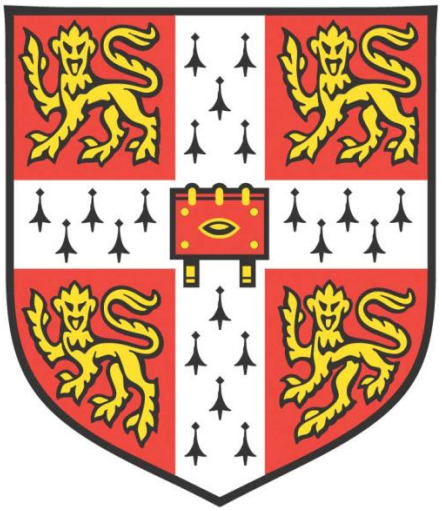
CHILDHOOD OBESITY PREVENTION IN SOWETO, SOUTH AFRICA



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DECLARATION

This thesis is the result of my own work and includes nothing which is the outcome of work done in collaboration except as specified in the text. It is not substantially the same as any that I have submitted, or, is being concurrently submitted for a degree or diploma or other qualification at the University of Cambridge or any other University or similar institution. I further state that no substantial part of my thesis has already been submitted, or, is being concurrently submitted for any such degree, diploma or other qualification at the University of Cambridge or any other University or similar institution. It does not exceed the prescribed word limit for the relevant Degree Committee.

ABSTRACT

Childhood obesity is a growing public health concern in many African countries. In South Africa, young children in urban low-income settings have been identified as being particularly at risk of overweight and obesity, while childhood undernutrition also persists. There is a need to develop and test context-appropriate interventions for the prevention of overweight and obesity among children in African settings. The aim of this thesis was to assess the state of the evidence related to childhood obesity prevention in Africa (Chapter 3), and South Africa specifically, and to conduct formative research to inform the development and evaluation of obesity prevention interventions (Chapters 4-7).

I first conducted a systematic review of childhood obesity prevention interventions in African countries in order to evaluate existing evidence with respect to effectiveness and implementation. Overall, I found evidence of small beneficial intervention effects on physical activity and anthropometric outcomes, but not on dietary behaviours. More interventions had been evaluated in South Africa (n=9) than any other African countries (n=5), and there was only one Tunisian intervention targeting preschool age children. This informed the narrowing of the thesis focus to preschool age children (age 3-5 years) in South Africa. Implementation findings largely centred on the challenges of resource constraints.

To further understand which behaviours to target and how, I conducted in-depth interviews with 16 caregivers of preschoolers in Soweto, which is a low-income urban setting in South Africa. I found that while parents are concerned with their children's health and happiness, they do not necessarily consider weight to be

of relevance unless it is causing noticeable health problems or attracting negative comments. I also identified barriers to healthy behaviours on different social-ecological levels, and the most promising avenues for interventions were targeting aspects of the preschool food environment and family routines, while recognising wider structural factors like unemployment. I concluded that the promotion of children's healthy behaviours in South Africa needs to be done in a weight-inclusive and non-stigmatising way that recognises contextual factors, such as parents' limited sense of agency in relation to children's health and weight, safety concerns, unemployment, and resource constraints.

Finally, I conducted a qualitative process evaluation in the context of a feasibility study of a community health worker-delivered, home-based intervention to promote nurturing interactions and preschoolers' healthy behaviours in Soweto. The focus on healthy behaviours as a way to support children's health and development regardless of weight resonated with both participating caregivers and community health workers (CHWs) delivering the intervention. However, challenges related to the set-up of the CHW programme, such as dissatisfaction with current contracts and resulting resistance to new tasks, meant that the delivery method was not found to be feasible for behavioural interventions in this setting.

My PhD research underscores the complexity of childhood obesity and associated behaviours, particularly in a low-income setting in South Africa. I have identified potential avenues for interventions in the preschool years, and posit that these may be best delivered through community-based organisations as opposed to CHWs linked to public sector primary health care facilities.

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LIST OF ABBREVIATIONS AND ACRONYMS

BMI	Body mass index
Bt20	Birth to Twenty
C	Control group
CDC	Centers for Disease Control and Prevention
CHW	Community health worker
CSE	Completed secondary education
FGD	Focus group discussion
HIC	High-income country
HIV	Human immunodeficiency virus
I	Intervention group
INC	Inconclusive
IOTF	International Obesity Task Force
LMIC	Low- and middle-income countries
MRC	Medical Research Council
NCD	Non-communicable disease

NR	Not reported
PA	Physical activity
PE	Physical education
RCT	Randomised controlled trial
SA	South Africa
SADHS	South Africa Demographic and Health Survey
SANHANES-1	South African National Health and Nutrition Examination Survey
SSB	Sugar-sweetened beverage
SSE	Some secondary education
TE	Tertiary education
WHO	World Health Organization

1 SETTING THE SCENE: CHILDHOOD OBESITY AND HEALTH-RELATED BEHAVIOURS

"Tackling childhood obesity is one of the most serious challenges of our generation, requiring a societal and systems change in our approach to food, lifestyle, and the environments children grow up in."[1] *(p. 2434)*

"The need for action on childhood obesity is supported by strong evidence, and sufficient evidence and logic exists to conclude that all childhood settings can contribute to the creation of healthy environments, improved diet and physical activity patterns, and healthy body size."[2] *(p. 2512)*

1.1 Definitions and significance of childhood obesity

The World Health Organization (WHO) describes childhood obesity as one of the most serious global public health challenges of the 21st century.[3] The urgency with which current high rates of childhood obesity are approached in public health stems from an established and growing evidence base on the consequences and risks associated with overweight or obesity in childhood, and the tendency of early adiposity to track into adulthood.[4–7] The problem is global, and increasingly affecting children in low- and middle-income countries (LMICs).[8,9]

Overweight refers to "abnormal or excessive fat accumulation that presents a risk to health"[10] and obesity is defined as an even more severe form of such fat accumulation. Childhood obesity thus refers to the accumulation of abnormal or excessive body fat before the age of 18 years. Childhood obesity presents a serious risk to health both in childhood and later in life.[6] There are various physiological mechanisms through which nutritional excess in early life can influence a child's growth and development, including hormonal regulation and organ development.[11] However, the health-related consequences of a high body

fat mass do not necessarily present themselves in childhood, and so the risk to health is often focused on expected future health consequences, such as non-communicable diseases (NCDs), associated with specific levels of excess body fat.[12]

Obesity is a key risk factor for NCDs such as cardiovascular disease, cancer and type 2 diabetes.[13,14] Globally, the burden of NCDs is growing but the epidemiological dynamics have changed in the past decades.[15] For example, the burden of cardiovascular disease and associated mortality has decreased drastically in high-income countries (HICs), whereas these trends have varied across LMICs, with mortality rising rather than declining in some regions.[15–17] Moreover, the prevalence of type 2 diabetes has increased worldwide, but at faster rates in LMICs compared to HICs.[15,18,19] Given that NCDs put a financial strain on both health systems and households, and have wider negative impacts on labour force participation and productivity, these developments are particularly alarming for LMIC settings.[20–25]

There is wide consensus regarding childhood obesity being an urgent public health concern, but there are several ways of quantifying the phenomenon. As de Onis and Lobstein have summarised, “The classification of overweight and obesity relies on three prior selections: an anthropometric indicator, a reference population with which to compare the index child or community, and cut-off points that best identify individuals and populations at risk of overweight/obesity-related morbidity and mortality.”[26] (p. 458) Body mass index (BMI), meaning body mass or weight relative to height, is the most commonly used anthropometric indicator of excess fat accumulation. Due to different stages of development in childhood, BMI is considered in relation to age and

sex when it comes to children. Multiple systematic reviews have established that as a proxy for obesity, BMI-for-age is conservative with a moderately high false negative rate but a very low false positive rate.[27–30]

The WHO Child Growth Standards are widely used to classify children under the age of five years, and typically used references and cut-offs for older children include those put forward by the International Obesity Task Force, the American Centers for Disease Control and Prevention (CDC), and the WHO.[26,31,32] These methods are summarised in Table 1. Although some recent research reports generally good agreement between different obesity classification methods,[33] they do differ somewhat due to the use of different reference populations, which has implications for estimates and comparisons of obesity prevalence.[31,33–39] There are also recent developments in constructing cut-offs that can accurately identify children at risk of adult overweight or obesity,[40] but overall the methods described in Table 1 are widely accepted when used to estimate population level prevalence.

According to a systematic review and meta-analysis, childhood obesity predicts some adult morbidity, as the study found that high childhood BMI was associated with an increased incidence of adult type 2 diabetes, coronary heart disease and some types of cancer.[41] However, a large proportion of the obesity-related morbidities occurred in adults who did not have obesity in childhood. In LMICs, this may be related to the complex life course exposure to the double burden of malnutrition, with trajectories from early life undernutrition to overweight and obesity and an increased risk of non-communicable diseases later in life.[11]

Table 1 Comparison of internationally used classification systems for childhood overweight and obesity

Method	Reference population	Cut-off points for overweight and obesity
WHO Growth Standards, age 0-5 years[37]	National Center for Health Statistics/WHO international reference population.	At risk of overweight if BMI>+1SD, overweight if BMI>+2SD, and obesity classifications to be treated with caution in young children (BMI>+3SD). Overweight and obesity not necessarily separately reported.
WHO Growth Standards, age 5-19 years[37]	National Center for Health Statistics/WHO international reference population.	Different cut-offs than in the younger age group. Overweight if BMI>+1SD and obesity if BMI>+2SD.
IOTF[31,34]	Nationally representative datasets of children aged 2-18 years from Brazil, UK, the Netherlands, Singapore, USA and Hong Kong.	Age- and sex-specific BMI cut-offs. Later updated to allow comparison with other measures using percentiles.
CDC[35,36]	Nationally representative US sample (age 2-20 years).	Percentile ranking of BMI relative to CDC BMI-for-age growth charts. Normal weight = 5th to <85th percentile, overweight = 85th to <95th percentile, obesity ≥ 95th percentile.

Negative health consequences of obesity can manifest themselves already in childhood, and include psychosocial and mental health consequences in addition to physical ill-health.[42] Evidence from a systematic review and meta-analysis demonstrates that overweight and obesity in childhood are associated with a higher risk of depression or severe depressive symptoms.[43] Depending on the context and the degree of societal weight bias, childhood obesity is potentially very stigmatising and disadvantaging for the individual child, who may experience bullying and other psychosocial problems.[44–47] Long-term health impacts of childhood obesity later in life are summarised in Table 2.

Childhood obesity has also been associated with lower educational attainment in some settings, but these associations are weak and likely explained by other underlying factors, such as socioeconomic status.[48] High-quality studies from HICs that adjusted for socioeconomic status suggest that the relationships between childhood obesity and educational attainment are not well established, except in the specific case of adolescent girls' lower mathematics attainment being longitudinally associated with obesity.[49]

Table 2 Impact of childhood obesity on health outcomes later in life: evidence from systematic reviews and meta-analyses

Review	Relationship between childhood overweight or obesity and morbidity or mortality later in life
Childhood obesity as a predictor of morbidity in adulthood: a systematic review and meta-analysis[41]	Positive and statistically significant association between childhood BMI (all age groups under 18) and type 2 diabetes. The association between childhood BMI and adult coronary heart disease was also positive and statistically significant in children aged 7 years and over. Little evidence of any association between childhood BMI and stroke. Some evidence from three cohort studies that childhood BMI is positively associated with odds of adult hypertension at age 7 years and over. A reported trend of lower incidence of breast cancer as BMI increases, but these results were not statistically significant. There was a modest positive association between BMI and the odds of other types of cancer in most included cohorts. Quality and risk of bias assessment found most included studies to have mostly low risks of bias.
The impact of childhood obesity on morbidity and mortality in adulthood: a systematic review[50]	Consistent evidence that overweight in early life was associated with increased risk of type 2 diabetes in adulthood. Increased BMI or overweight in early life was associated with increased risk of hypertension in adulthood. Some evidence that increased BMI or overweight in childhood or early adulthood was associated with increased risk of coronary heart disease in later life. Mixed results and/or few studies on the associations between childhood overweight or obesity and risk of stroke, and risk of different cancers or cancer mortality. Consistent evidence of high BMI in childhood being associated with increased risk of all-cause mortality in adulthood. No meta-analysis. Quality assessment done but not reported.
Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: systematic review[6]	In four of the five relevant cohorts obesity and/or overweight before age 18 years were significantly associated with increased risk of premature mortality. All relevant studies included reported that child/adolescent overweight and obesity were significantly associated with increased risk of later type 2 diabetes, stroke, coronary heart disease, and hypertension. No meta-analysis or quality assessment reported.

1.2 Behavioural determinants of childhood obesity

Sources for this background were identified through searches in PubMed, Google Scholar and Scopus, using combinations of search terms such as “childhood obesity”, “behaviours”, “causes”, “determinants” and “risk factors” with a focus on finding review articles, and through checking references and citations of relevant articles and authors. The most recent publications were prioritised.

The complexity of childhood obesity and its multiple causes is becoming increasingly recognised.[51] Causes of obesity include many modifiable and non-modifiable factors including genetic variation, birthweight, and behaviours.[32,52] As is the case with many public health challenges, it is difficult to give a definitive account of causes, or define the extent to which specific determinants contribute to obesity compared to others. Behaviours pertaining to energy intake or expenditure, namely eating and movement, can be seen as intermediary factors between an individual’s biology and their environment, with an energy imbalance in favour of intake over expenditure resulting in the accumulation of excess fat. Physical inactivity and unhealthy diets are thus the key health behaviours associated with childhood obesity in LMICs as well as HICs.[53–55]

In my thesis, I will focus on modifiable behavioural factors, namely dietary behaviour, physical activity, and to a lesser degree also sleep, screen time, and sedentary behaviour. I do not view these behaviours as merely individual lifestyle choices, but as will be further elaborated in the next chapter, they occur

within the context of social and environmental factors.[51,56] These contextual factors include both proximal determinants of behaviour, such as family circumstances and neighbourhood food environments, and more distal or upstream systemic drivers, such as the national economic and policy environment.[51,52,56]

In terms of the growing burden of obesity in children and adults in LMICs, it is important to recognise the role played by nutrition transitions linked to economic growth and development, as societies experience changes in patterns of physical activity and shift towards increased access to and consumption of highly processed foods and beverages.[57] As summarised by the authors of a recent Lancet series on the double burden of malnutrition, "The general concept of the nutrition transition is that in each region of the world (not only countries but subregions within countries), a transformation in the way people eat, drink, and move at work, at home, in transport, and in leisure has affected the distribution of body composition and created nutritional problems. The transition has produced remarkable shifts in physical activity and diets in LMICs and a rapid increase in overweight, obesity, and nutrition-related non-communicable diseases."[57] (p.69)

1.2.1 Dietary behaviour

The term dietary behaviour is somewhat vague and complex, but a recent interdisciplinary conceptual analysis process that involved expert consultation generated a taxonomy of three main categories of food choice, eating

behaviour, and dietary intake and nutrition,[58] with various dimensions of each category illustrated in Figure 1. All three categories are relevant for childhood obesity and children's optimal dietary health. However, given the role of what a recent Lancet series article on the double burden of malnutrition terms "the new nutrition reality"[57] in the emergence of childhood obesity in LMIC settings, and the increased recognition of commercial determinants of health, including marketing of unhealthy foods,[15,59,60] the most pertinent aspect of children's dietary behaviours to consider is the consumption of so-called non-essential foods and beverages, such as ultra-processed and energy dense foods, and sugar-sweetened beverages. Indeed, many childhood obesity prevention interventions focus on restricting these types of foods, and promoting the consumption of fruit and vegetables, as well as practices such as eating a nutritious breakfast every day.[61] While the relationship between breastfeeding and childhood obesity is important and continues to be examined,[11,62–64] my thesis will not focus on the period of infancy (birth to age 2 years) in any great detail.

Diet quality can be assessed in several different ways, and there are many challenges in reliably measuring dietary intake, which often relies on recall.[65,66] Using subjectively measured dietary intake and three common diet quality indices, diet quality has been found to be associated with children's weight status independently of physical activity.[67] Beyond weight and obesity, diets have a considerable bearing on health outcomes and in particular, NCDs.[68,69] Indeed, high sodium intake, low intake of whole grains, and low intake of fruits have been highlighted as leading dietary risk factors for mortality and morbidity.[68] According to a systematic review focusing on children and

adolescents, there is cross-sectional evidence of a relationship between unhealthy dietary patterns and poorer mental health.[70] Conversely, healthy diets confer many benefits, and high dietary quality among adults is associated with a reduction in the risk of all-cause mortality, cardiovascular disease, cancer, type 2 diabetes, and neurodegenerative disease.[71]

Figure removed for copyright reasons.

Figure 1 The taxonomy of outcomes related to dietary behaviour (copied from source)[58]

Throughout this thesis, I will refer to diet and dietary behaviours as broad terms that capture different aspects of the quality and quantity of what people eat. I will not discuss specific diets or diet plans in the prescriptive sense of the word, but rather different ways in which foods, eating, and different aspects of accessing food interact with human health, and how this interaction is perceived by research participants.

1.2.2 Physical activity

Physical activity can be defined as "behaviour that involves human movement, resulting in physiological attributes including increased energy expenditure and physical fitness",[72] and it captures movement behaviours as different as unstructured play, dancing, organised sports or household work.[73,74] Physical activity is further categorised into different types according to intensity of different activities, ranging from light (1.5-2.9 METs) such as slow walking, to moderate (3.0-5.9 METs), such as some forms of yoga, and vigorous (≥6.0 METs), such as running.

The significance of physical activity for childhood obesity prevention seems intuitive given that the behaviour involves energy expenditure, but the relationship between physical activity and adiposity in children is somewhat inconsistent in reviews of existing evidence.[75,76] Even where associations between higher physical activity and lower obesity rates can be ascertained, it is not always possible to rule out reverse causality of obesity contributing to lower levels of physical activity, as opposed to low levels of physical activity

contributing to obesity. A relatively well established relationship in the literature on physical activity and childhood obesity is that between higher intensity, moderate or vigorous physical activity and lower levels of childhood adiposity compared to light physical activity.[77,78]

It is well established that physical activity is associated with a multitude of benefits beyond weight management across the life course. Specifically, children's physical activity has been associated to varying degrees with beneficial effects on at least mental health, quality of life, psychosocial outcomes, motor skill development, cardiometabolic health and risk profiles, bone and skeletal health, and cognitive functioning and development.[79–86]

1.2.3 Sleep

There is some meta-analytic evidence from longitudinal studies that shorter sleep duration is associated with an increased risk of childhood obesity,[87] but the reviewed studies all stem from HICs, and predominantly self-reported sleep data. In an Australian birth cohort, sleep problems reported by mothers in the early years of childhood were also associated with obesity in young adulthood.[88] In contrast, there is some meta-analytic evidence, also relying on self-report data, indicating that longer sleep duration in adults is associated with an increased risk of obesity.[89] When examined in combination with physical activity and sedentary behaviour, a systematic review of predominantly low-quality evidence found high sleep to be associated with favourable adiposity and metabolic health outcomes among children and youth aged 5-17 years.[90]

However, it is important to note that the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) framework[91] used by the authors to assess the quality of evidence automatically downgrades studies that may provide high-quality epidemiological evidence, such as prospective cohort studies, if they do not conform to a randomised controlled trial design. While the exact relationship between sleep and childhood obesity in different populations is not fully understood, it is reasonable to consider it when examining health behaviours that relate to childhood obesity and its prevention, in particular because of the significance of sufficient sleep for the health and development of children.

1.2.4 Screen time and sedentary behaviour

Sedentary behaviour is defined as “any waking behavior characterized by an energy expenditure ≤1.5 metabolic equivalents (METs), while in a sitting, reclining or lying posture”,[92] and this threshold has also been deemed appropriate for young children.[93] Screen time, which can be a form of sedentary behaviour, refers to “screen-based behaviors”,[92] such as time spent engaging with computers, tablets, smartphones or televisions. A systematic review examining screen-based and other sedentary behaviours in children under the age of five years reported predominantly unfavourable or no associations between screen time and adiposity.[94] The review also reported primarily no associations between objectively measured total screen time and adiposity, but it only included one African study from Tunisia.

It is unclear what the exact relationship between sedentary behaviours and childhood obesity is. However, sedentary behaviour represents inactivity by its very nature, and there is evidence of clustering of screen time and unhealthy eating behaviours among children and young people.[95,96] Indeed, since high-quality evidence of how these behaviours interact with adiposity is lacking for LMIC settings, and African settings in particular, it is important to consider both sedentary behaviour and screen time as potentially relevant behaviours for childhood obesity prevention in South Africa.

1.3 From global to local

1.3.1 Childhood obesity globally

Using the WHO's definition of obesity as a BMI at least two standard deviations above the mean, the World Obesity Federation has predicted that globally, there will be 158 million children aged 5-19 years living with obesity in 2020.[97] Obesity prevalence among 5- to 19-year-olds increased in every region of the world between 1975 and 2016, but the proportional rise was smallest in high-income regions (averaging 30–50% per decade), and largest in southern Africa (about 400% per decade).[98] Childhood obesity has until recently been considered a public health challenge that primarily affects HICs. However, the WHO, UNICEF and the World Bank together estimate that there were over 40 million children under the age of five in the world with overweight or obesity in 2018, and as can be expected based on the distribution of the world population,

a vast majority of these children resided in LMICs.[9] It is therefore important to examine and address childhood obesity beyond high-income regions.

