b>Post IQR</b>                 | 12.5          | 9.8        | 2.8          | 0.1          | 1.2        |
| <b>Post Max</b>                 | 74.0          | 62.6       | 9.4          | 0.9          | 10.3       |
| <b>Post Min</b>                 | 34.69         | 25.77      | 0.21         | 0            | 6.2        |
| <b>Diff. Mean</b>               | 3.1           | -3         | -0.2         | -0.0         | 0.1        |
| <b>Diff. Standard Deviation</b> | 6             | 5.2        | 0.1          | 0.1          | 1.1        |
| <b>Shapiro W</b>                | 0.983         | 0.982      | 0.972        | 0.859        | 0.902      |
| <b>Shapiro p value</b>          | 0.909         | 0.887      | 0.631        | 0.001        | 0.013      |
| <b>Parametric</b>               | TRUE          | TRUE       | TRUE         | FALSE        | FALSE      |
| <b>Levene F</b>                 | 0.0976        | 0.0475     | 0.21776      | 0.03483      | 2.42603    |
| <b>Levene p value</b>           | 0.92166       | 0.828296   | 0.642631     | 0.852626     | 0.125177   |
| <b>Levene significance</b>      | TRUE          | TRUE       | TRUE         | TRUE         | TRUE       |
| <b>T-test T</b>                 | -2.726361     | 2.98563668 | 0.35490614   | -            | -          |
| <b>T-test p value</b>           | 0.01110854    | 0.00595146 | 0.72541724   | -            | -          |
| <b>T-test significance</b>      | TRUE          | TRUE       | FALSE        | -            | -          |

|                              |        |        |            |            |            |
|------------------------------|--------|--------|------------|------------|------------|
| <b>Wilcoxon Z</b>            | -      | -      | -          | 55         | 238        |
| <b>Wilcoxon p value</b>      | -      | -      | -          | 0.900      | 0.438      |
| <b>Wilcoxon significance</b> | -      | -      | -          | FALSE      | FALSE      |
| <b>Cohen's d</b>             | 0.515  | 0.564  | 0.0671     | 0.0298     | 0.0360     |
| <b>Cohen effect</b>          | Medium | Medium | Very small | Very small | Very small |

# APPENDIX U: HEALTH FACILITIES SETTINGS

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Groote Schuur Hospital



False Bay Hospital



Hout Bay Clinic



# APPENDIX V: PARTICIPANT INFORMATION

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## PARTICIPANT INFORMATION SHEET

Dear health practitioners,

We are conducting a study called 'Qualitative evaluation of a nutrition education program for women: perspectives of community health practitioners.' If you meet our inclusion criteria, we would like to hear your opinion about health and nutrition. Below you will find more information about who we are and what is involved. Please feel free to contact us if you have any questions or would like to take part.

**What is the study about?** Eat Better South Africa (EBSA) is a non-profit organization which has run a number of nutrition education programs for women from low income communities. Their aim is to teach participants how to improve their health by choosing foods that are low in sugar and refined carbohydrates but high in fat. We are conducting research to evaluate the EBSA programs, with the aim to improve them. To do this, we need to take into account the perspectives of community health practitioners. Therefore, this study will interview health practitioners from the areas where EBSA has run or will run their programs.

**Are you eligible to take part?** You will be eligible to take part if you are a medical health practitioners and work in [community name] on at least on a monthly basis. You will need to be able to understand and speak English.

**What will be required of you?** You will meet with a UCT researcher at a time and place that is convenient for you for about an hour. The researcher will interview you by asking for your opinion on health and nutrition. We will not ask about facts so there are no right or wrong answers. If you don't want to answer a question or talk about a particular topic then you don't need to. You will also be asked to fill in a short questionnaire (age, occupation etc.).

**What will be done with the information collected?** The interviews will be recorded for sound (not video). They will then be transcribed, using codes if your names are mentioned. Anonymous transcriptions will be analysed according to standard qualitative research procedures. Themes of interest will be identified and some anonymous quotes may be used to add context to these themes. Results (but not the voice recordings or your names) will be presented to EBSA so they can improve their programs and may also be published in research and magazine articles and may be presented at public and scientific talks.

**Will my information be kept confidential?** All your information will be kept strictly anonymous. You will be given a study code that will be used instead of your name for all data we collect from the questionnaires and interviews. These codes, any personal identifiers, and the voice recordings will be stored in a password protected folder that only the study investigators will have access to. As soon as the voice recordings have been transcribed and double checked, they will be permanently deleted.

**What are the benefits of taking part?** You will be given the opportunity to share your opinion of the health and nutrition of people from the communities that you work in and any opinions you may have about the EBSA program. This might help us improve the EBSA program. We will share our study conclusions with you and you will also be given R100 to reimburse you for your transport costs.

**What are the risks of taking part?** There are no foreseeable risks in taking part in this study. You will be encouraged to speak honestly about the community's health and diet. For some people, these topics may be sensitive and may cause negative emotions. Please keep in mind that none of the investigators will judge you for anything that you say, and that your information will be anonymous to everyone else.

**Ethical considerations:** This study has been approved by the faculty of Health Sciences, Human Research Ethics Committee (UCT). You will only start this study once you have confirmed that you understand what the study is about by signing the informed consent form on the day of the interview. Participation in the study is entirely voluntary and you

have the right to withdraw from the study at any time. The investigator may also withdraw you from the study at any time should he/she believes it is in your best interests to do so, or you are found to be ineligible for the study.