1.3.2 Childhood obesity in Africa

In Africa, the prevalence of overweight or obesity among children under five years of age is 4.9%, and in absolute numbers the number of children under five with overweight has increased from 6.6 million in 2000 to 9.5 million in 2018.[9] Moreover, as the map in Figure 2 illustrates, some parts of the African continent are more severely affected than others, or indeed, any other regions in the world. The prevalence of overweight or obesity among children under five years in Northern Africa and Southern Africa is 10.6% and 13.0% respectively.[9] Simultaneously, different forms of undernutrition, including stunting (low height-for-age), wasting or thinness (low weight-for-height) and underweight (low weight-for-age), still constitute a major challenge across the continent.[57] It is thus important to recognise that if malnutrition is taken to mean suboptimal nutrition, it now refers to a spectrum of poor nutrition, from undernutrition to overweight and obesity.[11,57,99,100]

Figure removed for copyright reasons.

Figure 2 Overweight prevalence by region among children under five (copied from source)[9]

Research examining nutrition transitions suggests countries are moving away from the challenges of undernutrition as they experience social and economic changes.[57,101–103] However, obesity has joined rather than replaced undernutrition on the public health agenda across many African settings.[104] Indeed, this alarming trend is the focus of a recent Lancet series on the double burden of malnutrition, which involves calls to address undernutrition and obesity together, rather than as separate concerns.[11,57,105]

1.3.3 Childhood obesity in South Africa

South Africa is experiencing a triple burden of malnutrition, consisting of micronutrient deficiencies, undernutrition (stunting, wasting and underweight), and overweight and obesity.[99,100,106] Although these different forms of malnutrition may co-exist within the same child, such concurrency is rarely reported in nutrition statistics, and developments across the life course are not yet fully understood.[57,107,108]

It is important to note that 4% of South African children under the age of five were estimated to be affected by both overweight and stunting in 2019,[109] and another study that included 519 children from two provinces in South Africa found 68.4% of children with obesity to also be stunted.[108] The separate reporting of these overlapping forms of malnutrition can lead to problematic double counting of malnourished children, while overlooking the full dynamics of child malnutrition.[110] As the analysis from South Africa illustrates, childhood obesity in LMIC settings may be linked to early life undernutrition.

The most recent nationally representative obesity prevalence estimates in South Africa stem from the Demographic and Health Survey (SADHS), which uses WHO growth standards to define overweight, and indicates that 13.3% of children under five years of age had overweight, while as many as 27% were stunted in height.

Figure 3 clearly demonstrates this double burden of undernutrition and overnutrition among young South African children.

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Figure 3 Nutritional status of children under the age of five years in South Africa (copied from source)[111]

Another relatively recent, and even more comprehensive national study than the SADHS, is the South African National Health and Nutrition Examination Survey (SANHANES-1) from 2012.[112,113] According to SANHANES-1, which uses IOTF cut-offs[31,34] for childhood overweight and obesity, the age group 2-14 years had an overweight prevalence of 16.5% among girls, and 11.5% among boys, while the corresponding rates of obesity were 7.1% for girls and 4.7% for boys.[112] Table 3 provides a summary of overweight and obesity prevalence by age and gender according to both SADHS and SANHANES-1. Their estimates differ because they use both different cut-off points for classifying overweight and obesity, and different sample populations.

Table 3 Overweight and obesity prevalence by age and gender in South Africa[111,112]

Age (years)	Girls		Boys	
	Overweight	Obesity	Overweight	Obesity
1 - 1.5*	12.6	n/a	12.6	n/a
1.5 - 2*	13.8	n/a	13.8	n/a
2 - 3*	12.5	n/a	12.5	n/a
3 - 4*	9.4	n/a	9.4	n/a
4 - 5*	8.8	n/a	8.8	n/a
2 - 5**	18.9	4.9	17.5	4.4
6 - 9**	12.3	4.1	4.5	2.7
15 - 17**	19.3	8.0	7.3	1.5
15 - 19*	15.8	11.0	6.1	2.5
18 - 24**	25.3	21.7	5.8	4.2

*SADHS, 2016 (WHO Growth Standards) **SANHANES-1, 2012 (IOTF cut-offs)

The recently published Global Atlas on Childhood Obesity by the World Obesity Federation provides dire predictions for the future of child nutrition in South Africa. These predictions are presented in Table 4, and include projected obesity rates of nearly 30% among 5-19-year-olds based on the NCD Risk Factor Collaboration's analyses that include both nationally representative and community-specific data.[97] To put these predictions in a global context, with an expected obesity prevalence of 28.2% for children (5-9 years of age) and 27.1% for adolescents (10-19 years of age), South Africa ranks in the top 20 countries with the highest predicted rates of obesity by 2030. As Table 5 shows, many of the countries with higher predictions are small island nations, meaning that they have much lower absolute numbers of affected children and adolescents than South Africa.

According to the Global Atlas on Childhood obesity, South Africa is also among the top 20 countries with highest obesity prevalence in children under five years of age.[97] However, these overall estimates do not capture how childhood obesity is distributed within South Africa, across different settings or by age or gender. In particular, since obesity among children is known to be socioeconomically patterned,[114] it is important to take a closer look at how childhood obesity is distributed vis-à-vis existing inequalities in society.

Table 4 Predictions for South African children in the Global Atlas on Childhood Obesity (adapted from source)[97]

Age group (years)	2030 predicted obesity prevalence	2030 predicted number of children with obesity
5 - 9	28.2%	1,375,345
10 - 19	27.1%	2,770,984
5 - 19	n/a	4,146,329

Table 5 Countries with highest predicted childhood obesity prevalence in 2030 (adapted from source)[97]

Country	Obesity prevalence, age 5 - 9 years	Country	Obesity prevalence, age 10 - 19 years
1. Cook Islands	45.9	1. Cook Islands	41.6
2. Niue	44.8	2. Niue	40.9
3. Palau	44.7	3. Palau	40.1
4. Nauru	43.3	4. Nauru	39.4
5. Tuvalu	42.8	5. Tuvalu	38.2
6. Marshall Islands	41.1	6. Tonga	36.9
7. Tonga	41.0	7. Tokelau	36.7
8. Tokelau	40.5	8. Marshall Islands	35.4
9. Kiribati	38.7	9. Kiribati	33.1
10. Micronesia	37.6	10. Samoa	32.8
11. Samoa	37.1	11. Micronesia	32.1
12. China	32.0	12. South Africa	27.1
13. Egypt	29.5	13. Kuwait	26.6
14. South Africa	28.2	14. United States of America	24.2

15. Dominican Republic	27.7	15. Saudi Arabia	23.3
16. Qatar	27.5	16. Egypt	22.8
17. Puerto Rico	27.4	17. Qatar	22.2
18. Argentina	27.2	18. Puerto Rico	22.1
19. Bahamas	27.1	19. Dominican Republic	22.0
20. Kuwait	26.9	20. China	21.8

1.3.4 Sociodemographics of childhood obesity in South Africa

Patterns of malnutrition and related behaviours are shaped by factors like socioeconomic status, ethnicity, age, and gender.[4,115–117] The specific social and historical context of South Africa has led to persisting health inequity, which is now also visible in the heavy burden and uneven distribution of wealth and health, including NCDs.[118,119] In the following sections, I will provide an overview of how childhood obesity is distributed by gender, age, socioeconomic status or setting, and race.

1.3.4.1.Gender and age

In South Africa, the prevalence of overweight is 27% among adult women and 20% among adult men.[111] Obesity prevalence, when separated from overweight prevalence, is 41% and 11% respectively. The gender difference in obesity rates is stark, and at least in part, an illustration of gendered differences in opportunities to engage in healthy behaviours.[120] These differences in obesity prevalence are to some extent present already in childhood, but vary somewhat by age, as illustrated in Table 3. Here, data are included from both SADHS and SANHANES-1, and since these two national surveys use different cut-offs and age groups for childhood obesity, their estimates differ somewhat but together they provide an overall summary of how overweight and obesity emerge in early childhood already, and how the difference in prevalence between girls and boys starts to be visible in adolescence, and continues to grow with age. Indeed, SANHANES-1 data suggest a stark difference between girls and boys already

before the age of 10 years, with overweight prevalence among boys aged 6-9 years only about a third of the prevalence of girls in the same age group. Moreover, the proportion of obesity in relation to overweight grows among girls, and as the adult rates suggest, eventually overtakes overweight prevalence. These patterns highlight the importance of starting to address childhood obesity in South Africa in the early years, and the need for unpacking and understanding the gender differences already in childhood.

1.3.4.2.Socioeconomic status and setting

> *"The urban centers of many cities in Africa, Asia and Latin America are rooted in colonial legacies of sociopolitical exclusion that evince today as spatial inequalities that manifest in terms of proximity to aspects of the city that are meant to confer an urban advantage, such as infrastructure and amenities, and are consequently closely linked to health inequities."*[15](pp.1670-1671)

Despite South Africa being an upper-middle-income country, many families experience similar levels of poverty or deprivation as countries classed as low-income as South Africa has one of the highest levels of income inequality in the world.[121] This income inequality still largely follows the racial patterns deliberately engineered through apartheid policies between 1948 and 1994. Partly as a legacy of colonial and apartheid planning, there are four broad settlement types in South Africa: urban formal, urban informal, rural formal and rural informal, also known as rural tribal areas.[122] Table 6 summarises the characteristics of these different areas, demonstrating that while socioeconomic status cannot be assumed from settlement type alone, locality can serve as a useful proxy for circumstances and living standards in South Africa.

According to SANHANES-1 data summarised in Table 7, urban formal and urban informal settings have the highest rates of overweight and obesity among both girls and boys.[112] Indeed, smaller studies conducted more recently also indicate that children in low-income urban settings are particularly at risk of adiposity.[123,124] By contrast, children living in rural informal settings had the lowest prevalence of childhood overweight and obesity.[112] While rural settings should not be completely overlooked, it is worth noting that 66% of South Africa's population reside in urban settings, and given the trends of urbanisation this rate will keep increasing.[125] It is therefore particularly important to focus research efforts on urban settings, and children who are most at risk of adiposity and NCDs.

Table 6 Characteristics of urban and rural settings in South Africa (adapted from sources)[122,126]

Setting	Characteristics
Urban formal areas	Typically, permanent buildings and formally owned land and property. These areas are controlled by a local or district council. Generally good access to water, electricity and waste management, and roads are maintained. During apartheid, urban formal areas in South Africa were reserved for White people.
Urban informal areas	Also referred to as townships, informal settlements or 'squatter camps'. Service delivery tends to be poor compared to formal areas, although these areas are also controlled by a local or district council. Many residents live in non-permanent buildings, such as shacks. Under apartheid, these localities were created outside of the city limits, and designated to Black Africans who worked in the city or in mines. Some townships, such as Soweto, have developed into a mix between urban informal and formal areas, with permanent buildings and some more formal neighbourhoods with relatively good access to services, as well as informal settlements with almost no access to formal amenities. According to Statistics South Africa, only informal settlements are classified as urban informal, but it is unclear whether Soweto was included as an urban formal or urban informal area in the SANHANES-1 analysis.
Rural formal areas	Also known as 'semi-towns', these are areas that lack a local authority and are mostly developed around mining or other industries, where housing is often provided by employers.
Rural informal areas	Villages governed by a tribal authority. These areas are typically characterised by pockets or clusters of houses or huts, surrounded by large areas of open land. Tarred or asphalt roads are seldom present, and water or electricity is not necessarily supplied to the houses.

Table 7 Overweight and obesity by locality in girls and boys aged 2-14 in South Africa (adapted from source)[112]

Gender	**Girls**		**Boys**	
Locality	Overweight %	Obesity %	Overweight %	Obesity %
Urban formal	19.4	8.9	11.8	5.4
Urban informal	20.8	9.3	20.0	5.2
Rural formal	13.1	4.4	8.9	4.2
Rural informal	10.7	6.3	9.0	2.5

It is well established in many HICs that childhood obesity prevalence tends to have an inverse association with socioeconomic indicators, with the highest prevalence typically found among groups with the lowest socioeconomic status.[127,128] Conversely, it is often stated that there is a positive relationship between obesity and socioeconomic status in LMICs, whereby childhood obesity predominantly affects those with a higher socioeconomic position.[61,114]

However, the pattern is not straightforward across LMICs,[129] and the situation in South Africa is certainly more complex. While it is difficult to find nationally representative analyses on childhood obesity for different age groups in relation to socioeconomic status, the SADHS data provide some indication of how early childhood overweight is distributed by wealth quintile. As Table 8 demonstrates, overweight prevalence according to the WHO growth standards is highest in the lowest wealth quintile, and the fourth quintile, with little variation across strata apart from the highest quintile, which has a relatively low prevalence of below 9.3%.

Table 8 Overweight prevalence among South African children under five years of age by wealth quintile (adapted from source)[111]

Wealth quintile	*Overweight prevalence %*
Lowest	15.6
Second	13.3
Third	11.3
Fourth	14.9
Highest	9.3
Total	13.3

1.3.4.3.Race and ethnicity

Statistics South Africa currently recognises four distinct population groups: Black African, Coloured (mixed ancestry), Indian/Asian and White.[130] These four terms partly stem from apartheid era definitions but are still used widely in South Africa to capture the social construct of race. In addition, there are numerous ethnic and linguistic groups in South Africa, including eleven national languages and many smaller indigenous languages. According to the most recent population survey conducted between censuses in South Africa, 80.7% of the country's total population of 55.7 million are Black African, whereas 8.7% are Coloured, 2.5% are Indian/Asian, and 8.1% are White.[130]

In terms of comparing childhood obesity between different population groups, SANHANES-1 had too few White and Indian/Asian participants for meaningful comparisons, but Table 9 summarises overweight and obesity in different population groups where possible based on data from both SANHANES-1.

A cross-sectional study conducted in one of South Africa's nine provinces found that in a sample of 1559 school learners aged 7-18 years, Black African children were more likely than others to have overweight and obesity.[131] As the national statistics also indicate, there are both high overweight and obesity prevalence rates and high absolute numbers of children with overweight or obesity among Black African and Coloured children in South Africa, given that they represent the two largest population groups in the country.

Table 9 Overweight and obesity by population group, children aged 2-14 years in South Africa[112]

Gender	Girls		Boys	
Population group	Overweight %	Obesity %	Overweight %	Obesity %
Black African	16.2	7.3	11.9	4.8
White	n/a	n/a	n/a	n/a
Coloured	14.6	5.3	8.0	3.8
Indian/Asian	n/a	n/a	n/a	n/a

1.3.4.4.South African guidelines and children's health behaviours

South Africa recently launched its first 24-hour movement guidelines for birth to five years, and the national food-based dietary guidelines, including the paediatric food-based dietary guidelines, were last updated in 2013.[132–134] The new Road to Health booklet launched by the South African Department of Health in 2018 for tracking the health and clinic visits of children under the age of five also outlines healthy nutrition in accordance with the paediatric food-based dietary guidelines, starting from breastfeeding.[135] The South African 24-hour movement guidelines for birth to five years recommend three hours of physical activity, less than one hour of daily screen time, and 10-17 hours of sleep depending on children's age. The visual representation of the guidelines has been translated into all 11 official languages of South Africa, and the English version is included here as Figure 4.[133] The paediatric food-based dietary guidelines focus on breastfeeding, complementary feeding and responsive feeding for the establishment of healthy eating behaviour.[134] The general guidelines encourage eating a variety of food, including plenty of fruit and vegetables every day, starchy foods at most meals, different sources of protein daily, and limited amounts of fats, sugar and salt.[134]

Figure removed for copyright reasons.

Figure 4 The South African 24-hour movement guidelines for children aged 0-5 years (copied from source)[136]

As with overweight and obesity rates, it is difficult to construct a complete account of children's health-related behaviours in South Africa. The larger health-related surveys, SANHANES-1 and SADHS, do not cover children's physical activity at all, and mostly capture nutrition-related knowledge or perceptions as opposed to behaviours beyond breastfeeding. However, the most recent Healthy Active Kids South Africa Report Card from 2018 provides a useful overview of existing evidence on children's health-related behaviours of relevance to childhood obesity, as it covers twelve indicators related to physical activity and six related to nutrition.[137] Table 10 summarises the grades assigned to each indicator from the three most recent report cards. This illustrates that with the notable exception of early childhood physical activity receiving the grade "A-", most indicators show that South Africa is only succeeding with about half or less than half of children and youth when it comes to engaging them in sufficient PA and healthy nutrition-related behaviours, and having supportive environments for these behaviours.

As the authors of the report card note, these findings largely stem from small studies that are not nationally representative, and that do not use objective measures of health-related behaviours, but the snapshot the report card provides of the health-related behaviours of children and youth in South Africa is nonetheless valuable for highlighting specific areas to explore and address, such as sedentary behaviour and snacking, sugar-sweetened beverages, dietary sodium and fast food intake. Research and action are needed across the focus areas of the report card, as there have been no significant improvements in the health behaviours or environmental factors assessed.[137]

Table 10 Comparison of 2014, 2016 and 2018 Healthy Active Kids South Africa Report Card grades (adapted from source)[137]

Indicator	2014	2016	2018
Physical activity:			
Overall physical activity	D	C	C
Early childhood physical activity	-	INC	A–
Organised sport participation	C	D	D
Active play	INC	INC	INC
Active transportation	C	C	C
Sedentary behaviours	F	F	F
Early childhood sedentary behaviour	-	-	INC
Physical fitness	-	D	INC
Family and peer support	INC	C–	C–
School	D	D	D–
Community and environment	D–	C–	C–
Government	B	B	C
Nutrition:			
Fruit and vegetable intake	C	D	D
Snacking, SSBs, dietary sodium	F	F	F
Fast food intake	-	F	-
School nutrition culture and environment	-	-	D–
School tuck shop	D–	INC	-
Vegetable gardens	-	-	C
National School Nutrition Programme	B	B	C
Food security	-	D	D–
Advertising and media	D	D	D–
Body composition:			
Overweight/obesity	D	D	D
Undernutrition	C	C	C
Early childhood body composition	-	D	D

A: Succeeding with a large majority of children and youth (81 - 100%); B: Succeeding with well over half of children and youth (61 - 80%); C Succeeding with about half of children and youth (41 - 60%); D Succeeding with less than half, but some, children and youth (21 - 40%); F Succeeding with very few children and youth (0 - 20%); INC Inconclusive owing to insufficient data; SSB sugar-sweetened beverage; - Not assessed or not available.

As will be further discussed in Chapter 2, the exact nature of dietary and movement behaviours and their determinants may vary significantly between different environments. For example, variation in diets between settings stems from many different reasons such as socioeconomic status, cultural practices and preferences, and the availability of different foods. Likewise, physical activity of children and adolescents is determined by many different factors. For instance, in an urban South African setting, adolescent girls' participation in sports may depend on perceived social norms or concerns about safety.[138] Other context-specific barriers to healthy behaviours of children in South Africa include the high cost of healthy foods,[139,140] gendered notions of acceptable behaviour, body image and beauty ideals,[138,141–143] limited resources for sports in low-income settings, and safety concerns restricting physical activity.[138,144,145] While it is difficult to convey a full picture of children's health-related behaviours and their determinants in South Africa, the key observation here is that it is important to understand the specific context in which the behaviours of interest occur. This notion will be developed further in Chapter 6.

1.3.5 The need for childhood obesity prevention in South Africa

The burden of NCDs has risen substantially in Sub-Saharan Africa over the last three decades.[13] Overweight and the associated behaviours of physical inactivity and unhealthy diets are major NCD risk factors, and very prevalent in Sub-Saharan Africa overall.[146] In South Africa, there is already a high burden of NCDs, but the high prevalence of childhood obesity, and the projected future rates presented in previous sections suggest that the situation will worsen and

further strain the public health system.[21,147–149] Action is needed in order to curb the alarming trends of childhood obesity, and the high rates of obesity among young children in South Africa suggest it is important to start early. As it is well established that obesity is difficult to reverse, expensive to treat, and incurs costs beyond its treatment to society, efforts need to focus on effective prevention.[150,151] Population strategies, as opposed to high-risk strategies involving the screening and targeting of individuals, are recommended in order to avoid creating stigma among children considered high-risk, and due to the interconnectedness of behaviours and environments.[150,152] The tax on sugar-sweetened beverages that South Africa introduced in 2018[153,154] is an example of a population strategy, and while its full results are yet to be seen, it is important to explore further opportunities for preventing childhood obesity in South Africa.

1.4 Aim and objectives

While the evidence base concerning the exact epidemiology and aetiology of childhood obesity in South Africa is incomplete, my PhD research involved a systematic approach to first understanding the research gaps, and conducting research to start filling some of the key gaps. The aim of this thesis is to assess the state of the evidence related to childhood obesity prevention in Africa, and South Africa specifically, and to conduct formative research to inform the development and evaluation of obesity prevention interventions. The following objectives have guided the research, and will be fulfilled through respective thesis chapters:

- To review the effectiveness of childhood obesity prevention interventions in African countries on anthropometric and behavioural outcomes (Chapter 3)
- To identify barriers and facilitators to childhood obesity prevention interventions in African settings based on existing evidence (Chapter 3)
- To examine how caregivers of young children in an urban low-income setting perceive overweight, obesity, and related behaviours (Chapter 5, Chapter 6)
- To understand what barriers and facilitators to addressing childhood obesity and unhealthy behaviours are of relevance to caregivers in an urban low-income setting (Chapter 6)
- To test the feasibility and acceptability of a home-based, community health worker-delivered intervention to promote healthy behaviours among preschool age children in an urban low-income setting (Chapter 7)

Before presenting the empirical work I have conducted in response to these objectives, I will provide some conceptual and theoretical background to situate the research in its cross-disciplinary foundations.

2 FOUNDATIONS: PHILOSOPHICAL AND THEORETICAL BASIS

2.1 Contextualism and critical realism

Beyond the normative value placed on good health in its own right, the importance of addressing childhood obesity can be framed in many different ways, including as a human rights issue,[155–157] particularly vis-à-vis the Convention on the Rights of the Child, or as a negative externality resulting in societal costs from ill-health.[151] For the purposes of this thesis, the focus on childhood obesity as a problem to be addressed stems from the recognition that obesity compromises children's optimal health and wellbeing, both in childhood and later in life. However, a critical and reflexive approach to the discourse around childhood obesity prevention is also taken throughout. This is because framing obesity as something that needs to be prevented cannot be fully separated from weight stigma and societal biases against larger bodies,[46,158] and public health researchers should exercise caution in how sensitive topics are treated so as not to contribute to further stigma or harm.

As has already been alluded to, the scope of previous research into childhood obesity and its prevention has been largely limited to HICs. When dealing with topics for which limited evidence exists, it is important to try to recognise how well existing evidence, generated in settings that in many ways are vastly different from a middle-income country like South Africa, can inform new research and interventions in new settings. This recognition is also grounded in the philosophical underpinnings of my qualitative research focus, which posits that context is important for both the data that are collected, and for making sense of them. Braun and Clarke describe "an appreciation that information and knowledge always come from somewhere"[159] (p. 21) as a key tenet of

qualitative research, and further, that subjectivity is present both in “the data we analyse, and the analyses we produce”[159] (p. 21). The authors refer to subjectivity as a central bias that cannot be fully avoided, and which needs to be considered and addressed through explicitly contextualising both data and analyses. This inevitable but manageable subjectivity recognised in qualitative research traditions is different from subjectivity that involves intentionally influencing research findings or processes based on one’s personal views.

Contextualist research has its basis in critical realism, which is a philosophical perspective that differs from typically more positivist orientations in quantitative approaches. Contextualism thus represents a form of relativism that acknowledges the role that contexts play in determining how reality or existence (ontology) and knowledge (epistemology) can be understood. More specifically, critical realism employs a realist ontology, and a relativist epistemology.[160] Critical realism recognises the limits of reality in the positivist sense but acknowledges that there can be meaning attached to things beyond what would be considered ‘real’ or ‘true’ under a more strict positivist framework. An illustrative example provided by Steve Fleetwood is that of a mythical creature, such as a unicorn.[161] Even if I do not personally believe that unicorns exist as physical beings, they exist as a concept, and discourses about unicorns are real because I can consider the meaning that unicorns hold in different contexts, such as literature, popular culture or different historic mythologies. In similar vein, a research participant may describe ideas or experiences that could be factually refuted, but said ideas or experiences still have meaning for the participant or for understanding a specific phenomenon through qualitative research.

In this sense, my qualitative research does not interrogate whether people are telling the 'truth' in the strictest, absolutist sense of the word. Instead, through analysing how people describe, for instance, the limitations their surroundings place on them as parents, I try to make sense of how their realities, lived experiences and contexts shape their behaviours. For instance, if a parent perceived their neighbourhood to be unsafe, even if police records would not include a single instance of crime in the neighbourhood in the past year, it would be important to try to understand the experienced sense of unsafety as opposed to merely dismissing it as incorrect. Similarly, my systematic review of behavioural interventions to prevent childhood obesity in African countries seeks to understand the state of the existing literature, and contextualise extant research in terms of what it can tell us about childhood obesity, its prevention, and conducting research on these topics, in African settings.

The aforementioned considerations regarding contextualism pertain to the subjectivity of data. The practice of reflexivity, on the other hand, is the predominant method put forward in qualitative research for addressing subjectivity of analyses. As described by Green and Thorogood,[162] "Reflexivity is one of the ways qualitative researchers have of taking subjectivity seriously, without abandoning all claims to producing useful accounts of the world." (p. 23) This means critically examining both the social and political context of the research (why this, why now?), and personal characteristics of, or views held by the researcher that inevitably influence both the collection and analysis of data. The broader positioning of my research, dimensions of my personal subjectivity, and the challenges of accounting for a context which I do not share with my research participants, will be further discussed in chapter 8.

2.2 Behavioural epidemiology and social-ecological models

> *"Obesity is the result of people responding normally to the obesogenic environments they find themselves in."* [52] (p. 804)

My research is situated within the field of public health, and it focuses on behaviours that can be considered modifiable obesity-related risk factors. As part of my aim was to conduct formative research to inform the development and evaluation of obesity prevention interventions, there is a need to consider what research can inform such processes. I have therefore made use of behavioural epidemiology[163] and different approaches to intervention development as guiding conceptual frameworks in designing and carrying out the research described in my thesis. Behavioural epidemiology describes five phases of developing evidence-based interventions to change health-related behaviours. These phases range from establishing links between behaviours and health to evaluating and translating evidence into practice, as demonstrated in Figure 5.

Figure 5 Phases of behavioural epidemiology (adapted from source) [163]

It is important to highlight that many of these phases necessitate a context-specific understanding of both behaviours and the health issue in question. In terms of guidance for conducting research that supports these phases of behavioural epidemiology and specifically the development of interventions, there are many frameworks available. Perhaps the most prominent is the Medical Research Council's (MRC) recently updated guidance on how to develop complex interventions to improve health and healthcare.[164] In terms of informing intervention development, actions listed in the logic model in Figure 6 include reviewing published evidence, understanding the context, and attending to future implementation. Similarly, a framework called Intervention Mapping, which is widely used for behavioural interventions, highlights thorough consideration of the intervention setting and barriers and facilitators of behaviours, including environmental factors.[165] While I have not followed the entire iterative process that these frameworks set out, my thesis draws on the guidance from all three frameworks in order to assess the state of the evidence related to childhood obesity prevention in Africa, and to conduct formative research to inform the development and evaluation of obesity prevention interventions in South Africa.

Figure removed for copyright reasons.

Figure 6 Logic model for intervention development according to MRC Guidance (copied from source)[164]

Focusing on behaviours may imply a focus on individuals, but behavioural epidemiology and intervention mapping do take into account determinants of, and influences on, health-related behaviours. Accordingly, my research also builds on the notion that individual behaviour does not take place in a vacuum but is shaped by, and to some extent also shapes, different aspects of our environments. Social-ecological models of health (Figure 7) provide a helpful illustration of this, placing individuals within the context of societal influence and interaction, including interpersonal, institutional, community, and policy levels. [56,166]

Figure 7 Simple social-ecological model

Social-ecological models of health illustrate how individuals are not separate from the environments in which they find themselves, and recognise the interplay between societal structures and individual agency in a sociological sense.[167] In Giddens' outline of the theory of structuration, structural factors do not necessarily override individual choices. Individual agency is to be seen in

relation to structure, as a duality rather than a dichotomy. It exists both within the constraints of surrounding society, and with opportunities to shape structures through, for example, collective action consisting of multiple individual agents.

A more specialised application of the basic idea of situating individuals within a social-ecological framework is the Six-Cs developmental conceptualisation of contributors to overweight and obesity in childhood.[51] This model is presented in Figure 8. It is not restricted to the social and behavioural spheres, but consists of five zones representing 1) nutrition, 2) activity, 3) personal and relational attributes, 4) resources and opportunities, and 5) practices; six levels of characteristics, labelled as “The Six-Cs” (cell, child, clan, community, country, and culture); and a time dimension, which captures relationships between the different Cs, as well as stages of childhood development progressing with time. The five zones consist of both modifiable and non-modifiable factors that relate to behaviours, and barriers and facilitators of health-related behaviours. The Six-Cs are ways of organising these factors.

As was outlined in the previous chapter, my thesis will not focus on the biological (cell level) aspects of childhood obesity, and thus the most relevant application of the Six-Cs model is the overall complexity it represents, and the acknowledgement of the interplay between social and biological factors.

Figure 8 The Six-Cs developmental ecological model of contributors to overweight and obesity in childhood (copied from source)[51]

3 CHILDHOOD OBESITY PREVENTION IN AFRICA: OVERVIEW OF EXISTING EVIDENCE AND RESEARCH GAPS

3.1 Background

This work is published as:

Klingberg S, Draper CE, Micklesfield LK, Benjamin-Neelon SE and van Sluijs EMF. Childhood Obesity Prevention in Africa: A Systematic Review of Intervention Effectiveness and Implementation. International Journal of Environmental Research and Public Health. 2019;16(7):1212. doi:10.3390/ijerph16071212

It was presented at the International Society for Behavioural Nutrition and Physical Activity Annual Meeting, Hong Kong, June 2018, as an oral presentation in the symposium “Childhood obesity prevention in low- and middle-income countries: harmonising global evidence and contextual factors in interventions.”

3.2 Introduction

As the intervention development frameworks introduced in Chapter 2 emphasise, it is important to understand the extent and quality of existing evidence in the beginning of any intervention development process. However, to the best of my knowledge, there have not been any systematic reviews on childhood obesity prevention interventions focused specifically on African countries. Earlier reviews on similar topics that have included African countries have examined school-based childhood obesity prevention,[168] and physical

activity promotion[169] across LMICs, and other obesity-related topics, such as the relationship between socioeconomic status and overweight and obesity, among school children in Sub-Saharan Africa.[170]

Recent reviews of high-quality childhood obesity prevention interventions shed light on effective interventions from many different settings but they have only included one study from an African country.[61,171,172] At the time that this systematic review was carried out, no African studies had been included in existing global reviews. While this already suggests that there may not be much evidence from the African continent, or that the quality of existing evidence is low, it is critical to understand the research that has already been conducted in the region, and identify lessons that can inform future interventions. As was established in Chapter 1, behaviours and norms that influence behaviours such as physical activity are highly context-specific. Therefore, the best avenues for intervening in obesity-related behaviours cannot be assumed based on evidence from other countries or settings. Systematic reviews have been criticised for inadequately considering the context in which interventions take place,[173] and it is thus important to situate findings and interventions in the specific implementation settings, and reflect on how evidence can be translated across settings.

It is also valuable to consider whether interventions are targeting individuals and their behaviours directly, or through changing some aspect of the environment. As was described in Chapter 2, social-ecological models conceptualise different levels of the environment in relation to individuals, and it is thus a useful to employ such frameworks for examining behavioural interventions, and understanding how they are situated within the wider context of individuals.[56]

Social-ecological levels of influence include individual or intrapersonal, interpersonal, institution, community and policy.

The aim of this chapter is to review existing evidence on the effectiveness of behavioural childhood obesity prevention interventions in African countries on anthropometric and behavioural outcomes in children ages 2–18 years. In addition, the following sub-questions are considered:

- What behaviours have been addressed in past interventions?
- What age groups and settings have the interventions targeted?
- What levels of the social-ecological model are the interventions situated within?
- How do these aforementioned characteristics relate to effectiveness of interventions?
- What barriers and facilitators to implementation or effectiveness have been identified in existing studies?

3.3 Methods

I conducted and report this systematic review according to the PRISMA guidelines,[174] and focused on behavioural childhood obesity prevention interventions targeting 2–18 year-olds in African countries. I only considered published, peer-reviewed articles describing experimental or quasi-experimental studies. I did not apply any limitations to language but considered literature published before 1990 unlikely to be of relevance due to the low levels of

overweight and obesity prevalence in the African region at that time.[175] Table 11 describes all inclusion and exclusion criteria.

Table 11 Eligibility criteria for the systematic review

	Included Studies	Excluded Studies
Population	Generally healthy, typically developing children and adolescents ages 2–18 years residing in African countries	Studies targeting children and adolescents with specific disease or condition, including asthma, diabetes, and obesity
	Normal or mixed weight populations	African populations residing outside of Africa
Intervention	Any behavioural (including but not limited to) physical activity- or diet-related interventions aimed at preventing overweight and obesity (even if not explicitly stated) among children in any context (home, community, school, etc.)	Obesity treatment interventions, malnutrition prevention interventions targeting undernutrition, non-behavioural interventions
Study design	Primary research question: Randomised or non-randomised controlled trials (cluster or individual), controlled pre-post studies, prospective cohort studies with a control group, interrupted time series and repeated measure studies, quasi-experimental studies and natural experiments	Cross-sectional studies, non-experimental studies, non-human studies, laboratory-based studies
	Sub-questions: Any design, including qualitative studies, as long as they are describing the same studies as those selected for answering the primary research question of the review	N/A
Outcomes	Primary outcomes: Adiposity-related outcomes, including prevalence of overweight and obesity, and body composition. Intermediate behavioural outcomes such as changes in physical activity and fitness, sedentary behaviour, and dietary behaviour	Other health outcomes, such as blood pressure, if not reporting about relevant adiposity outcomes
	For behavioural outcomes, both objective and subjective measures of physical activity, dietary behaviour, or other relevant behaviours, such as sedentary behaviour, are acceptable	Other outcomes of behavioural interventions, such as cognitive development, if not reporting about relevant behavioural outcomes (increased

		physical activity, fitness, sedentary behaviour, or dietary behaviour)
	Secondary outcomes from sibling article search: Barriers and facilitators to implementation of childhood obesity prevention interventions	N/A
Publication type	Peer-reviewed journal articles	Conference abstract, working paper, study protocol, report, dissertation, book, website
Publication year	1990 onward	Before 1990
Setting	Any African country according to the World Bank's regional definitions of Sub-Saharan Africa and North Africa[176,177]	Countries in any other regions
Language	Any language	N/A

I employed a comprehensive search strategy using the search terms outlined in Appendix C to identify relevant literature published between January 1990 and May 2017. I searched the following seven databases: Embase, Scopus, Medline, Web of Science, SciELO, PsycINFO, and the Cochrane Library.

In addition to database searches, I searched for additional relevant literature through checking references of included articles, and the previously mentioned existing reviews,[168–170] consulted key researchers regarding relevant journals to screen, and screened online archives of recommended regional journals (see Appendix C). This screening process covered all issues available in the journals' online archives as of June 2017.

I used referencing software (Mendeley, EndNote) to manage titles and abstracts retrieved through the comprehensive search. I removed duplicates, and screened citations using a checklist based on the eligibility criteria. I undertook all title and abstract screening, and EMFvS carried out a duplicate screening of 500 titles in order to harmonise screening approaches. LKM further checked a random sample of 10% of all titles and abstracts. I obtained the full text of all studies identified as potentially eligible following the screening of titles and abstracts. EMFvS and I duplicate screened these articles independently, and decided on final inclusion based on the eligibility criteria in Table 11. The flow of the screening and selection process is illustrated in Figure 9.

I carried out data extraction using a piloted data extraction spreadsheet, and SEBN checked the extracted data adding any missing information to the form. I extracted the following data: study title, intervention name, population targeted, intervention description, study design, information about control group or comparison, outcomes, outcome measurements, publication type, publication year, setting, country, language, inclusion criteria, baseline descriptive data, randomisation procedure, length of intervention, length of follow-up, number of follow-ups, losses to follow-up, sample size, effectiveness for all relevant outcomes, details of tests and adjustment, subgroup effects if relevant, and any related publications referred to in the article.

EMFvS and I independently carried out a duplicate scoring exercise, assigning effect scores to each outcome type (dietary behaviour, physical activity, or anthropometric outcomes) for each intervention. This approach to comparing effects has been used and described in other reviews.[178–181] The scores were composites based on all relevant outcomes (e.g., different fitness indicators)

reported in each study, and ranged from “++” to “- -“, where “++” denotes a statistically significant, clearly intervention-attributable desired change on primary outcome or most outcomes of interest; “+” denotes a desired change on primary outcome, or mostly desired changes on relevant outcomes; “0” denotes no changes, mostly no changes, or both positive and negative changes that cancel each other out; “-“ denotes a negative change on primary outcome, or mostly negative changes on relevant outcomes; and “- -” denotes a statistically significant, clearly intervention-attributable negative change on primary outcome or most outcomes of interest. EMFvS and I re-examined differences in scoring, ensuring that each intervention was scored according to the scoring criteria. We also generated summary scores for each behaviour by comparing the number of different scores and awarding the most frequent score as the summary score.

LKM and I independently carried out a duplicate assessment of the methodological quality of included studies using the Quality Assessment Tool for Quantitative Studies developed by the Effective Public Health Practice Project.[182] Where it was difficult to fully harmonise ratings due to unclear criteria or study reporting, a combined quality rating (e.g., weak-moderate) was assigned. No meta-analysis was carried out due to heterogeneity in study designs, outcome measures, and reporting.

In order to answer the sub-questions of this review, I conducted a search and review of process evaluations or other articles directly related to the included interventions. These articles are referred to as “sibling articles”, capturing published work “commissioned specifically to explore the context surrounding an effectiveness study, with the explicit aim of documenting the process and explaining contextual factors that influence implementation and/or outcomes”[183]

(p.4). Search approaches included reference checking of included articles and using intervention names and author names as search terms in PubMed and Google Scholar. Sibling articles identified through this process, as well as all included articles, were then re-reviewed and data corresponding to the review's sub-questions were extracted using an Excel spreadsheet. These data items included behaviours, age groups, and levels of the social-ecological model targeted by each intervention, observations (including quotes) about how these characteristics relate to effectiveness, as well as observations regarding barriers and facilitators to intervention effectiveness or implementation. Data extraction and the resulting observations were checked by CED and EMFvS, and reflections were discussed within the review team, particularly between myself and CED.

3.4 Results

3.4.1 Design and quality of included interventions

The combined search strategies yielded 9,714 non-duplicate articles, of which 17 were included for full review (Figure 9). They describe 14 different interventions from three African countries: South Africa (n = 9), Tunisia (n = 4), and Uganda (n = 1). Articles that were excluded during the full text screening stage were either targeting undernutrition, did not test a behavioural intervention, or were evaluated outside of Africa. Included interventions and their evaluations are described in detail in Table 12.

Out of the 14 included interventions, three were randomised controlled trials, while the others utilised pre-test/post-test designs with (n = 8) or without (n = 3) a comparison group. The methodological quality of most studies was considered weak (n = 11), and this was due to both shortcomings in design and incomplete reporting. The theoretical basis of interventions was seldom explicitly reported but some (n = 3) referred to the social-ecological model or social cognitive theory.[184–187] Very few formal process evaluations or sibling articles were identified through the additional search process. Only one intervention (HealthKick, tested in the Western Cape in South Africa) explicitly involved a process evaluation, and there are several published articles documenting everything from intervention development[144,188,189] to implementation[190] of the HealthKick intervention. Moreover, the authors of some of the other included studies provided useful insights about the interventions or the study context more generally either in the evaluation studies included in the systematic review,[191–195] or in other publications.[196–198]

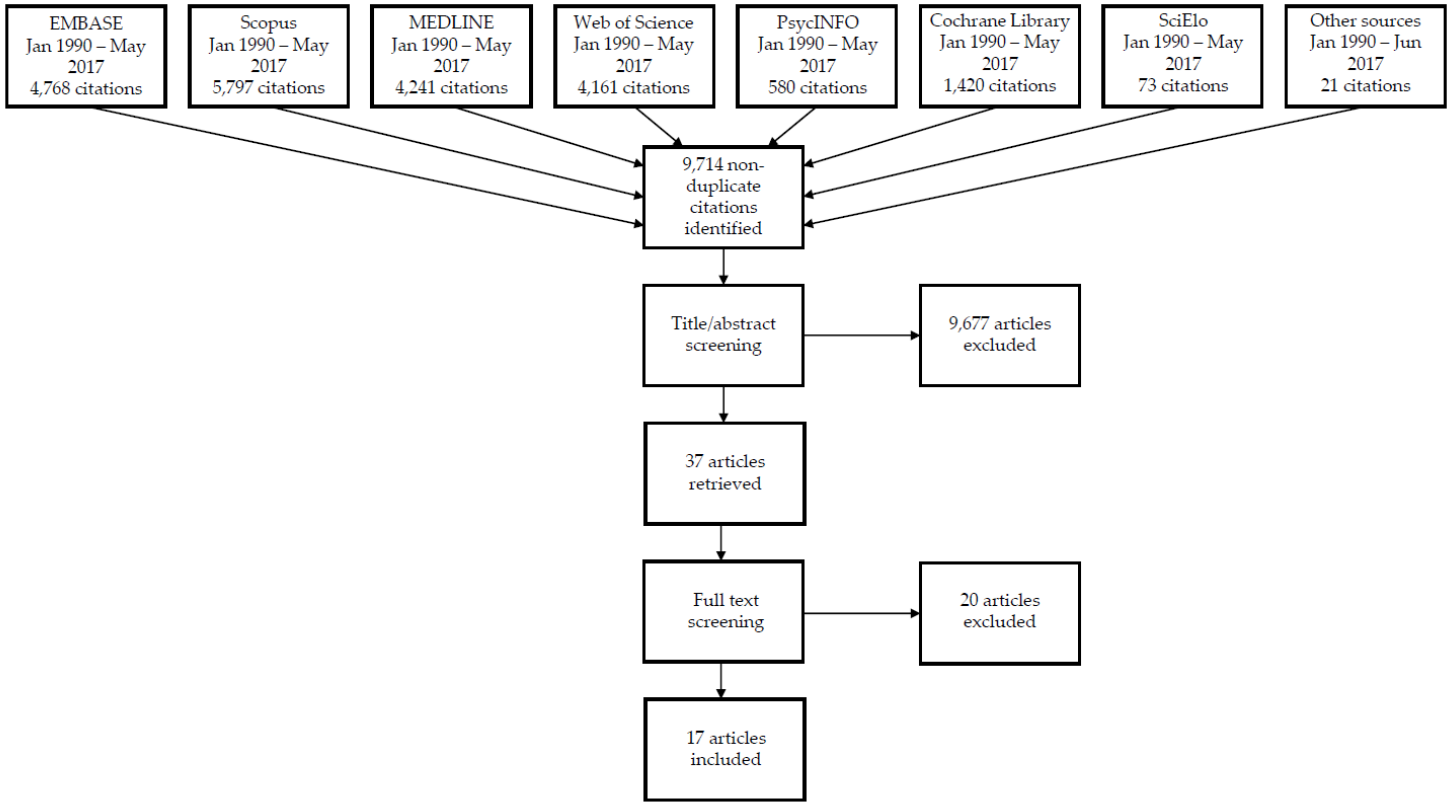

Figure 9 Flowchart of search, screening and selection process

Table 12 Characteristics of included childhood obesity prevention interventions in African countries (n = 14)

Intervention and study references	Intervention context (targeted setting)	Baseline characteristics	Study design	Components, dose and levels of social-ecological model	Outcomes
DoH Health Promoting Schools Nyawose & Naidoo 2016 [193]	Low socio-economic status Clermont Township, KwaZulu-Natal South Africa (School, family)	N = 129 Gender: 51.2% boys Age: 11–15, mean 12.26 years	Quasi-experimental, non-equivalent groups design with an intervention programme and assessment pre- and post-intervention.	4-month intervention. Introduced various methods of PA and healthy nutritional habits within the PE lessons in the school curriculum. A minimum of two one-hour PE workshops were conducted per month. Activities included warm-up games, circuit and fun group games. Parents took part in four group sessions where PA was discussed, and dietary guidelines were introduced. Unable to estimate overall dose received. Levels: Individual, interpersonal, institution.	Sports and PA participation (learner questionnaires that have been used in other South African studies), fitness (Eurofit Physical Fitness Test Battery adapted for use in South Africa), height and weight.