**Please feel free to contact the UCT Human Research Ethics Committee if you have any queries:** Floor E53, Room 46, Old Main Building, Groote Schuur Hospital, Observatory, 7925.  
Phone: (021) 406 6338.

# APPENDIX W: INFORMED CONSENT

**Informed consent form for the study entitled:** Qualitative evaluation of a nutrition education program for women: perspectives of community health practitioners.

**Participant Code:**\_\_\_\_\_

|                                                                                                                                                                                                                 |     |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| I am aware that by completing and signing this form, I am agreeing to participate in the study entitled 'Qualitative evaluation of a nutrition education program for women: perspectives of community doctors'. | Yes | No |
| I have read and understood all of the information laid out in the Participant Information Sheet.                                                                                                                | Yes | No |
| All the procedures and risks also have been explained to me in a language that I understand and all my questions have been answered.                                                                            | Yes | No |
| To the best of my knowledge I am eligible for this study because I am a medical doctor and work in [community] on at least a monthly basis as a health care practitioner                                        | Yes | No |
| I am aware that I will be interviewed for about an hour about my opinions of health and nutrition                                                                                                               | Yes | No |
| I am aware that I am free to ask any questions about the study procedures but that certain questions may only be answered after the study, if investigators think they will influence the discussion            | Yes | No |
| I am aware that I am not obliged to answer any question that I don't want to                                                                                                                                    | Yes | No |
| I am aware that participation in any part of this study is entirely voluntary. I am free to withdraw from parts of the study or the entire study at any time.                                                   | Yes | No |
| I also understand that the investigators may withdraw me from the study at any time.                                                                                                                            | Yes | No |
| I am aware that my information will be recorded and stored in an anonymous way at UCT and will then be analysed by the investigators in coded form.                                                             | Yes | No |
| I am aware that the interviews will be recorded for sound. Recordings will be                                                                                                                                   |     |    |

|                                                                                                                                                                                                                                                                                                               |     |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| transcribed, using codes if any names are mentioned, and then permanently deleted as soon as the transcriptions have been double-checked. I understand that anonymous results will be presented to EBSA and may be published in scientific and magazine articles or presented at scientific and public talks. | Yes | No |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|

**To be completed by participant:**

Name and Surname: \_\_\_\_\_

Email address: \_\_\_\_\_

Phone/ cell number: \_\_\_\_\_

Alternative contact number: \_\_\_\_\_

Print name of participant

Signature

Date

**To be completed by study investigator:**

By signing this form below, I confirm that I have explained the study to the participant and did not force them in any way to agree to participate.

\_\_\_\_\_  
Print name of investigator

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date



# APPENDIX Y: IDIs QUESTIONS

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## Open-ended questions and probing questions

- 1.How would you describe your role as a health care provider in [community]?
- 2.What do you think the major health problems/ diseases in [community] are?
  - 2.1.What are your thoughts about NCDs like obesity, diabetes, and cardiovascular disease in [community]?
- 3.Does the health care centre you work for offer any lifestyle education to patients with chronic diseases, like obesity, diabetes, and cardiovascular disease?
  - 3.1. What lifestyle advice do they give?
- 4.What role do you think nutrition plays in chronic diseases in [community]?.
  - 4.1.Describe the foods/ nutrients/ diets you think to lead to chronic diseases
  - 4.2.Describe the foods/ nutrients/ diets that you think should be used to prevent/ treat chronic disease in [community].
- 5.How would you describe the diets of the patients that you see from [community]?
  - 5.1.Why do you think they eat this way?
- 6.Have you heard of the Eat Better South Africa nutrition education program?
  - 6.1.[If no, explain EBSA: “Eat Better South Africa is a nutrition education program for people from under-resourced communities that promotes low-carbohydrate high-fat diet or Banting diet to prevent or treat metabolic conditions. It consists of groups of people that meet every week for an educational session for a period of six weeks.”]
  - 6.2.[If yes],
    - 6.2.1.How did you hear about it?
    - 6.2.2.Have you had any patients that told you they had taken part in an EBSA program?
    - 6.2.3.What have you heard about the EBSA program?
    - 6.3.4.Describe the diet that you think they recommend?
- 7.What do you think about EBSA holding a program in [community]?.
  - 7.1.How did you / would you respond if one of your patients told you they were following an EBSA/ Banting/ low carbohydrate high fat diet?

8. Have you heard about “Banting” or low-carbohydrate high-fat diets?
- 8.1. [If no, explain: “A low-carbohydrate high-fat (LCHF) diet is a way of eating that restricts the amount of carbohydrates and increases the number of healthy fats that you eat to optimize your health and nutrition.”]
- 8.2. [If yes], 8.2.1. Describe what you think a banting or LCHF diet would look like?
- 8.2.2. Describe the foods included and avoided
- 8.2.3. What are your general impressions of this diet?
- 8.2.4. How do you think this diet relates to chronic diseases?
- 8.2.4.1. Do you think it might make it better or worse?
9. How do you think nutrition can be improved for people living in [community]?

## APPENDIX Z: THEMATIC MAPS

### Health practitioners' thematic maps