Gum Marom Kids League (GMKL) Richards et al., 2014 [199]	Post-conflict, urban low resource setting, Gulu, Uganda (Community)	N = 1462 Gender: 43.3% boys Age: 11–14	Single-blinded randomised controlled trial nested within observational study.	11-week voluntary competitive sport-for-development football league. 32 volunteer adults from the local community trained as football coaches. Each weekend the GMKL participants took part in a 40-min game of football and various peace-building activities. Overall dose: ~7.5 h over 11 weeks. Levels: Individual, interpersonal, community.	Physical fitness (multi-stage fitness test and standing broad jump), anthropometric outcomes (BMI-for-age and height-for-age z-scores compared with WHO reference data).
Harrabi et al., 2010 [186]	Secondary public schools in Sousse, Tunisia (School)	N = 2338 Gender: 46.8% boys Age: 12–16 (mean 13.3 ± 1.1)	Pre-test post-test quasi experimental design (with control group).	Intervention over one school year. Components included classroom-based health promotion, student projects, health clubs and discussions. Interventions were delivered by project team with teachers and school doctors. Interclass sport tournaments organised throughout the school year. Award ceremony held at the end. Unable to estimate overall dose received. Levels: Individual, interpersonal, institution.	Dietary habits and PA (pre-tested self-administered questionnaire).

HealthKick Steyn et al., 2015 [184], De Villiers et al., 2016 [200], Uys et al., 2016 [185]	Urban and rural primary schools from the lowest 3 socio-economic quintiles, Western Cape, South Africa (School)	N = 998 or 1002 Gender: 47.2% boys Age: 10 years at baseline	Cluster RCT.	3-year whole-of-school program targeting healthy eating and physical activity by creating a healthier school environment. Educators given training and resources to implement their own action plans. Educators asked to give extra 15 min of PA a day and at least one healthy eating activity per month. Schools set goals and implemented changes over three years. Dose: ~1.5 h/week for 3 school years. Levels: Individual, interpersonal, institution.	Dietary behavior (unquantified 24-h recall) and fitness (modified Eurofit). Used both validated and unvalidated questionnaires.
Healthnutz Draper et al., 2010 [192]	Poor urban school setting in Alexandra township, Johannesburg, South Africa (School)	N = Unclear Gender: NR Age: NR	Pre-post test (with control group).	3-month intervention. Training for teachers 2 months prior to implementation, weekly PA and health education sessions for learners incorporated into curriculum. Unable to estimate overall dose received. Levels: Individual, interpersonal, institution.	Anthropometric measurements (height and weight), physical fitness (Eurofit Fitness Testing protocol adapted for use in South Africa).

Hochfeld et al., 2016 [191]	Poor urban school setting in Alexandra township, Johannesburg, South Africa (School, community)	N = 1975 Gender: 52% girls Age: 6–17, median 10	Pre- and post-test design (no control group).	14-month intervention. School breakfast provided, school kitchen upgrades, nutrition education, community development activities. Unable to estimate overall dose received. Levels: Individual, institution, community.	Anthropometric measurements (height, weight, BMI using standard protocols).
Kebaili et al., 2014 [201]	Public schools in urban setting in Sousse, Tunisia (School)	N = 2338 Gender: I: 46.8% boys, C: 46.5% boys Age: 12–16	Pre-post quasi-experimental evaluation.	3-month intervention. Interactive lessons and activities delivered by trained teachers in collaboration with doctors. Unable to estimate overall dose received. Levels: Individual, interpersonal.	Dietary behaviour (pre-tested self-administered questionnaire).
Maatoug et al., 2015 [202]	Urban preschools in Sousse, Tunisia (Preschool, family)	N = 539 Gender: I: 53.6% boys, C: 46.4% boys Age: I: Mean 4.50 years (±0.51), C: 4.73 years (±0.34)	Quasi-experiment (with control group).	8-month preschool-based intervention. Lifestyle intervention with training sessions, workshops, tournaments and educative supports to teachers and parents. Unable to estimate overall dose received. Levels: Individual, interpersonal.	Eating habits, PA, and screen time (parent questionnaire).

“Masikhusele iKamva Lethu” (“Let Us Protect Our Future.”) Jemmott et al. [187]	Urban and rural schools in Eastern Cape, South Africa (School)	N = 1057 Gender: 52.8% girls Age: 9–18 (mean 12.4)	Cluster RCT.	6-day intervention. Theory-based, highly structured health promotion intervention consisting of 12 1-h modules. Sessions included interactive exercises, games, brainstorming, role-playing, and group discussions. Materials included comic workbooks specially designed for the intervention. Dose: 12 h in 1 week. Levels: Individual, interpersonal.	Dietary behaviour (self-report using 7-item food frequency questionnaire developed by the National Cancer Institute) and PA (self-reported PA over past 7 days using CDC-developed 3 item questionnaire).

Nutrition and Physical Activity (NAP) Pilot Naidoo et al., 2009 [203]	4 primary schools in KwaZulu-Natal, South Africa (School)	N = 256 Gender: 44% boys Age: Grade 6 learners	Prospective empirical pilot study with an intervention and an assessment before and after intervention (no control group).	6-month intervention. Classroom-based materials were developed with cost-effectiveness and sustainability in mind. NAP was integrated into the school curriculum. Educators were trained to lead intervention activities and had some freedom in how to implement these. At least two monthly follow-up visits to schools by the research team was provided. There were also changes to the school food environment. Unable to estimate overall dose received. Levels: Individual, interpersonal, institution.	PA (self-reported through learner questionnaire).

Nutrition and Physical Activity (NAP) Naidoo & Coopoo 2012 [194]	Rural, peri-urban and urban schools in KwaZulu-Natal, South Africa (School)	N = 798 at baseline Gender: 54% boys Age: 9–16 years (41% of learners aged 12 at the onset of the study)	Pre-post evaluation (with control group).	18-month intervention. Classroom-based materials were developed with cost-effectiveness and sustainability in mind. NAP was integrated into the school curriculum. Educators were trained to lead intervention activities and had some freedom in how to implement these. Unable to estimate overall dose received. Levels: Individual, interpersonal, institution.	PA (self-reported through learner questionnaire) and fitness (measured using Eurofit Physical Fitness Test Battery, 1993).
PLAY Naude et al., 2008 [204] PLAY Lennox & Pienaar 2013 [205]	Secondary schools in a low socio-economic township area in the North-West Province, South Africa (After-school) Secondary schools in a low socio-	N = 279 Gender: 40.5% boys Age: 13–18	Pre-post evaluation (with reference group).	19-week voluntary after school PA programme supervised by Biokinetics students. The programme was performed twice weekly for an hour session per day, and consisted of 20 min of aerobic dancing, 20 min of ball games, and 20 min of strength- and flexibility exercises. Dose: 38 h (2 h/week for 19 weeks) Levels: Individual.	BMI (anthropometric measurements according to ISAK-standard) and body fat % (Bod Pod, and tricep and subscapular skinfolds).

	economic township area in the North-West Province, South Africa (After-school)	N = 318 Gender: 43% boys Age: Grade 8 (13–14)	Quasi-experimental before-after evaluation (with control group).	6-month voluntary after-school physical activity intervention. Two 60-min sessions a week. The sessions were divided into 30 min of aerobic training, 15 min of strength and flexibility training, and 15 min of sport-related ball skills activities. Dose: 52 h (2 h/week for 26 weeks). Levels: Individual.	PA (previous day PA recall) and fitness (“The Bleep test”).

“Schools in Health” Maatoug et al., 2015 [206]	Urban school setting in Sousse, Tunisia (School, family, community)	N = 4003 Gender: I: 50.2% boys, C: 46.5% boys Age: 11–16	Quasi-experiment (with control group).	3-year school-based intervention. Trained student leaders organised events, teachers ran sessions to promote PA and healthy diets. After-school soccer games both within and between schools. Information about healthy behaviours was provided to students and parents. Snack stores were encouraged to stock healthier options, and children were rewarded with stickers for choosing healthy snacks. Unable to estimate overall dose received. Levels: Individual, interpersonal, institution, community.	Overweight/obesity (standard anthropometric measurements), PA (standardised, pretested questionnaire) and dietary behavior (standardised, pretested questionnaire).
Walter 2014 [195]	3 disadvantaged primary schools in Port Elizabeth, South Africa (School, family)	N = 79 Gender: 48.1% boys Age: Mean age 10.27 ± 1.22, range 9–12	Experimental design (no comparison).	6-week intervention delivered by University students with parents and teachers. The intervention focused around providing sports and play equipment to schools. Focus on free play. Unable to estimate overall dose received. Levels: Interpersonal, institution.	PA (Actigraph accelerometry).

BMI = Body Mass Index; C = control group; I = intervention group; NR = not reported; PA = physical activity; PE = physical education.

3.4.2 Targeted settings, age groups and behaviours

All except one preschool intervention in Tunisia and one community-based sport-for-development programme in Uganda were school-based or after school programmes. Five interventions reportedly targeted more than one setting: school and family,[193,195] preschool and family,[202] school and community,[191] and school, family and community.[206] Included interventions addressed physical activity (n = 12),[185–187,192–195,199,202,203,205,206] dietary behaviour (n = 6),[184,186,187,200–202,206] and eight reported on anthropometric outcomes.[191–194,199,203,204,206] Only one intervention[202] targeted preschool age children, while all others targeted school-age children.

3.4.3 Outcome measures

A diverse range of outcome measures were employed across the studies (Table 12 and Appendix C). Although many studies reported on physical activity, most relied on subjective, self-report data as opposed to objective measurements. Only one intervention evaluation used accelerometery data.[195] Evaluation of fitness was generally done using recognised protocols.

Dietary behaviours were similarly generally measured using self-report, or parents' reports of children's diets. Included studies did not generally report on whether measures or protocols had been validated in the specific context in which they were being used. Shortcomings in reporting of outcome measures contributed to low quality ratings of many studies.

3.4.4 Intervention characteristics and levels of the social-ecological model

Interventions included curriculum changes,[186,192–194,203] additional sessions of physical activity or physical education,[184–187,192,193,199,200,202,204–206] additional teaching around healthy eating and lifestyles in general,[184–187,191–193,200–202,206] providing training or materials to teachers or parents,[184,185,192–195,200,202,203,206] organising sports tournaments or leagues,[186,199,206] providing or improving school meals,[191] and changing different aspects of the school environment.[184,185,191,195,200,203,206] All but one intervention involved several different components, the exception being a low-cost physical activity promotion intervention that primarily involved providing sports equipment, toys, and upgrades to the school playground in order to stimulate more free play.[195] As for levels of the social-ecological model,[56] most interventions focused on individuals, and to a lesser degree school environments, including school level policies and curricula (institutional level). Some also targeted teachers and families (interpersonal level) and the community. Intervention length varied from six days to three years. Intervention-specific levels of the social-ecological model and estimated intervention doses are reported in Table 12.

3.4.5 Effectiveness

Table 13 summarises intervention effects by intervention (See Appendix C for further details on effects for specific outcomes). There was no overall evidence of effect on dietary behaviour. Only two studies[187,201] out of six reported an

overall positive effect, while the remaining four interventions reported no effects.[184,186,200,202,206] More studies reported improvements in physical activity, and particularly fitness, with 6 of 12 interventions reporting positive overall effects.[186,187,192,194,195,203] However, the remaining studies reported no overall effects,[185,193,199,202,204,206] resulting in an overall physical activity effect score of between “0” and “+”.

Beyond behavioural outcomes, positive effects on anthropometric outcomes (n = 4 of 8 studies) included reductions in the prevalence of overweight or obesity (-3.1 percentage points,[206] -7.4 percentage points[191]), and mean weight,[193] and a statistically significant, intervention-attributable reduction in body fat in one South African study.[204] However, one study reported an increase in weight among participants in the intervention group,[192] which was statistically significant when compared to the control group. In summary, the overall effect score for anthropometric outcomes was between “0” and “+”.

In terms of targeting or reaching specific groups, a study evaluating a South African physical activity intervention included observations regarding the differential effects the intervention had in different age groups.[195] The strongest effect on physical activity outcomes was found in the youngest age group (Grade 3 learners, mean age 9.22) compared to the other groups (Grade 4–6 learners, mean age 10.42–11.45), and this was interpreted to be because the intervention promoted physical activity in the form of playing that may have been more suitable for the younger children. Moreover, the Ugandan sports-for-development programme seemed to attract participants who were already physically fit, and thus failed to target those who would have benefitted most from the intervention.[197]

While not all school-based or after school interventions (n = 12) were successful or effective, their pooled effect scores are clearly positive for both physical activity and anthropometric outcomes when separated from the non-school-based interventions (n = 2), neither of which were effective. The effect score for dietary behaviours remains at zero when looking at intervention settings separately.

Table 13 Quality assessment and effect scores by intervention and targeted outcome

Study	Quality assessment	Effect on dietary behaviours	Effect on physical activity	Effect on anthro-pometric outcomes
DoH Health Promoting Schools [193]	Weak	.	0	+
Gum Marom Kids League [199]	Moderate–strong	.	0	0
Harrabi et al. [186]	Weak	0	++	.
HealthKick [184,185,200]	Weak	0	0	.
Healthnutz [192]	Weak	.	+	-
Hochfeld et al. [191]	Weak	.	.	+
Kebaili et al. [201]	Weak–moderate	+	.	.
Maatoug et al. [202]	Weak	0	0	.
“Masikhusele iKamva Lethu” [187]	Weak	++	++	.
NAP pilot [203]	Weak	.	+	0
NAP [194]	Weak	.	+	0
PLAY [204,205]	Weak	.	0	++
“Schools in Health” [193]	Weak	0	0	+
Walter [195]	Weak–moderate	.	+	.
Overall	Weak	0	0/+	0/+

3.4.6 Implementation barriers and facilitators

Barriers reported to implementing school setting interventions included a lack of resources in schools,[190,192,193,195] low priority of physical education,[195] teachers' or other stakeholders' lack of time, buy-in, training or motivation,[190,193,194] teachers' fear of being criticised for implementing an intervention incorrectly,[192] and external disruptions to implementation, such as strikes.[190]

Two South African school-based studies recognised teachers' positive attitudes towards the interventions as facilitating implementation. One study by Walter reports that a physical activity intervention which involved giving low resource schools playground and sports equipment to stimulate free play also improved the appearance of the schools, and teachers reportedly responded positively to the changes, with comments such as "our school looks like a real school now"[195] (p. 364).

The qualitative evaluation of the South African Healthnutz intervention found that teachers were observing positive changes to the school environment, such as improved dynamics between teachers and learners, as a result of the intervention.[192] However, the authors also reported implementation challenges, such as problems with motivating teachers to deliver the intervention.

A South African school breakfast intervention, which improved learners' anthropometric outcomes and reduced the prevalence of overweight and obesity, reported that serving learners breakfast seemed to promote physical activity in addition to introducing the healthy habit of eating breakfast, as teachers subjectively observed changes in learners' levels of activity.[191] In this

urban low resource setting, the opportunity to engage in one healthy behaviour seemed to enable other healthy behaviours, and this may have contributed to achieving desired changes in anthropometric outcomes.

In the process evaluation of the South African intervention HealthKick, it was observed that engaging parents might be more effective in achieving changes, as mainly targeting individuals and the school environment did not achieve significant results.[190] This would involve addressing more levels of the social-ecological model at once. Indeed, the formative research carried out for HealthKick did involve parents, and identified the need to target parents through interventions too.[144] However, the formative stage also indicated that parental engagement was low and challenging for schools in the study area. Another South African intervention, the Department of Health's Health Promoting Schools initiative, included a family component, and was reportedly successful in engaging parents.[193] Parents' active participation in group discussions improved over the course of the intervention, and the authors also report that parents' own attitudes and behaviours around physical activity improved, which contributed to promoting physical activity among learners.

3.5 Discussion

This chapter provides an overview of behavioural childhood obesity prevention interventions that have been implemented and evaluated in African countries. It also reflects on lessons that can be learnt from these studies in the absence of a mature and high-quality evidence base. Most of the African interventions I

reviewed had some reported effect on either behavioural or anthropometric outcomes; but overall, there was only limited evidence of effectiveness on each outcome of interest. Evidence of effectiveness is particularly scant for dietary behaviours. I observed more promising effects on physical activity and anthropometric outcomes but the majority of interventions I assessed were of weak methodological quality. In light of the overall weak quality of the studies, it is clear that there is a dearth of high-quality evidence of effective strategies to prevent childhood obesity in African settings. However, some interventions did achieve desired changes to health-related behaviours, which is meaningful regardless of effects on obesity per se. Focusing on promoting healthy behaviours may be more appropriate than specifically framing interventions as obesity prevention, particularly while undernutrition also persists in many African settings.

The included studies described interventions in only three different African countries, which in itself suggests that evidence of childhood obesity prevention interventions in Africa is scant. This partly reflects the comparably low rates of childhood overweight or obesity in some parts of Africa but it is interesting to compare the contexts of these three countries. Tunisia is a lower middle-income country in North Africa, with a reported overweight or obesity prevalence of 25% among 5–19-year-olds in 2016.[207] In South Africa, an upper middle-income country, the corresponding figure was 24.7% in 2016,[208] whereas Uganda, a low-income country in East Africa, had a lower overall prevalence of overweight or obesity of 10.3% among 5–19-year-olds in the same year.[209] The burden of non-communicable diseases is high in all three countries, with dietary risks, high blood pressure, high fasting glucose, and malnutrition among the top ten

causes of disability-adjusted life years[210–212] even if the urgency of childhood obesity per se is not the same across the countries.

School-based and after school interventions dominate much of the literature on childhood obesity interventions globally,[171,172,213] and out of the included interventions, those set around schools were effective in many cases. However, this conclusion should be drawn cautiously considering that so few other intervention settings have been comprehensively tested in African countries. Based on our review, it is not possible to conclude that non-school-based interventions are ineffective even though these approaches did not demonstrate intervention-attributable effects in our synthesis. Further high-quality research is needed to identify the utility of targeting different settings in African contexts.

As for which behaviours to target, there have been mixed results from other systematic reviews conducted in high-income settings. Interventions focusing on dietary behaviours alone were found to be more effective in a systematic review of childhood obesity prevention interventions set in HICs.[171] However, a global review which does not include any African countries found targeting dietary behaviours and physical activity together to be the most effective approach.[172]

A synthesis of meta-analyses and reviews of health behaviour interventions suggests that interventions targeting single behaviours are more effective than those targeting multiple behaviours in changing the behaviour in question but interventions targeting multiple behaviours, such as both dietary behaviours and physical activity together may have a greater effect on changing weight.[214] Based on our review, there is no clear trend in existing African interventions to

suggest that targeting single or multiple behaviours is better. Decisions about what behaviours to target should be guided by the behavioural epidemiology of the specific intervention context,[163] and this may vary considerably between different age groups. More research on childhood obesity prevention interventions targeting younger, preschool age children in African settings is needed, given the rapidly increasing prevalence of overweight and obesity in this age group.

Moreover, other systematic reviews of childhood obesity prevention interventions suggest that focusing on schools in combination with community or home settings may be the best approach.[171,172] In this review, I found five examples of interventions targeting multiple settings,[191,193,195,202,206] of which two targeted both schools and families,[193,195] and one targeted schools, families and the community.[206] However, the observations regarding the challenges of engaging parents in school-based interventions[144,190] introduce the question of whether these combined approaches actually could improve the effectiveness of childhood obesity prevention interventions in low resource settings in African countries seeing as parental engagement may not be feasible. It is possible that a different approach is needed, and including a focus on community or wider family may be more useful than specifically trying to engage parents in school-based interventions. Again, understanding the specific intervention context is crucial when following recommendations from HIC studies.

Nevertheless, some of the identified barriers (e.g., lack of buy-in or time from teachers or school management) and facilitators (e.g., intervention benefits beyond health outcomes) to implementation and effectiveness are similar to the challenges of implementing school-based interventions in HICs.[192] This may

facilitate the use of existing, HIC-dominated evidence of childhood obesity prevention interventions in designing and developing new interventions in LMIC settings. However, as most of the interventions included in our review are school-based, it is possible that interventions targeting other settings may encounter different challenges that are more unique to the specific context in which they are implemented.

By assigning effect scores to each intervention by the behaviours it targeted, I was able to gain an overall understanding of the effectiveness of childhood obesity prevention interventions in African countries on anthropometric and behavioural outcomes in children ages 2–18 years. However, it was challenging to pool together effect scores for vastly different outcomes, such as specific fitness indicators and overall levels of physical activity. In most cases, it was also difficult to attribute effects to the interventions due to limitations in both study design, and analyses performed. Where detailed comparison between intervention and control groups was not available, I based judgements on what authors described in words, and cautiously assigned effect scores based on the data available in each paper.

While the included studies were too heterogeneous for a meta-analysis, I found it useful to consider what evidence currently exists but has not necessarily been captured in global or regional reviews due to more stringent inclusion criteria. Another strength of this review is that the systematic search was complemented with a screening process of regionally relevant journals, which were not all indexed in mainstream databases. However, this also introduced an element of bias as searching and screening beyond databases involves choices around inclusion and exclusion of specific journals. Similarly, while I did not use

language as an exclusion criterion, our search strategy was in English, and this may have affected our ability to find all potentially relevant articles in other languages if they did not have translated abstracts or English keywords.

The challenges I experienced in synthesising evidence due to the heterogeneity of studies have also been reported in other reviews focusing on African or LMIC settings.[100,168] By highlighting research gaps that exist both in terms of quality and quantity of studies, I hope to encourage further research into childhood obesity prevention interventions in African countries, including accompanying process evaluations. Conducting process evaluations, and using appropriate theories as the basis for interventions has been recommended but is often neglected.[168,215,216] While it cannot be claimed that theory-based interventions would have been more effective by virtue of being theory-based, a more explicit theoretical basis could have helped to unpack the limited effectiveness of many of the interventions included in this review, even in the absence of process evaluations. A key recommendation for future research is to make use of more rigorous evaluation designs in terms of appropriately powered randomised or cluster randomised controlled trials, as this would vastly improve the evidence base of childhood obesity prevention in African countries. However, this can only happen with substantial and sustained research funding, and further capacity building to ensure the availability of a well-trained work force to conduct the research. This may not only aid an increase in the quantity and quality of the research, but also the ability to develop and comprehensively evaluate more complex interventions, including those targeting families and communities. In addition to improving the quality of evaluative designs, and conducting process evaluations according to existing frameworks and

guidance,[215–217] more detailed reporting when publishing findings would also contribute to a higher quality of evidence.

3.6 Conclusions

Based on current evidence, school-based interventions have demonstrated some potential for childhood obesity prevention in South Africa and Tunisia, but our findings indicate limited overall effectiveness. However, there is a general lack of high-quality evidence of effective childhood obesity interventions across Africa, and I would be cautious about extrapolating from these findings when it comes to other African countries and intervention settings. In particular, few studies have targeted the family or community and even fewer have focused on very young children. Further research building on both global and context-specific evidence will help to develop more effective approaches to address childhood obesity as a growing public health concern.

In South Africa, there is a need to develop effective interventions to prevent and address overweight and obesity in childhood, and promote healthy behaviours throughout the life course. In light of the dearth of evidence on childhood obesity prevention in the early years of life in African countries, including South Africa, the following chapters will focus on children in the preschool age group of 3 to 5 years.

3.7 Contributions

I designed this study together with Esther van Sluijs, Catherine Draper, Lisa Micklesfield, and Sara Benjamin-Neelon with input from Shane Norris and Liesl Nicol to the review protocol. I developed the search strategy with advice from Isla Kuhn and Veronica Phillips at the Medical Library of the University of Cambridge, and conducted the literature searches in all seven databases and relevant unindexed journals. I conducted the title, abstract and full text screening in duplicate with Esther van Sluijs. I carried out data extraction, which was checked and finalised by Sara Benjamin-Neelon. I conducted quality assessments of included articles in duplicate with Lisa Micklesfield. I searched for and screened sibling papers independently, and extracted data from those additional articles with guidance from Catherine Draper. I developed a data synthesis and interpretation method together with Esther van Sluijs, and we assigned effect scores to each included study in duplicate. I critically interpreted the findings and drafted the full manuscript. Esther van Sluijs and Catherine Draper contributed to the interpretation of the quantitative and qualitative results respectively, and all authors provided inputs to, and approved, the final manuscript.

4 CHILDHOOD OBESITY AND CHILDREN'S HEALTH BEHAVIOURS IN CONTEXT: QUALITATIVE METHODS

4.1 Background

In Chapter 2, I introduced the conceptual framework of behavioural epidemiology, and presented the recommended stages of developing complex public health interventions. Chapter 3 therefore serves as a first step in an intervention development process, in which I mapped existing evidence of childhood obesity prevention interventions from African countries and identified research gaps in terms of settings and age groups targeted through existing interventions. I demonstrated that prevention programmes for children of preschool age were largely missing in the extant literature. In this chapter, I describe the methods of an in-depth qualitative study I carried out in Soweto, South Africa in order to generate evidence that can inform future interventions targeting preschoolers in low-income urban settings.

4.2 Introduction

The rationale for conducting in-depth qualitative research on caregiver perspectives and home settings of preschool age children in Soweto is to inform future interventions targeting young children in urban low-income settings in South Africa. Since obesity is a complex public health issue, qualitative research provides opportunities to gain deep, context-specific insights about the individual, family, social, and environmental factors contributing to obesity.

The following two chapters present two related analyses from a qualitative study for which I collected data in Soweto between September 2018 and January

2019. The first analysis focuses on parents' perceptions of preschoolers' weight and size, and the second on the same parents' perspectives on children's movement and dietary behaviours, as well as barriers and facilitators to preschoolers' healthy habits. I will first present a joint methods section for both analyses, but each of the two chapters will begin with the specific background and aims of that chapter.

4.3 Theoretical approach and study design

This study is situated within a contextualist epistemological approach to qualitative inquiry, and utilises semi-structured in-depth interviews, field observations and reflexive thematic analysis.[159,218,219] I selected this approach to enable a focus on individual experiences and perceptions in a way that recognises how the broader social and physical environment may constrain, enable, shape or be shaped by, the individuals, zoomed in on through the qualitative inquiry. As described by Braun and Clarke,[219] a contextualist application of thematic analysis is influenced by critical realist theory that "acknowledge[s] the ways individuals make meaning of their experience, and, in turn, the ways the broader social context impinges on those meanings, while retaining focus on the material and other limits of 'reality'."(p.81) Contextualism is described in more detail in Chapter 2, but briefly, what people say is taken to be a reflection of the reality that they are living and experiencing, and where possible, individual accounts are contextualised by providing a rich description of the environment in which study participants live, and any relevant interactions

between the individual and other levels of the social-ecological model of health,[56] such as family circumstances or community characteristics.

4.4 The study setting

Soweto is a large, densely populated, low-income urban setting, historically known as a township (see Table 6 in Chapter 1). It forms part of the City of Johannesburg Metropolitan Municipality in Gauteng Province, South Africa. The area is a result of colonial and apartheid urban planning, whose policies of racial segregation assigned most of Soweto to Black African residents in an effort to confine them outside of, but not too far from, the city of Johannesburg.[220–222] The township carries enormous historical significance, as its residents, most famously young students of the 1976 Soweto uprising, played a notable role in the anti-apartheid and liberation struggle.[223] The population of Soweto is still predominantly of Black African descent, and the legacy of historical disadvantage is evidenced by frequent protests that block roads in order to bring attention to poor government service delivery in the area. Unemployment is high, although it is difficult to ascertain how it compares to the Gauteng province average of 31% in 2019.[224]

There are numerous squatter communities and informal settlements, consisting of shacks or other informal housing with very limited basic amenities. However, there are also areas that have become more middle-class, as exemplified by renovations, luxurious expansions and new housing developments that provide a visible example of inequality and disparities within Soweto. The

neighbourhoods included in this study represent relatively formal and socioeconomically diverse parts of Soweto. They were selected due to prior research contacts with preschools through which recruitment was carried out. Residents of these neighbourhoods typically live together with extended family in detached houses with electricity and running water that also often have additional rooms or shacks for family members or tenants in the backyard.[225]

The most noticeable differences between the neighbourhoods were related to traffic and resulting safety concerns. Traffic-related safety concerns were prominent because of the high rates of injury and death in South Africa resulting from road traffic accidents, often due to drunk or otherwise reckless driving.[226] All homes had some kinds of fences, yards and gates. Some participants lived on quieter or more spacious streets where children frequently played outside the gates, while others had bigger yards and less need for space outside the gates. Some, however, had very little space for children to play outside the house at all. The neighbourhoods were not noticeably different in terms of other safety concerns beyond traffic.

Soweto has featured prominently in South African public health research, and it hosts the largest and longest running health-related cohort study in Africa, the Birth to Twenty + (Bt20) cohort. Bt20 is the largest and longest running child and adolescent health study in Africa, and it has contributed valuable evidence to numerous studies of relevance to many different child health topics, not least childhood obesity.[227–231] The cohort has been colloquially known as “Mandela’s children” as the birth cohort was set up in 1990, in the final years of apartheid rule, and following Nelson Mandela’s release from prison, again signalling the historical significance of Soweto in the struggle for independence.[232] The cohort

participants are now in their 30s, and even beyond Bt20 there is a rich and growing public health and medical literature focusing on Soweto. However, qualitative research on obesity in the early years of childhood has not been previously done in Soweto, and given the rationales outlined in section 4.1, it is an ideal setting for examining perceptions relating to children's weight, size and behaviours.

4.5 Participants and recruitment

In South Africa, preschools are not part of the compulsory and free basic education system, and early childhood development programmes before the age of five are provided by private day care centres and preschools. This means that parents pay fees for their children to attend preschool, and as such not all children access pre-primary education. Currently, 69% of South African children in the 3-5 years age group attend some form of early learning group programme.[233] Nevertheless, I carried out recruitment through preschools as these could facilitate contact with families that had children in the age group of interest. I approached six preschools with information about the study, and principals from four of them agreed to passing on information and facilitating contact with caregivers of 3-5-year-old children. The other preschool principals were reportedly too busy to get involved in the research, or they did not respond. I recruited sixteen primary caregivers of preschool age children via the four different preschools in four neighbourhoods in Soweto, South Africa. Characteristics of the study participants are described in Table 14.

This recruitment approach combined elements of purposive and convenience sampling. While the choice of preschools was purposive in the sense that they would ensure some socioeconomic diversity in the sample, they were also known to the fieldwork assistant or my supervisor through prior contact. I recruited new participants until there was sufficiently rich and diverse data to answer the study's research questions. This was done purposively according to inclusion criteria, such as being fluent in English and vocal enough to participate in a qualitative interview according to the fieldwork assistant's assessment. This also involved an element of convenience in the sense that participants were recruited gradually rather than selected out of the entire pool of potential participants, as the latter was not practically feasible.

Out of the 16 participants, 14 were biological mothers of at least one preschool age child. Two participants were biological fathers of a preschool age child. I made a conscious effort to recruit fathers into the study but the vast majority of both potential and actual participants were women. All participants were of Black African descent but represented different linguistic groups of South Africa. Their preschool age children attended preschool Monday to Friday, from 8 o'clock in the morning to somewhat different hours in the afternoon or evening depending on the parents' work or other commitments. The socioeconomic circumstances of study participants varied somewhat, ranging from participants who were unemployed and without much family support or state welfare, to participants who were employed or studying while living with family members who had a stable income. Some participants were tenants in backyard rooms or shacks, and typically employed and less dependent on extended family than the other participants living in family houses.

Table 14 Sociodemographic characteristics of study participants

#	Age	Relationship to preschool child(ren)	Marital status	Age of preschool child(ren)	Highest level of education	Employment status	Social grants in household	Neighbour-hood
1	21	Mother	Single	4	CSE	Unemployed	Child support	1
2	26	Mother	Single	4	CSE	Employed	Child support	2
3	30	Mother	Married	4	CSE	Unemployed	None	2
4	38	Mother	Divorced	4	CSE	Employed (part-time)	Child support	1
5	47	Mother	Widowed	5	CSE	Employed	None	1
6	23	Mother	Single	4	SSE	Unemployed	Child support	1
7	30	Mother	Married	4	CSE	Employed	None	1
8	42	Mother	Single	3 & 4	SSE	Unemployed	Child support	3
9	36	Mother	Single	5	CSE	Employed	Child support, relative's disability grant	1
10	37	Mother	Single	4	CSE	Employed	Child support	3
11	27	Mother & aunt	Single	4 (son) & 3 (niece)	CSE	Unemployed	Unclear	1
12	25	Mother	Single	4	TE	Recently unemployed (occasional work)	Child support	4
13	25	Mother	Single	4	CSE	Student	None	1

14	24	Father	Single	4	TE	Student (part-time work)	None	1
15	29	Mother	Married	5	CSE	Employed	Older child's disability grant	1
16	37	Father	Single	5	TE	Unemployed	None	1

CSE: Completed secondary education; SSE: Some secondary education; TE: Tertiary education (diploma or certificate). The child support grant is approximately US$28/month/child. Disability grants can be up to approximately US$120/month in South Africa. Neighbourhood 1: Generally quiet, small streets and cul-de-sacs with some space to play in the street; Neighbourhood 2: Very busy roads, small yards and no space to play outside the gates; Neighbourhood 3: Busier streets than neighbourhood 1 but space to play inside yards, and outside the gates in some cases; Neighbourhood 4: Varying traffic depending on location, generally no space outside yards. Some children from neighbourhood 1 attend preschool here.

After providing information about the study, and opportunities to ask questions, I obtained written consent from each participant wishing to participate, and separate written consent for audio recording the interviews. I also gave each participant a R150 (approximately US$10) supermarket voucher at the end of the interview as appreciation of their time, but this was not mentioned in the information sheet or verbally before the interview had been completed so as not to incentivise or pressure people into participating. Some interviews were rescheduled, even several times, and some were cancelled due to potential participants' other time commitments. Not having time to participate was the only reason given for refusals.

4.6 Data collection

I conducted in-depth interviews in English in the participants' homes, or in a location convenient for them, such as a relative's home, between September 2018 and January 2019. A local Sowetan fieldwork assistant with good proficiency in several of the official languages spoken in South Africa in addition to English facilitated contact with preschools and participants, and was present for each interview to assist with data collection. I had trained the fieldwork assistant in basic qualitative research methods and ethics.

I utilised a pilot-tested topic guide flexibly in the interviews (Appendix D). I added new questions and topics to the guide as they emerged throughout the interviews. I also used a questionnaire to collect sociodemographic and other background information (Appendix D). I dropped some items, such as an

observation checklist for toys and sports equipment found in the home, as they were not conducive to a relaxed, friendly and respectful interview atmosphere. In addition to the audio recorded interviews and the background questionnaires, I compiled contextualising field notes based on observations about the interview visit, the participant's home and neighbourhood, and the interactions between the participant and the preschool age child if they were present during the interview. I also discussed field observations together with my fieldwork assistant.

The interview recordings ranged from 28 to 83 minutes in length. Later interviews were longer due to new questions and topics arising and being added to the topic guide. I transcribed the first four interviews verbatim, and coordinated the professional transcription of the remaining twelve interviews. I checked all professionally transcribed interviews against the original recordings, ensuring that they had also been captured verbatim.

4.7 Data analysis

I analysed all transcripts using reflexive thematic analysis according to the process developed by Braun and Clarke,[159,218,219] utilising the field notes to support and contextualise the analysis. I selected this qualitative analysis method because its reflexive nature and compatibility with a contextualist approach enabled analysing individual perspectives in an open, inductive and contextually grounded way. I used analysis software MAXQDA (Release 12.2.0) to support transcription, coding and data management.

This particular method of thematic analysis consists of six phases, which do not necessarily occur in a linear or discrete manner. The first phase of familiarising oneself with the data comprised transcription, checking transcripts, and repeated reading of transcripts. In the second phase, I generated initial codes, and organised these into categories (domains) according to whether they related to childhood obesity, specific behaviours, parenting or other topics. This categorisation was a practical rather than analytical exercise, facilitating the analysis through making the codes easier to navigate. In the third phase, I developed preliminary themes and discussed them with my supervisors. I then reviewed, reorganised, defined and named the themes in the fourth and fifth phases. Finally, I summarised and described the themes in the sixth phase.

The coding was inductive, data-driven and focused on manifest semantic content so as to be open to new concepts or patterns throughout the analysis, and to avoid potentially misguided latent interpretation in this cross-cultural qualitative inquiry.

4.8 Ethical approval

I obtained ethical approval from the University of the Witwatersrand's Medical Human Research Ethics Committee (reference number: M180257, Appendix D), and this approval was also supported by the Psychological Research Ethics Committee at the University of Cambridge in the United Kingdom.

4.9 Contributions

I designed this qualitative study together with Esther van Sluijs and Catherine Draper, with input from Shane Norris to initial plans. I developed the study protocol, and obtained funding from the Cambridge MRC Doctoral Training Programme, and ethical approval from the University of the Witwatersrand and the University of Cambridge. I conducted all 16 interviews myself. I had the assistance of Karabo Sethlafuno for recruitment, fieldwork, and early interpretations, as well as guidance from Catherine Draper for establishing contact with preschools and in the recruitment process more generally. I wrote field notes after each interview based on my own observations and my discussions with Karabo Sethlafuno. I transcribed four of the interviews myself in order to immerse myself with data from the first interviews while conducting the rest, and managed the transcription of the remaining transcripts by a professional transcriber. I checked professionally transcribed interviews against original recordings, and managed and analysed the data using MAXQDA (Release 12.2.0) software. I carried out all coding and theme development, and had discussions with Catherine Draper and Esther van Sluijs about the refinement and naming of themes. I drafted two manuscripts for submission to journals, and Esther van Sluijs and Catherine Draper provided inputs to, and approved, final manuscripts. The article based on Chapter 5 was published in PLoS One in April 2020,[234] and the manuscript based on Chapter 6 is currently being revised for resubmission to a special issue on maternal and child nutrition in Sub-Saharan Africa in the journal Public Health Nutrition. A poster presentation based on chapters 4, 5 and 6 was presented at the International Society of Behavioral Nutrition and Physical Activity (ISBNPA) annual meeting

in Prague, in June 2019, and at the MRC Quinquennial Review site visit to the MRC Epidemiology Unit in Cambridge in November 2019.

5 “The thing is, kids don’t grow the same”: parent perspectives on preschoolers’ weight and size in Soweto, South Africa

5.1 Background

In Chapter 3, I described the dearth of high-quality evidence on childhood obesity prevention in African settings in general, and specifically the lack of interventions targeting young children. In this chapter, I present the first part of my findings based on the qualitative data collection and analysis described in Chapter 4. Here, the focus is on understanding how parents in Soweto perceive preschoolers' weight and size, and how this reflects the home and family context.

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5.2 Introduction

As was established in Chapter 3, much of the literature on childhood obesity prevention in African settings focuses on older, school-age children.[235] Younger age groups are thus a relevant focus for formative research that can inform the development and evaluation of obesity prevention interventions in South Africa. Research has also found that children living in urban low-income settings in South Africa are particularly at risk when it comes to childhood obesity,[123,124,236] and perceptions and behaviours related to childhood obesity in LMICs have not

received much attention in existing qualitative literature, particularly in younger age groups. For example, a review of qualitative studies examining barriers and facilitators to preschool age children's physical activity found such qualitative research from LMIC contexts largely missing.[237] There is thus a need to better understand the circumstances under which obesity develops in the earlier years of childhood in South Africa.

Qualitative research involving South African adolescents has shown that there are complex, and sometimes conflicting, social and cultural norms and ideals related to body size and behaviours such as physical activity and healthy eating.[138,238–241] Previous research in South Africa has also explored views of child-minders and health workers when it comes to childhood obesity in younger children.[242] However, little is known about parental views on childhood obesity and preschool age children's health behaviours in South Africa. Given that parents and caregivers are relied upon to recognise issues and take action when it comes to children's health and well-being, it is important to elicit their views on children's weight and size in specific contexts. Such qualitative work in Indonesia has found, for example, that carers believe "chubbier" children to be healthier,[243] and a study from South Africa also identified perceptions of obesity being associated with wealth and power.[242] However, in the absence of more comprehensive research on such preferences, it is unclear whether this is reflected in the views or practices of South African caregivers of young children.

The aim of this study is to describe how parents or caregivers of young children in Soweto, South Africa, view children's weight and size, particularly childhood obesity, and to situate these perspectives in the context of the home environment in which preschool age children live. The study design is

qualitative, drawing on the experiences and perspectives of parents with a child or children of preschool age (3-5 years) in Soweto using the methods outlined in Chapter 4.

The research questions addressed in this chapter are:

1. What perceptions, beliefs, and priorities do caregivers of preschool children in Soweto have regarding preschoolers' weight and size?

2. What is the significance of the social (family) and physical (home) environments for these caregiver perspectives?

5.3 Findings

Sociodemographic characteristics and other background information about the 16 participating parents is described in Table 14 in Chapter 4. Through the thematic analysis process described in Chapter 4, I developed three themes that capture meaningful patterns of relevance to the aim of this study. They relate to different aspects of children's growth, size, behaviours and family situations.

5.3.1 Growing differently

This theme captures how parents in the study talked about differences in children's body weights and sizes, and illustrative excerpts from the interviews

are presented in Table 15. Parents had different ideas about how children grow, and why some children are bigger or smaller than others. Their views around children growing differently, and whether they were more concerned about underweight or overweight tended to be connected to how they perceived their own preschooler to be growing. Overweight was rarely a concern people had regarding their own children, even if some considered it to be very common among children in their neighbourhood.

Across interviews, many different explanations were offered for why children are different in terms of height or weight. Parents cited the role of genes or family background, and that children and their bodies just are a certain way for no particular reason, as explanations to children growing differently. As several of the quotes illustrate, parents did not necessarily or consistently see a direct link between how much children were eating and how they were growing, and so other factors were seen to be involved in determining a child's weight regardless of eating habits.

Different stages of growth were also acknowledged, and many described "baby fat" as a normal stage, likely to pass as children reached preschool age. Monitoring a child's growth was usually done by observing how they looked compared to other children their age, and how their clothes fit. Some observed with relief that their children had suddenly grown in height, or gained a better appetite. Children being thin or short for their age worried parents, and this was often attributed to a poor appetite in one's own children, and parental neglect or problems in the home when it came to other children. The reasons parents gave for children growing differently thus only selectively placed blame on parents or

circumstances, and tended to focus on biological or otherwise unmodifiable factors.

Table 15 Interview excerpts about growing differently

Theme	Excerpt
Growing differently	"The thing is um, kids don't grow the same. You might feed them whatever you feed them the same amount of food and whatever but from their birth ah they're not the same cos you get a child which weighs three point what, what, or six point what so they won't grow the same. Others are going to be thin." (Interview 5, mother) "I don't know if this makes sense, but his body, like the way he's structured, it's not, he's not someone that would like get fat. I don't know, even if he eats a lot." (Interview 14, father) "I'm thinking maybe it's genetic also because even in his class there are kids that are… huge. When you look at them, they're like seven, eight years... It's just a genetic thing." (Interview 9, mother) "Unless that's genetic of course, there are those people that, it just runs in the genes. No matter how good or badly their situation is, but it's just in the genes. They're just fat." (Interview 16, father) "Others are born like that, you're overweight and having nothing to eat, it's your body, it's like that you know, and you're underweight and you've got everything. You have a plate of food every day, you've got a cereal in the morning, during the day you do have snack, you've got everything but your body it's like so thin, it's your body like that. Others have got nothing but their body is so huge and those people you find that they even go to bed without anything, but it's their body, it's like that." (Interview 5, mother)

5.3.2 The ‘right’ way to be

Discussing the language used to describe children’s weight or size revealed both some personal preferences that parents had, and more general norms regarding the ‘right’ way to be. Interview excerpts that capture this theme are presented in Table 16. According to the parents in the study, both underweight and overweight might be commented on by strangers, other children or parents, but not necessarily in the same way. Underweight was more consistently described as worrying or attracting negative comments or concerns about parental neglect. Overweight, on the other hand, could receive positive attention. Parents tended to be either sceptical about the concept of ‘normal weight’, or unsure about what it meant. Instead, the term that was used to capture a desired size or appearance was “fresh”. What this meant in practice was not about a specific weight but being “fresh” implied not looking too thin, and having enough to eat.

However, the word “fresh” also came up when discussing children’s overweight and obesity as a way to describe the way a child’s body is “supposed to be”, which was distinct from obesity or being fat in a negative sense. Being “fresh” could mean being round, big or “chubby” but not to the point of being somehow negatively affected by the weight or looking older than other children, implying that obesity, on the other hand, meant an unhealthy or very noticeable level of excess weight. “Fresh” was described as a positive word but preferences around size or the ‘right’ way to be were described as not necessarily being connected to health. This is elaborated further in the third theme.

One mother described both others and herself liking the way “chubby” children look but she also did not think that should be something to aspire to, and criticised parents for letting their preferences about cuteness or positive comments from others lead to what might be an unhealthy body size.

A child’s size or weight could be read in many ways, and thus the ‘right’ way to be was not one specific thing, but rather depended on what different parents prioritised. Underweight attracted concerns and negative attention, whereas children’s overweight or obesity could also be attributed to different circumstances in the child’s family, including affluence and a child having everything they want or need, as well as parents not knowing or caring about health risks associated with obesity. In addition to looking nice or representing the ‘right’ size for a child, being “fresh” was also associated with happiness and wealth.

The ‘right’ way to be centred on not being too different from other children, at least not in a negative way, and parents expressed concerns about stigma and bullying if children were perceived to be different. Some of the most educated parents in particular also talked about children’s body image and self-esteem, and the importance of ensuring that children were taught to be confident about who they are, and not affected by other people’s comments.

Table 16 Interview excerpts about the 'right' way to be

Theme	Excerpt
The 'right' way to be	"It's not supposed to be fat, it's supposed to be fresh. There's fat, fat is obese. It is a big baby, a very big baby. And then, the fresh child is a child…where you can't see all the bones. My son, I can see the bones, he worries me [laughing]. Ja." (Interview 10, mother) "Don't take other people's saying and make it yours, you know that your child is big…do something. She might be looking nice, yes, you're chubby, nice, nice, nice…but where does that fatness comes from? You see, you must do something." (Interview 9, mother) Interviewer: "Okay, and you mentioned fresh, what does that mean?" Participant: "The child is living well, like they can get everything they want, that's how they rephrase it." (Interview 1, mother) "Sometimes it helps…the child to be much more resilient and not take offences easily because it's… out there it's a cruel world. It's a terrible world." (Interview 12, mother)

5.3.3 Weight is not health

Interviews easily moved from the topic of weight or growth to other aspects of health, such as infectious childhood illnesses. This theme represents the ways in which a distinction was made between children's weight and their health. As one of the fathers pointed out, weight is not the same as health because being fat does not necessarily mean being unhealthy or healthy. His quote, and other interview excerpts that capture this theme are presented in Table 17.

A child could be healthy or unhealthy regardless of their weight, and health mattered more than weight to the parents in the study. Discussions around what looking healthy meant often focused more on signs of illness in children's behaviour, eyes or skin than observing their weight or growth. What people described as unhealthy foods were not necessarily problematised because of how they might affect children's weight, but rather because of poor food hygiene, causing hyperactivity, negative effects on appetite, and health consequences like diabetes and hypertension.

Concerns around overweight or obesity as health-related problems were described as things wealthier communities or White people worried about because they were seen as having the means to do something about the problem. Here, the recognition of behavioural mechanisms was more prominent, as can be seen from the quote from one of the fathers regarding going to the gym. What participants described as behaviours or specialised healthcare that might address overweight or obesity were seen as requiring money. Weight was not an urgent health issue to be prioritised if resources

were limited, and this was expressed by some as being specific to the working class or Black South Africans.

Nevertheless, study participants were concerned about the consequences of childhood obesity and expressed that weight could become a health issue if it resulted in diabetes or asthma, hindered children's mobility or participation, or could not be reversed. Before that, overweight or obesity were not necessarily much of a concern, with a few exceptions among the socioeconomically better off participants who described wanting to make sure their children would not gain too much weight. As mentioned in the previous theme, these parents also raised issues around weight stigma and bullying. This demonstrates that while health may not be the primary or only lens through which weight is viewed, the concerns around stigma and bullying are linked to children's psychological wellbeing. The possibility of children committing suicide as a result of weight-related bullying was raised, and thus while weight *per se* was not necessarily seen as indicative of health, it could have detrimental consequences to a child's health and wellbeing.

Table 17 Interview excerpts about weight and health

Theme	Excerpt
Weight is not health	"Fat does not mean unhealthy. Fat does not mean healthy, as well." (Interview 14, father) "It depends on what they eat mostly, um yeah mostly what they eat that makes them healthy, cos mostly if you keep on feeding a child junk food it's gonna be a problem. It's gonna give them maybe high hypertension... If you give him sugar most of the times he won't prefer to eat… that sugar will be more important to him than eating food, you see, yes." (Interview 7, mother) "But with us especially Blacks, if a child is big, it's obese, it's not a problem as long as they live... You know with Whites, they take it serious, you know they will go to doctors, for nutrition and...to keep it together. Maybe try and get the child to lose some weight but with us, we must deal... I think they start to taking it seriously maybe when the child start suffering from things like asthma you know, he can't breathe, he can't walk long distance, and, and, and only then. When the child is still fine, walking around, playing around. It's not a problem." (Interview 15, mother) "The middle class can actually do something about it in terms of going to gym, things like that. Paying for that gym." (Interview 16, father) "Sometimes you find there are people who…say funny things or hurtful things towards the parents and the kid. So if a child understands, it's a problem. Sometimes some kids commit suicide because of that. Like there's one child in Katlehong who committed suicide because of how they were teasing him at school. He was a big child, he was very big." (Interview 12, mother)

	“It depends on the age, I think. Firstly, when you say your age, they’re going to be like, ‘ah, and you’re that big’. Like it’s always negative comments…Some people do say it to the child, and it’s wrong because it makes them have low self-esteem. It really affects them.” (Interview 13, mother)

5.4 Discussion

The aim of this study was to examine how parents or caregivers of young children in Soweto, South Africa, view children's weight and size, particularly childhood obesity, and to situate these perspectives in the context of the home environment in which preschool age children in Soweto live. I did this through a reflexive thematic analysis of 16 interviews, which resulted in three themes: growing differently, the 'right' way to be, and weight is not health.

Children being small for their age was a somewhat consistent concern across the interviews but many participants also talked comprehensively about potential negative consequences of overweight and obesity. The reasons parents gave for children growing differently reflected the socioeconomic realities of the study setting as the role of genes or other unmodifiable factors were frequently cited as more significant than behaviours in causing variation in weight and size. This is in line with other recent research from Soweto regarding the limited agency people experience when it comes to behaviours or choices that relate to health and weight.[120] Feeling constrained by environmental factors makes it seem futile to focus on behavioural aspects of health or weight, as there may be very little space or capacity for making changes or healthier choices.

This is an interesting contrast to the more individualistic discourses around personal responsibility in obesity prevention in many high-income settings,[244] and reflects the broader sense of limited agency that was expressed by participants through comments around class and race in a highly unequal

society. These findings underscore the need to consider both equity and effectiveness in developing childhood obesity interventions in low-income settings, as public health interventions that require a high level of individual agency from intended beneficiaries are unlikely to be effective when individuals are constrained by structural and environmental factors.[244]

Children being “fresh” was connected to some positive images like them having everything they want or need. However, the potential health concerns and stigma connected to overweight and obesity meant there was not a consistently positive interpretation of larger body sizes in children. The concerns around negative comments, teasing, and bullying associated with children having overweight or obesity suggest that despite some positive connotations of children’s larger body size, there is also stigma attached to overweight and obesity in this setting. Such concerns were also reported in a study on child-minders’ and health workers’ perceptions of childhood obesity in Cape Town.[242] This complexity is important to bear in mind in developing interventions as problematising obesity as a public health concern may exacerbate such stigma. Weight stigma can be very harmful to individuals, as demonstrated both by accounts of study participants concerned about children’s self-esteem and bullying driving children to suicide, and by public health research.[46]

Previous South Africa-based research with Black women and adolescent girls has also found views of overweight and obesity to be nuanced, complex and mixed in terms of both positive and negative connotations.[141,142,245] In contrast, when it came to thinness, participants in the present study did not attribute any positive connotations to it, and parents predominantly described children’s underweight as attracting suspicions about parental neglect. Thinness has

tended to carry some stigma in South Africa due to related suspicions of human immunodeficiency virus (HIV) or other illnesses.[141,242] However, specific fears of HIV stigma did not come up in connection with children's body size or preferences in any of the interviews in this study, and the stigma around thinness was expressed as being more about what it might say about parenting abilities or a family's socioeconomic circumstances than health status.

Parents in this urban low-income setting view children's weight and size in nuanced and, at times, contradictory ways. Given this complexity and the coexistence of undernutrition and childhood obesity, it may be more relevant to focus preventative efforts on addressing structural factors, and enabling healthy behaviours in a weight-inclusive way, as opposed to targeting obesity alone. All of this would need to be done with a sensitivity towards the risks of weight bias, stigma and disordered eating. Similar discourses are already taking place in high-income settings, and these may also inform health promotion in settings like South Africa.[158,246]

Strengths of the present study include the inductive, data driven approach and semantic focus on manifest content in analysing data from research that involved cross-cultural interactions and interpretations. Similarly, collaborating with a fieldwork assistant who understands the study setting from an emic perspective facilitated both data collection and analysis, and guided new questions being flexibly added both after piloting the interview guide and throughout interviews. Cultural differences need to be taken into consideration when interpreting these research findings, despite my previous experience in conducting research in cross-cultural settings. Nevertheless, I made efforts to mitigate this limitation by being open about the potential for misunderstandings

in the interviews, and frequently checking what exactly participants had meant by what they said. This tended to result in rich and in-depth data in most interviews. I also frequently discussed findings and interpretations with my fieldwork assistant, and my focus on contextualising participant accounts through field notes enabled partial triangulation of interview findings.

5.5 Conclusions

In this study, I found that parents of preschoolers in Soweto, South Africa, view children's body size and weight through multiple lenses, and their perceptions around how children grow may not centre on health. According to study participants, children should ideally not look too different from peers. While larger body sizes may be favoured to some degree in this setting, there is also a recognition of weight stigma and potential health consequences of severe childhood obesity. There is a need to develop context-appropriate preventative interventions to address the high rates of childhood obesity in South Africa, and this study suggests that rather than addressing weight *per se*, healthy environments and behaviours should be the focus of interventions in order to ultimately address both undernutrition and obesity. In the next chapter, I build on the analysis presented here by further exploring the movement and dietary behaviours of preschoolers in Soweto using data from the same qualitative study.

6 “CAN YOU IMAGINE THE PRESSURE?” PARENT PERSPECTIVES ON PRESCHOOLERS’ MOVEMENT AND DIETARY BEHAVIOURS IN SOWETO

6.1 Background

In Chapter 5, I examined how parents in Soweto perceive preschoolers' weight and size, and how this reflects the home and family context. In this chapter, the focus is on dietary and movement behaviours, namely eating, physical activity, sleep and screen time. I continue exploring contextual factors in order to develop an understanding of barriers and facilitators to healthy behaviours or habits for preschoolers in Soweto. The manuscript based on this chapter is currently being revised for resubmission to the journal Public Health Nutrition.

6.2 Introduction

The promotion of healthy behaviours is a central element of preventing childhood obesity.[61] Evidence-based dietary and physical activity guidelines set out the behaviours considered optimal for different age groups, and studies from high-income settings have demonstrated associations between physical activity guideline compliance and better health and developmental outcomes.80,94,247–249 South Africa recently launched its first 24-hour movement guidelines for children for birth to five years (see Figure 4 in Chapter 1), and the national food-based dietary guidelines, including paediatric guidelines, were last updated in 2013.132–134 The new Road to Health booklet launched by the South African Department of Health in 2018 for tracking the health and clinic visits of children under the age of five also outlines healthy nutrition, starting from breastfeeding.135 These South African guidelines recommend three hours of physical activity, less than one hour of screen time,

and 10-13 hours of sleep for children of preschool age (3-5 years) every day, and encourage eating a variety of food, including plenty of fruit and vegetables every day, starchy foods at most meals, different sources of protein daily, and limited amounts of fats, sugar and salt.

Despite the importance to public health, there is a dearth of research on South African preschoolers' fulfilment of dietary and movement guidelines. In order to build the evidence base needed to promote optimal health and development among preschoolers in South Africa, compliance to these guidelines needs to be assessed systematically. In addition, it is important to understand the contexts in which these behaviours occur, as it is recognised that factors like socioeconomic circumstances and elements of the built environment have a bearing on childhood obesity and related behaviours.[117,250,251]

The complex web of influences on childhood obesity have been conceptualised through various applications of the social-ecological model of health introduced in Chapter 2.[51,56] According to these, there are several levels and spheres of relevance to childhood obesity and related dietary and movement behaviours, including individual characteristics of a child, home and family settings, preschools, neighbourhoods, and wider cultural, societal and political aspects. Primary caregivers have unique insights when it comes to preschoolers' health-related behaviours, and barriers and facilitators to these.[252] This study focuses on the perspectives of parents of preschool age children to gain a better understanding of how they view children's health behaviours, as well as their role in relation to these. In particular, a better understanding of the constraining or enabling role of the environments in which preschoolers live can inform future behavioural interventions aiming to benefit low-income communities.[252] Given

the complexity illustrated in social-ecological models, many other perspectives, including children's own views and those of, for example, preschool staff,[253] are also relevant albeit beyond the scope of the present study.

The aim of this study is to describe how parents or caregivers of preschool age (3-5 years) children in Soweto, an urban and predominantly low-income township in Johannesburg, view children's health behaviours, and to situate these perspectives in the context of preschoolers' home environments.

The research questions addressed in this chapter are:

1. What perceptions, beliefs, and priorities do caregivers of preschool children in Soweto have regarding preschoolers' movement (physical activity, sleep, screen time) and dietary behaviours?

2. How do these caregivers view their own role, and the social (family) and physical (home) environments, in relation to such behaviours in preschoolers?"

6.3 Findings

Through the thematic analysis process described in Chapter 4, I developed four themes that capture parent perspectives on children's health behaviours, and barriers and facilitators to healthy habits. The four themes are: children's autonomy and the limits of parental control; balancing trust and fears; the appeal of screens; and aspirations and pressures of parenthood. Underlying all four themes is an element of tension and complexity, which reflects the

challenges and nuances of parenthood the parents in this study communicated in the interviews.

6.3.1 Children's autonomy and the limits of parental control

The tension between children's autonomy and the limits of parental control is exemplified in how parents in the study talked about their preschoolers' health-related habits, and eating and sleeping in particular. Illustrative quotes are provided in Table 18.

Many children were described as fussy when it came to food, and this often resulted in young children having considerable autonomy regarding what they eat. Parents showed awareness of foods that should be limited, but this conflicted with their ability or willingness to set boundaries for the children. This appeared to be amplified by the food environment around the home, which was described as fuelling children's desire for certain foods, and enabling unhealthy snacking. Parents' concerns about unhealthy foods were not only about sugar, fat, or salt, all of which were flagged as unhealthy by participants, but many also talked about foods in the neighbourhood being potentially unhygienic or expired.

The limits of parental control were manifest both in the home and in relation to parents' ability to monitor or influence what children were eating outside the home. Even though pocket money was often described as something for school-age children rather than the preschoolers, it was evident from both participant accounts and fieldwork observations that very young children were also given small amounts of pocket money. Since children often played on the

street outside their house in groups without much adult supervision, they were able to buy sweets and other snacks sold by street vendors and in small stalls (‘tuck shops’) that were either in or very near the areas in which they played. Some parents also described the challenges of other adults, such as relatives or other parents, giving their children fast food or unhealthy snacks, as this was again outside of their control.

Parents in the study considered the food children ate in preschool to be healthy, and this was a domain in which there was seemingly welcome control by preschool staff over children’s eating habits. While parents emphasised the limits of their control over what their children were eating outside the home, there were also instances in which they had some control but this did not result in health-driven choices. For example, an apparently nutritious lunch was provided by all preschools, but parents were expected to send snacks with the children each day so that they would have something to eat in the afternoon. The snack options were typically fruit juice (based on observations and participant accounts, these were usually sweetened fruit drinks rather than 100% fruit juice), yoghurt, fresh fruit and small bags of crisps. Although sweets were not mentioned as a preschool snack, it was clear from field observations that children sometimes also brought sweets with them from home to preschool. There were thus both healthy and less healthy options, but seeing as many parents described bulk-buying of snacks for their preschoolers, it seemed that crisps or other non-perishable snacks were preferred over fresh fruit. Choices around afternoon snacks were also influenced by children’s preferences, and not usually regulated by the preschools. One mother explained that at a recent parents’ meeting, a teacher had tried to ban unhealthy snacks, and wanted all

parents to only send fruits instead. However, so few parents had been at the parents' meeting that this was unlikely to be successful.

Many participants described themselves as being responsible for buying and preparing food at home, and an element of this role was keeping everyone in the household happy. Some described consulting children and other family members about their preferences, and others simply let children decide for themselves what they wanted to eat, within the limits of what was available and affordable. This was described as normal and practical, except for when children's food preferences centred on fast food that the family could not afford.

It was also practical to allow children to decide when to go to bed. Children not wanting to obey adults, or not being tired when the parents went to sleep, were cited as reasons for allowing children to set their own bedtimes. In many homes, children of different ages were allowed to stay up until they were ready to go to sleep, and younger children needing more sleep than the older ones was not recognised. However, preschool age children were described as often wanting to sleep at the same time as parents or grandparents, and so many of the parents who did have more established routines around bedtimes described pretending to sleep until the preschoolers fell asleep. Some parents therefore found ways to take children's preferences into consideration in a way that also supported healthy routines.

Table 18 Interview excerpts about autonomy and control

Theme	Excerpts
Children's autonomy and the limits of parental control	"We don't know when they go outside the gate what they're buying and we're not seeing them... It's better that whatever that they want they tell you, 'I want this and that and that', and then you buy for them. Cos for me, I prefer to buy everything. They know that they always have juice, crisps, everything, they have burgers, whatever." (Interview 9, mother) "You'll find that when he's with his friends, the parents will buy them a packet of sweets or chips [crisps] or whatever, and they'll be eating and he'll come back with a blue tongue [from sweets], you know." (Interview 14, father) "I'd say she's healthy when she's at [pre]school cos when she's home she eats a lot of sweet and junk food." (Interview 1, mother) "When they're going to crèche [preschool] you have to put for them snacks. Maybe I'm putting for him the Zoom, you know the Zoom, the juice Zoom… And yoghurt and snacks. Every day I have to put for him." (Interview 6, mother) "They were told to only bring fruits, I think two weeks back, we were at an opening meeting at crèche, and there is a teacher there who…was telling us no kids will bring Simbas [crisps] or any sweet here. Next year you only give them a bottle of water and a fruit… So if there is a kid there who came maybe with a packet of Simbas then I take my son with an apple then he comes back crying. 'Why aren't you buying me Simbas?' You know, ja." (Interview 11, mother)

	“It’s challenging cos he is a fussy eater...When you cook pap [maize porridge, traditional staple food] he’ll tell you he wants rice. When you cook rice he’ll tell you he wants noodles, so he’s very challenging when it comes to food…I prefer to ask him what does he prefer to eat then I can cook what he prefers to eat.” (Interview 7, mother) “Here at home we don't have a specific time for a child to go to sleep. A child go to sleep when they feel sleepy.” (Interview 10, mother) “They can decide for themselves. Cos they don’t want to listen to us.” (Interview 6, mother) “I can switch off the lights and sleep, make um pretend as if I'm sleeping. Just for him to sleep, then afterwards, wake up and do whatever I'm meant to be doing cos normally I read by that time, so yeah. The latest time he sleeps is 10 o'clock.” (Interview 4, mother)

6.3.2 Balancing trust and fears

This theme captures the uneasy relationship parents had with the neighbourhood in which they live, and illustrative quotes are summarised in Table 19. Many participants were quite happy with their neighbourhoods in general, but still had concerns about their children playing outside. Several parents had grown up in the same area themselves, and they tended to reason that it must be fine for their own children to play outside before it gets dark because they had done the same as children. Nevertheless, fears regarding reckless and dangerous driving in the neighbourhood, and the possibility of children getting kidnapped and murdered, were often expressed.

Playing was something that mostly took place outdoors, either in the yard or if considered safe enough, out in the street. Parents talked about children's playing as them typically just "running around", and this was not an indoor activity. Some also had bicycles or scooters, which again, required outdoor space. All parents recognised the need or desire of children to spend time playing outdoors but this had to be balanced with fears about what might happen to children playing outside.

Supervision was described as essential because although there were often older children or other parents who could keep an eye on children, many parents talked about not wanting to trust others with their children. The presence of extended family or having enough space for other children to come over to play as opposed to allowing children to go elsewhere to play alleviated the issue of having to trust adults outside one's family to some extent. Overall,

there was not much active parental supervision detectable in the study neighbourhoods during field observations, and supervision often meant checking on children through a window or through listening out for sounds of playing.

When asked what could be changed or improved about the neighbourhoods, the most consistent suggestion from study participants was for children to have access to safe parks or playgrounds, or some kind of spaces for playing and sports. However, the complicated dynamic of trust and fears in relation to the neighbourhood was present here as well as some speculated that while it would be important to have more spaces dedicated to children, such new facilities would likely be vandalised or become unsafe because of people using them for other purposes, such as drinking alcohol.

Table 19 Interview excerpts about balancing trust and fears

Theme	Excerpt
Balancing trust and fears	“They can go out, I'm fine but yoh [colloquial exclamation] I don't like the idea of them going out, I really don't like it. But I don't have a choice, they're kids. I'm not gonna lock the doors every day! I can't, nobody locked the doors for me so (laughing) I can't do that, I'm not gonna lock the doors for them, I can't do that.” (Interview 4, mother) “Uhh it is not safe [for kids to play outside the yard]… Like kids now get kidnapped, murdered, so that’s the reason.” (Interview 11, mother) “I don’t feel safe. It’s better that he’s in the yard because you won’t be depending on other people to look after your kid… I don’t trust my neighbours.” (Interview 9, mother) “Ja then I’m just thinking like there’s no other extramural activities around. Because even if they do create, our own people mess it up so, it’s quite, it’s quite tough. It’s quite tough… Like when you get to have like nice parks with nice activities, bins and everything, but then because of people that are exposed to other things they go and damage. So now the kids don’t have those places anymore that’s why now they get to play only around, around our areas.” (Interview 16, father)

6.3.3 The appeal of screens

As illustrated by the quotes in Table 20, devices such as smartphones, tablets and laptops were described as both entertainment and educational resources, which contributed to their prominence in children's daily routines. Preschoolers also regularly watched cartoons or soap operas on TV, especially on the weekends and in the evenings after it got too dark to play outside. Sometimes this was a shared family activity, and a way for parents to spend time with their children. However, the strong desire of children to play with phones and tablets was described as more of a novelty compared to the normalised activity of TV viewing.

On the one hand, parents were impressed with their young children for being able to operate devices like smartphones and tablets. On the other hand, parents found it inconvenient that children were playing with the parents' phones or other personal electronic devices, potentially deleting important information, using too much data, or making noise with games.

The reasons for parents to restrict children's screen time were therefore mostly practical. The dangers of strangers on social media or content that is not meant for children also came up but none of the parents talked about screen time itself as a potentially harmful or unhealthy activity.

Table 20 Interview excerpts about the appeal of screens

Theme	Excerpt
The appeal of screens	"He wants to play games with it and by the end of the day he ends up pressing a whole lot of wrong things on my phone. I find my phonebook deleted… I keep it away. But then whatever chance or whatever opportunity that he gets he will definitely take it and I find him trying, just pressing and pressing. Because I have a pattern. So yeah, the last time he found out my pattern. I found him already opening my phone and playing the game already. So, they're quite smart. They're quite smart." (Interview 16, father) "Ja, eish [colloquial exclamation], so now my phone has a passcode. I'm over that. So I bought them these tablets but not like it's for games, it's not really games. It's for learning but it's too loud. Yoh! [colloquial exclamation] And obviously they need it volume up. Play it, volume up ohh. So I took out the batteries. It must come out. It's too much. So they sing along to that. Your ABCs, your 123s." (Interview 15, mother)

6.3.4 Aspirations and pressures of parenthood

This theme captures the ways in which parents described aspirations and pressures in relation to being a parent, often stemming from their social and physical environment, as well as from the challenges of unemployment. Quotes illustrating these aspirations and pressures are summarised in Table 21.

Both healthy and unhealthy foods were described as easily available in the neighbourhoods, and one challenge was maintaining healthy food habits for children when others could be seen to do something different. The way in which the affordability of different foods was described paints a somewhat complex picture. Vegetables and other foods described as healthy were reportedly cheap and available everywhere, but many parents expressed concerns about being able to afford enough food for their families, and some preferred to spend their money on more filling foods than vegetables. While financial constraints were often cited in relation to buying what were seen as luxurious or unhealthy foods, such as takeaways, some parents also found it easier and cheaper to buy local fast food compared to buying all the ingredients for cooking a meal.

Parents talked about wanting to make their children happy, and while loving and caring for children was typically described as spending time together, there were also aspirations related to taking children to places like malls, cinemas and fast food restaurants. A typical narrative was expressing that love and care are the most important things parents provide for their children, and that love is not really about money, but there are things money can buy that could make children happier or that would make parents feel like they really are doing their

very best for their children. Only a few families were able to spend money on such things regularly, as many were affected by unemployment, and found it difficult to afford everything they needed each month. One mother's fear that children might turn to stealing as they got older in order to compensate for parental shortcomings illustrates the severe pressure some parents felt. Overall, the feeling of not being able to give your children everything they want, or everything you want for them, was one of the most difficult challenges parents described facing. The role of extended family was described as compensating where parents were lacking, for example, in buying presents or treating children to takeaway meals.

Despite the pressures and sometimes unachievable aspirations, most parents in the study described themselves as being happy with their situation. Typically, the only desired change was finding work, or if already working, getting a better paid job. Having a job or sufficient family support tended to mean that both necessities and luxuries could be afforded although parenthood still came with its own challenges.

Table 21 Interview excerpts about aspirations and pressures

Theme	Excerpt
Aspirations and pressures of parenthood	”We have a Debonairs [pizzeria] just next to us. Imagine the child passing by with a box of pizza here and then this one she is sitting at the gate. ‘Mummy doesn’t buy me that, she is always making me eat carrots and all those things’, can you imagine the pressure?” (Interview 12, mother) “Love is very important. It’s something that you can never buy or, it comes naturally. So that’s the most important thing I guess for me. It’s just to give them that… Being with them.” (Interview 16, father) “You know sometimes you need to go out and especially to the malls... It blesses you as a mum, at least I am doing something for my kids. Even though I know I don’t have to, you know kids, even you can buy a small pizza, to them it's like you did something big, so I just buy a pizza and they will sit down and eat and then we start shopping for whatever we want then we come back… Honestly, I only do that every three months, I have to budget…you know like make sure that some of the things which I think it is…not a necessity, so I just stop buying those so that I can be able to afford to take them to, to the mall.” (Interview 8, mother) “Cos you know, without money at home, I cannot be raising my kids, you understand? We're gonna face some certain challenges… Cos with us, with our kids it's different, you find [name of older son] is nine, ‘Oh my mum can't buy for us food, my mum can't do that’, he's gonna start going out, start robbing people, start doing funny things. Just to put food uh food on the table so I don't want that.” (Interview 4, mother)

	“[Members of the extended family] try to take a second parent role, you know. So, maybe if you’re lacking somewhere, they’ll cover up that part without you even noticing. Let's say maybe I’m not like financially stable. I cannot get my child takeaways maybe every month…You know. They’ll be there to get him takeaways.” (Interview 14, father) “The unemployment, hey. Yeah. Not being employed, yeah. I think that's all [I would change] Cos I I-I have support here at home, like we take care of each other at home but the not working part, not getting a permanent job, yeah.” (Interview 4, mother) “Challenges, eish [colloquial exclamation], no, I don’t think I have any challenges. I’m doing great. I’m doing good. [laughing] Obviously it's not, it's not easy being a mum. It's not easy. And obviously you are never taught how to be a mum. Just, it’s a natural thing. You don’t know whether you’re doing right, or you’re doing wrong. But you hope that you’re doing the best you can.” (Interview 15, mother)

6.4 Discussion

The aim of this study was to describe how parents or caregivers of preschoolers in an urban low-income setting in South Africa view children's health behaviours, and to situate these perspectives in the context of the home environment. I developed four themes: children's autonomy and the limits of parental control; balancing trust and fears; the appeal of screens; and aspirations and pressures of parenthood. These themes centre on complex barriers and facilitators to healthy habits, and they reflect the nuanced ways in which parents in the study described their views and situations.

The participants showed varying degrees of awareness regarding health-related behaviours, and health itself was not necessarily the guiding principle in how parents made decisions that related to preschoolers' movement and dietary behaviours. Practicality, financial constraints, aspirations and pressures, among other things, played a role in this. The social-ecological model helps to make sense of the barriers and facilitators that participant accounts in this study highlighted, and these are summarised in Figure 10.

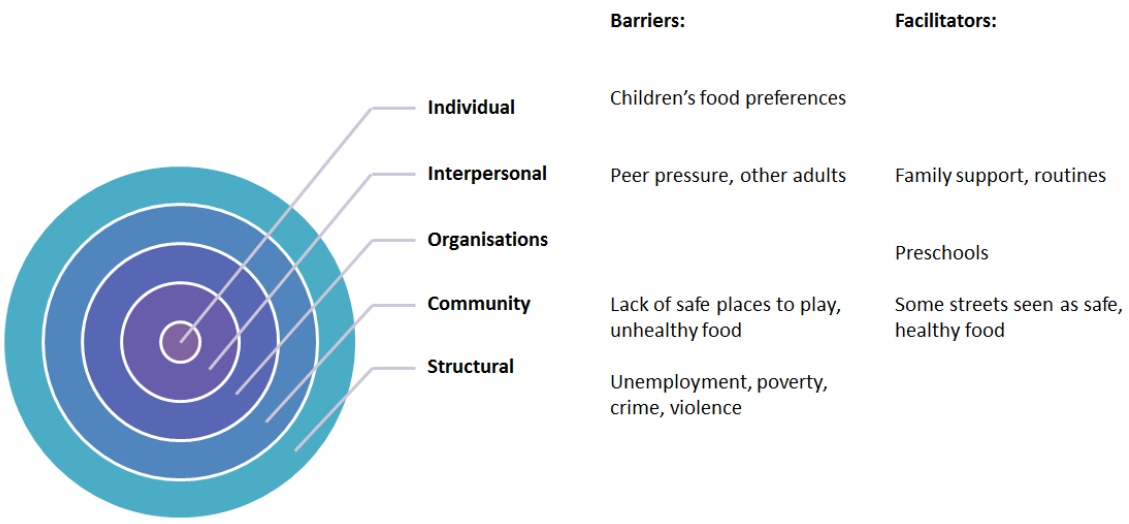

Figure 10 Barriers and facilitators to healthy habits organised by levels of the social-ecological model

While the focus of the present study was on the social and physical environments, such as family routines and neighbourhood food environments, the interviews with parents of preschoolers also shed light on how more distal and structural factors, such as unemployment and poverty, were prominent concerns in the families' lives, and inseparable from considerations of more proximal influences on health behaviours. Other studies from Soweto have also highlighted the limits of individual agency vis-à-vis structural constraints in this low-income setting when it comes to health-related behaviours.[120] Formative research conducted in both urban low-income areas and rural settings for the dissemination of the South African 24-hour movement guidelines also found similar barriers around children's movement behaviours.[254] Recognising these tensions in people's lived experiences and observable circumstances

necessitates critical consideration of what can be achieved through public health interventions, and in particular, who is most likely to benefit.[244]

The findings of this study show that regardless of children's weight status, there are several aspects of their movement and dietary behaviours that could be improved from a public health perspective. In particular, some of the habits and routines that parents described around children's snacking and sleeping may be possible to address without being hindered by structural or environmental factors. While these complex constraints should also be addressed, they will require approaches beyond behavioural public health interventions. The most promising avenue for behavioural interventions may thus be the targeting of habits more constrained by interpersonal and organisational rather than structural or community factors (Figure 10).

Research in HICs has found parenting styles to have a bearing on preschool age children's health behaviours, such as fruit and vegetable consumption,[255,256] and supporting healthful parenting could be explored in the Sowetan setting too. There is also an opportunity for coordinated action by preschools and parents in order to overcome some aspects of peer pressure and unhealthy snacking, and in households where there is enough space for different family members to feasibly sleep at different times there is an opportunity to try to establish bedtime routines that would ensure that preschoolers get enough sleep. Engaging families and preschools in this way could be a way to improve the degree to which children meet sleep and dietary guidelines.

Similarly, when it comes to screen time, the dual nature of how parents approach it as both educational and disruptive could be utilised in promoting behaviours that meet recommended guidelines. The formative research for the South African 24-hour movement guidelines also found that caregivers considered young children's use of electronic devices impressive and potentially educational, as well as useful for keeping children occupied with something while caregivers are busy.[254] However, if parents are willing and able to limit screen time for certain purposes, without feeling like potential educational benefits will be lost, it may be possible to support parents to establish habits for their preschoolers that align with guidelines, and that favour educational and developmentally appropriate content. While guidelines focus on the quantity of screen time, the evidence base on the different effects on health and beyond of different types of screen time is growing, though mainly through research in HICs outside the African continent.[94,257] Intervention development to address screen time and the earlier mentioned routines around sleeping and eating in the specific context of Soweto would need to be done in a participatory way in order to fully align with people's realities, and for example, the wider household and family dynamics.

The fears and lack of trust expressed by parents are, unfortunately, well founded in light of statistics on violent crime and child abuse in South Africa.[258,259] They also echo qualitative findings from another low-income setting in South Africa.[236] While there is a growing discourse around the promotion of so-called 'risky play' in high-income settings,[260] there is a need to make outdoor play safer for children in South Africa. Even if South African preschoolers are relatively active,[123,124] it is unacceptable for it to happen at the expense of their

safety and wellbeing. A focus on the interpersonal level in interventions, and engaging parents to address barriers to healthy behaviours together may also be a way to stimulate some trust and community cohesion through parents realising they share the same concerns for their children. However, crime and violence will need to be addressed on multiple and higher levels, and interpersonal trust is unlikely to improve significantly without concrete improvements in safety.

It is clear from the analysis presented here that parents want their children to learn, develop, and feel happy and loved. Supporting these positive notions through interventions that promote nurturing care in a way that ultimately also promotes healthier habits could be a promising approach in this setting. While nurturing care and parenting interventions have tended to focus on the first two years of life,[261,262] the findings of this study suggest that preschoolers may also benefit from such an approach. Research exploring this type of interventions in urban townships in South Africa is beginning to emerge,[263] and rigorous evaluations are needed to determine the effectiveness of such approaches on promoting healthy habits.

Other research in South Africa has explored the ways in which aspirational consumption is linked to indebtedness, poverty and the legacy of apartheid.[264] Indeed, the aspirations that parents in the study expressed around buying certain things, or giving their children experiences like visiting malls, provide insights into the lived experience of poverty and inequality in a society where consumption is a way of signalling social status or wellbeing. Against South Africa's history of apartheid, it is hardly surprising if Black African families at least to some degree aspire to what Chevalier has described as "consumption

patterns previously reserved for whites" [265] (p.118). From the narratives of the parents in the present study, it is evident that consumption can also signify parental love and the pursuit of making one's children happy. It may be difficult to steer these types of aspirations towards more health-centred ideals without also introducing an element of judging parents for the choices they make. Moreover, given the framing of fast food consumption as occurring on special occasions, it may not be a pivotal part of children's diets on which to focus.

Overall, these findings underscore that Soweto is a dynamic and complex setting in which to promote health. Much needed improvements in livelihoods and employment opportunities may also mean increased opportunities for consuming unhealthy foods. In engaging parents in preschoolers' health behaviours, it would be important to promote healthy habits in a non-judgmental way, and try to inspire health-aligned aspirations by, for example, making the case for healthy habits promoting children's development and learning, which is evidently important to parents.[263]

There are some strengths and limitations that relate to the design and methods of this study. A specific limitation is the small number of male participants, and the fact that no other caregiver types, such as grandparents, aunts or uncles, were recruited into the study despite their relevance as primary caregivers of many children in Soweto. There were no noticeable differences or patterns between the responses of mothers and fathers in the present study, but this cannot be taken to mean that there are no differences between different caregiver types. It is also important to bear in mind that asking parents about health-related behaviours inevitably involves some social desirability bias as parents' responses are to some degree an expression of how they wish to be

viewed as parents. Although triangulation of interview findings against field observations was possible to some degree, it is not possible to determine whether specific claims made by participant were influenced by social desirability bias. In addition to social desirability bias, the possibility of participants emphasising negative aspects of their experiences due to expectations of receiving help or resources from the research team cannot be ruled out completely. However, there were no requests made by participants, and accounts of difficult experiences or circumstances were sometimes followed by observations that talking about them had felt helpful to the participant. Overall, the open and inductive approach of the qualitative inquiry allowed for nuanced and in-depth accounts from research participants despite challenges introduced by the cross-cultural nature of the research.[266]

6.5 Conclusions

This study paints a complex picture of preschoolers' movement and dietary behaviours in Soweto. Low-income families face many challenges that cannot easily be addressed through public health interventions, but there may be opportunities for behavioural interventions targeting interpersonal and organisational aspects, such as family routines and preschool snacks, to achieve positive changes in children's health behaviours. More research on preschoolers' movement and dietary behaviours, and interventions to improve them, are needed in South Africa. In the next chapter, I will describe a feasibility study of a home-based childhood obesity prevention intervention in Soweto.

7 CHILDHOOD OBESITY PREVENTION THROUGH NURTURING CARE: FEASIBILITY AND ACCEPTABILITY OF THE AMAGUGU ASAKHULA INTERVENTION IN SOWETO

7.1 Background

The two previous chapters have explored parent perspectives on childhood obesity and preschoolers' health behaviours, and identified the potential for promoting healthy behaviours through engaging with parents of preschool children in Soweto. In this chapter, I present the analysis and conclusions related to my formative research on a childhood obesity prevention targeting caregivers of preschool age children in Soweto. The Sowetan setting described in Chapter 4 is also relevant for the contextualisation of these findings.

7.2 Introduction

7.2.1 Nurturing care

Nurturing care has become increasingly recognised as a key framework for early childhood development.[261] Defined as "a stable environment that is sensitive to children's health and nutritional needs, with protection from threats, opportunities for early learning, and interactions that are responsive, emotionally supportive, and developmentally stimulating"[261] (p. 91), nurturing care largely aims to ensure that children grow and develop to reach their full potential. Against the background of structural barriers, parental aspirations, and the low priority of childhood obesity prevention discussed in previous chapters, nurturing care interventions in early childhood may be a promising avenue for addressing a multitude of child health and developmental challenges in LMICs, including childhood obesity.[263,267]

7.2.2 The Amagugu Asakhula intervention and pilot study

Following the success of a paediatric HIV disclosure intervention in South Africa called Amagugu,[268–270] meaning “treasures” in local languages isiZulu and isiXhosa, the intervention has been adapted into an obesity prevention intervention called Amagugu Asakhula, or “treasures that are still growing”. Amagugu Asakhula draws on the nurturing care framework,[261] the Information–Motivation–Behavioural Skills model,[271] and behaviour change techniques.[272] Figure 11 describes the adapted intervention’s theory of change and components.

Amagugu Asakhula is home-based, and delivered by community health workers (CHWs) to individual caregivers of preschool age children. Research from HICs suggests that CHWs may be well positioned to deliver childhood obesity interventions to disadvantaged groups and advance health equity through such interventions.[273] Other recent research from Soweto also suggests that CHWs are preferred delivery agents for health promotion interventions.[274] The feasibility and acceptability of Amagugu Asakhula has been tested through a pilot study in Cape Town.[263] The intervention was both feasible and acceptable with caregivers of preschool children in a low-income urban setting, when delivered by CHWs linked to a community-based organisation.

Figure removed for copyright reasons.

Figure 11 The Amagugu Asakhula intervention's theory of change (copied from source)[263]

7.2.3 Intervention approach and content

The content of the Amagugu Asakhula intervention is centred on promoting behaviours such as healthy diets, physical activity, limited screen time and sufficient sleep according to national guidelines (see Chapter 1). Based on previous formative research, the intervention was framed with an explicit focus on cognitive development rather than obesity prevention in order for it to address more salient issues with caregivers, as corroborated by the findings described in Chapter 5 and 6. This approach draws on synergies between childhood obesity prevention and healthy child development through promoting healthy behaviours and parenting that builds on nurturing interactions. Table 22 provides a comparison of intervention components that relate primarily to childhood obesity prevention and parenting respectively.

The Amagugu Asakhula intervention consists of six discussion-based sessions delivered by CHWs to caregivers of preschool age children in the participating caregivers' homes (Appendix E). Each session has been designed to focus on a specific health-related topic that can be covered and discussed in detail over 45-60 minutes. For example, the session "Healthy Bodies" covers behavioural factors that help or hinder children's healthy growth and development, and ways for parents or caregivers to ensure their children's dietary and movement behaviours, including sleep, support physical health and cognitive development.

The information, materials, and activities to be used in each session are described in detail in an intervention manual, and CHWs are expected to deliver the intervention in accordance with the manual. However, some individual

tailoring is encouraged in order to communicate with families in a relevant and respectful way. For example, advice relating to dietary behaviours must be aligned with each family's circumstances and level of food security. The intervention is also described in more detail in the published first pilot study investigating the feasibility and acceptability of Amagugu Asakhula in Cape Town, [263] and Appendix E of this thesis.

Table 22 Obesity prevention and parenting components of the Amagugu Asakhula intervention

Obesity prevention	Parenting
South African national dietary and movement guidelines guiding the intervention.	Nurturing care framework guiding the intervention.
Thematic focus of CHW-delivered sessions and activities on healthy bodies and health behaviours such as healthy eating, physical activity, sleep and limiting screen time according to guidelines.	Thematic focus of CHW-delivered sessions and activities on cognitive development and how children can benefit and learn from positive interactions with caregivers and from engaging in healthy behaviours.
Activity where children count beans depending on what healthy behaviours they have engaged in.	CHWs encouraging caregivers to connect with their children through activities like reading to them or singing with them.
Flashcard game with different exercises, such as star jumps.	Flashcard game with different activities for caregivers and children to do together.
Flashcard game with foods to have more of and foods to have less of, based on guidelines.	Star chart to help caregivers to track and reward children's health behaviours.
Caregivers keeping a screen time diary.	Family map activity, where caregivers and children identify and talk about different family members.
Caregivers keeping a food and sleep diary.	Activity where caregivers and children plant and grow a bean plant together.

7.2.4 Rationale and aim of the present study

According to the intervention development frameworks introduced in Chapter 2, exploratory studies, such as pilot and feasibility studies, are a recommended part of public health intervention development and evaluation cycles.[164,275] The rationale is to conduct formative research that supports decision-making related to setting up definitive trials, and enables optimisation of interventions prior to larger evaluations. One way of conceptualising feasibility studies is that they help to determine whether an intervention is appropriate for further testing.[276] As the first pilot study found the Amagugu Asakhula intervention appropriate for further testing, this study was developed to explore an alternative delivery mode through CHWs linked to a public primary health care facility. Through making use of existing public sector structures, this delivery mode would have considerable potential for scaling up, cost-effectiveness and sustainability, if the Amagugu Asakhula intervention would be found effective for obesity prevention among preschoolers.

Furthermore, according to the frameworks introduced in Chapter 2, process evaluation is a recommended feature of developing and testing public health interventions, as it allows for an in-depth understanding of how and why interventions succeed and fail, thus complementing effectiveness evaluations.[164,165,216] In particular, under-researched topics in low-income settings can benefit from thorough exploratory research and process evaluations at early phases already, as these types of studies maximise learning and can avoid scarce resources being wasted on large-scale trials of interventions that are unlikely to work.

The primary aim of this study was to assess the feasibility and acceptability of the delivery of the Amagugu Asakhula intervention by CHWs linked to a public primary health care facility in Soweto, a low-income, urban setting. A further aim was to generate insights about implementation in this specific setting that would support the optimisation of the intervention and its delivery. This also involved assessing the concepts of context, appropriateness, adoption, implementation and fidelity. Due to the nature of the present study being a feasibility study as opposed to an effect evaluation, I did not measure intervention effects on outcomes such as childhood obesity or health behaviours.

7.2.5 Modifications to the pilot study

My research involves four amendments to the original Amagugu Asakhula pilot study:

1. New implementation setting (Soweto).
2. Delivery through CHWs linked to a public primary health care facility as opposed to a community-based organisation.
3. Delivery by single CHWs as opposed to CHWs working in pairs.
4. CHWs having some discretion regarding how many caregivers to deliver the intervention to during the feasibility study.

The work presented in this chapter is a modified extension of the original Amagugu Asakhula pilot study. My research in Soweto provides new insights regarding the feasibility of delivering the Amagugu Asakhula intervention through CHWs linked to a public primary health care facility, as opposed to

being linked to a community-based organisation as in the original Cape Town pilot. I have also examined the acceptability of the intervention in a different urban low-income setting in South Africa, enabling context-specific optimisation of intervention materials and delivery. In this new setting, CHWs delivered the intervention on their own as opposed to working in pairs, which was the case in the Cape Town implementation site with different safety concerns.[263] An additional difference was the discretion that CHWs in Soweto had to decide how many caregivers to deliver the intervention in order to gauge how they would fit intervention activities with their existing tasks. In the original pilot study, each pair of CHWs was required to deliver the intervention to ten caregivers but they were not doing the same overall workload as CHWs linked to a public primary health care facility.

7.3 Methods

7.3.1 Design and ethics

I designed this study as a feasibility study with embedded process evaluation components. Methods included semi-structured key informant interviews, focus group discussions (FGDs), qualitative observations, and tracking of recruitment, training and implementation records.

I obtained ethical approval from the University of the Witwatersrand's Medical Human Research Ethics Committee (Reference number M181063, Appendix E). All participating CHWs and caregivers gave informed written consent for

participation, and additionally for being audio recorded if taking part in the process evaluation activities. In addition, I obtained permission from the Johannesburg Health District Research Committee to carry out the feasibility study through a public primary health care facility.

7.3.2 Community health workers

Public primary health care in South Africa is organised around clinics and community health centres that are free at the point of use.[277] Through CHWs, primary health care facilities can also carry out health promotion activities and community outreach, and link with other public providers such as social services. The CHWs who delivered the Amagugu Asakhula feasibility intervention in Soweto are part of a ward-based outreach system, which means that they are public sector health workers deployed in their local communities but attached to a public primary health care facility.[278] CHWs are each responsible for a specified number of households in their community, and their tasks include, for instance, promoting antenatal care attendance, the immunisation of children, and treatment adherence in the case of chronic illnesses. CHWs receive a few months' worth of training before being deployed in the communities, and they are managed by team leaders who are trained nurses.[279,280] However, while there are some formalised processes in place, there are notable gaps between policy and implementation in terms of the ward-based outreach system and primary health care more generally.[278,281]

7.3.3 Recruitment and training

A specific primary health care facility in Soweto was chosen as the site for the Amagugu Asakhula feasibility study due to existing contacts with the facility. My local supervisor in South Africa established contact with key individuals in charge of the ward-based outreach teams, and I shared information about the intervention and study both verbally in initial meetings with CHWs and their managers and team leaders, and in written format through information sheets that I handed out to CHWs. All CHWs linked to the facility, as well as their team leaders, were invited to take part in the Amagugu Asakhula training session that prepared CHWs to deliver the intervention to families with preschool age children. There were no specific criteria for participating in the training so as not to exclude any CHWs from additional learning opportunities.

I conducted two four-hour training sessions in association with regular CHW training days so as not to take time away from their regular work. The training covered some background information about childhood obesity, child health and development, and the approach, content and materials of the Amagugu Asakhula intervention according to the instruction manual that was handed out to each CHW. Considerable focus was given to health-related behaviours according to South African guidelines,[132–134] and how these relate to child nutrition, obesity prevention, and children learning and developing well. I delivered the training in a seminar format with as many practical examples as possible, and there was plenty of time for questions and discussions during the training sessions. In the session I also briefly discussed the research aspects of the feasibility study, and explained what was expected of participating CHWs.

Refreshments, including lunch, were provided to CHWs and team leaders attending the training sessions.

I asked CHWs who attended the training sessions to register their interest and intention to deliver the intervention. This part of the process was pragmatic rather than stipulated in the intervention protocol and manual, and it enabled budgeting of intervention materials for packs that would be handed out to CHWs. I subsequently purchased and printed materials (e.g. crayons, scissors, and flashcards on the themes of food, physical activity and nurturing interactions) and set up intervention packs for each participating CHW according to how many families (1 or 2) they were planning to recruit. At the end of the second training session, I handed out information sheets, consent forms, and sociodemographic questionnaires for CHWs to recruit participants. CHWs then had one week to make contact with families, and collect intervention packs for each family in order to start delivering the intervention.

All participating caregivers, and all CHWs who completed the intervention, were given R200 (approximately US$13.50) supermarket vouchers as a small gift of appreciation for their time and input to the research. Caregivers only found out about the vouchers after the intervention so as not to pressure or incentivise their participation. In accordance with what was agreed with the primary health care facility management, I informed CHWs that they would receive a modest gift but no additional salary, as the intervention-related activities were considered a normal part of their work. CHWs who attended the training also received certificates of attendance.

7.3.4 Study procedures and data collection

I carried out the entire feasibility study, from first to last visits to the primary health care facility, in Soweto between March and September 2019. The process is described in Figure 12, and delays to the process caused by CHWs going on strike are described under findings. In order to complete the intervention, CHWs needed to attend at least one training session, and deliver six sessions over six weeks to the caregivers they recruited. Participating CHWs were responsible for recruiting caregivers, obtaining informed written consent for the caregivers' participation, and background sociodemographic characteristics of participating caregivers (Appendix E). I also asked them to keep records of home visits, and write brief notes after each intervention session. I gave each CHW printed forms with specific questions to track this information (Appendix E). I carried out all other data collection, including moderating the FGDs.

Three weeks after the six-week intervention had been completed, I conducted five key informant interviews with individuals who had insights into the organisational structures and systemic dimensions of the ward-based outreach teams. In order to preserve confidentiality of the interviews and respect the anonymity of the five individuals, I will not describe these participants in detail, but their work involved positions of responsibility within the daily operations of the primary health care facility. Due to the same concerns regarding confidentiality and the sensitive nature of some findings, I will not identify the facility in question, or its location in Soweto.

In the same time period following the intervention, I also conducted four FGDs: two with participating caregivers (n=7 in each), one with CHWs who delivered the intervention (n=13), and one with CHWs who dropped out of delivering the intervention (n=5). All but one CHW who delivered the intervention took part in the FGD, and it was the preference of participating CHWs to all be present in the same FGD rather than be divided into smaller groups. Refusals to participate were due to other commitments (CHW), not wanting to be audio-recorded (caregivers), or not specified (caregivers).

I conducted all interviews and FGDs in English and audio-recorded them. I subsequently transcribed some of them verbatim myself (n=2 FGDs with CHWs because I could identify them by their voices and thus make sense of the group dynamic), and managed the transcription of the rest (n=2 FGDs and n=5 interviews) by a professional transcriber. I checked all professionally generated transcripts against original recordings. An additional note-taker was present for the two FGDs with caregivers. Due to the sensitivity of discussions with CHWs, I moderated the discussions alone as I had established a level of rapport with the CHWs throughout my interactions with them. In addition to interviews and FGDs, I recorded field observations during visits to the primary health care facility and kept records of training and meeting attendance, recruitment and retention of CHWs and caregivers, and any correspondence with participating individuals. I used data analysis software MAXQDA (Release 12.2.0) to facilitate qualitative data analysis and management.

After the intervention and all data collection had been completed, I visited the primary health care facility in September 2019 over two days to share study

findings with participating CHWs and other stakeholders, and discuss feedback regarding the study.

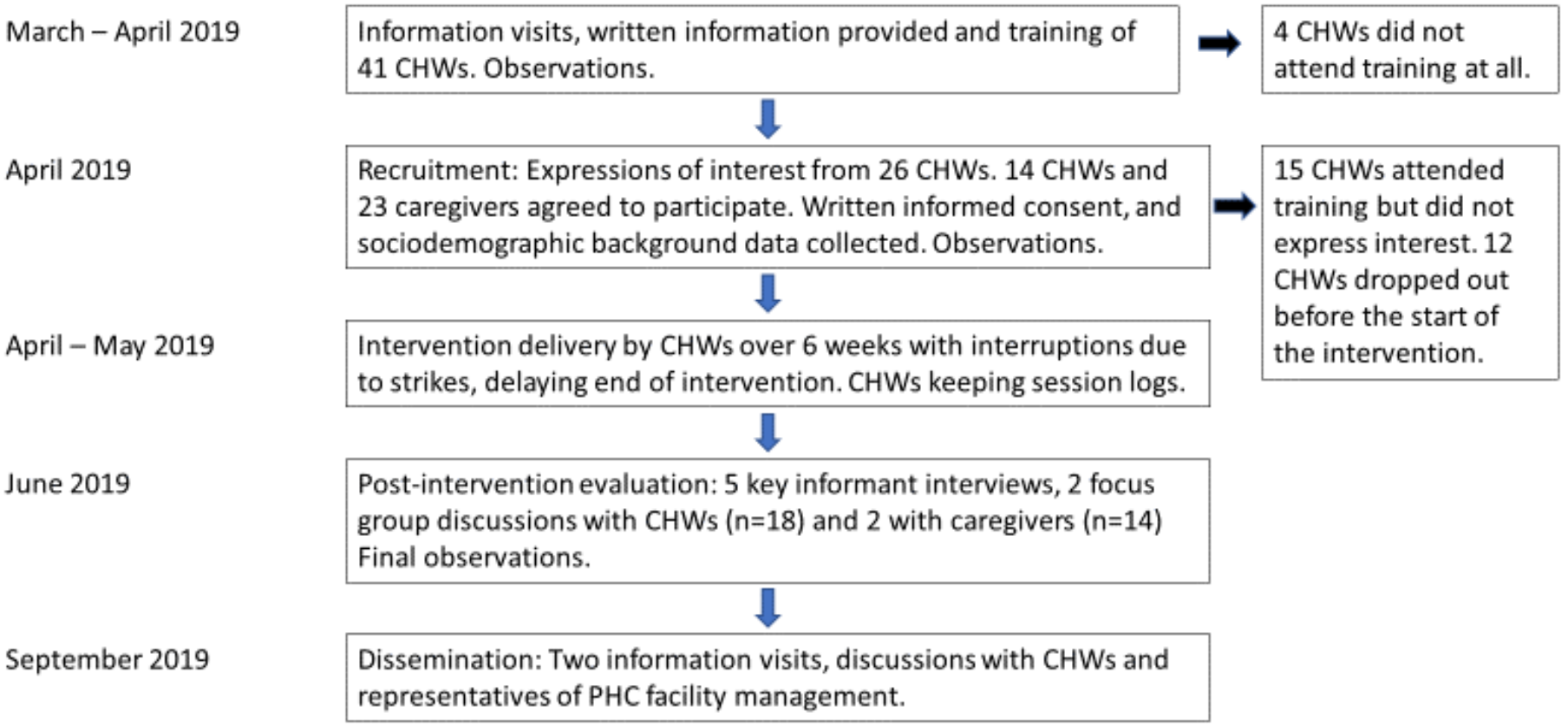

Figure 12 Flowchart of the Amagugu Asakhula feasibility study process

7.3.5 Evaluation framework and data analysis

My feasibility and acceptability study of Amagugu Asakhula was informed by process evaluation concepts to provide an understanding about the implementation of the intervention. Specifically, I have utilised the concepts of adoption, appropriateness, implementation and fidelity, and context in addition to the two focus areas of feasibility and acceptability.[216,282] Table 23 outlines the applied process evaluation framework that I developed based on existing literature[216,282] for testing the feasibility of delivering the Amagugu Asakhula intervention through CHWs linked to a primary health care facility in Soweto.

I utilised these concepts for the analysis of all qualitative data, and selected a deductive (also known as theoretical) thematic analysis approach in order to fulfil the aims of the study. This directed qualitative analysis involved the phases outlined by Braun and Clarke for reflexive thematic analysis,[218,219] but instead of developing themes based on the data, I developed them a priori using the process evaluation framework. Accordingly, I used the already developed themes as a starting point for the coding of transcripts, whereas field observations were not coded but used to support interpretation and analysis. I divided the themes into codes such as “in support of feasibility” and “against feasibility”. I also coded “miscellaneous” or “feedback” for pertinent data segments that did not fit into the pre-existing themes. Upon review, I did not find it necessary to extend the themes beyond the process evaluation concepts as the miscellaneous segments did not provide additional insight in response to the aim of this feasibility study. These data will instead be used to inform future iterations of the Amagugu Asakhula interventions.

7.4 Findings

I have organised the findings from the thematic analysis by the process evaluation concepts examined in the study. An overview of these concepts, as well as the main findings, is provided in Table 23. The analysis describes how different aspects of the Amagugu Asakhula intervention were received by both participating caregivers, and CHWs delivering it. It thus gives an account of how the nurturing care intervention could be utilised to promote healthy dietary and movement behaviours in preschoolers in Soweto, and details barriers and facilitators to intervention delivery.

Table 23 Overview of process evaluation concepts and findings of the Amagugu Asakhula feasibility study in Soweto

Concept 276,282	**Questions addressed**	**Data sources**	**Conclusion**	**Illustrative quotes**
Acceptability	To what extent was the intervention agreeable and satisfying, and perceived as acceptable by caregivers and CHWs?	Separate FGDs with CHWs and caregivers after the intervention.	Acceptable to both CHWs and caregivers.	**Acceptability of intervention content:** "For me it was easy because when [the CHW] came there, it was like about child development (other participants say 'Yes' in agreement). So I could understand, ok, he was talking about our kids… And now I've learnt that [my son] likes the colours, he even knows the colours. I didn't know that (laughter)… But now I'm learning everything, every day… He couldn't draw anything but now I can see there's a difference. And I'm very happy about that." (Caregiver, FGD) "I think it is the interest that my child showed… Like he was happy, he was so excited about it, like he reminded me almost every day about the pictures for us to play, like he, he really enjoyed it and if you really enjoy it, it means it is very important and it's, it is interesting." (Caregiver, FGD) "Well I feel that it was a great experience cos it also changed our lives. And improved on lots of things in our households so it's something that we're going to apply each and every time maybe we see that there are difficulties with the kids or something like that." (CHW, FGD)

				Acceptability of intervention delivery: Moderator: “So what about the fact that the community health workers were coming to your homes with this programme…?” Caregiver 1: “I prefer home visits. Because it's drawing attention to the other kids as well. I can teach my neighbour’s child as well.” (…) Moderator: “Did any of you find it somehow uncomfortable that these were home visits? Or any other comments or feedback?” Caregiver 2: “Not really, because they do visit.” (…) Caregiver 3: “[The CHWs] should come. It’s something we are used to. Because they do the home visits, so it was very nice doing something different…” (laughter) Caregiver 4: “Like ‘How are you feeling today, did you take your medicine?’ This one was like WOW. Something else. It was nice.” (FGD) Interviewer: “What about your impressions of how acceptable it was for the community health workers to do this type of, you know, longer home visits and several sessions and actually really going through almost teaching things…? How acceptable is it to do that kind of tasks compared to what the normal work is?” Key informant: “Uh huh (laughs) well it's, to be truthful, it was easy. Why I’m saying it was easy, because our scope of practice as I’m saying, is to educate… Our scope of practice is to educate the families, to educate the individuals, is to educate, educate… So it was easy for us because we already engaged with those houses.

				We already knew where to go to assist, and we already knew people, who to talk to, who to educate to, who've got children." (Key informant interview)
Adoption	To what extent were the training (CHWs) and intervention (CHWs and caregivers) adopted by targeted groups?	Recruitment and retention records, observations, separate FGDs with CHWs and caregivers after the intervention.	Mixed results.	"I thought maybe it's like just too much work and everything." (CHW who dropped out, FGD) "Everybody at first is sceptical (others murmuring in agreement) about the programme, and then when you get to learn about what the programme offers then you start enjoying it." (Caregiver, FGD) "Even sister [name of CHW] was good to me, because she came home and she introduced this thing to me and then she explained everything to me. Even though I was like with, like her, because I was sceptical like aai no. (laughing, others laughing too) I don't have time to sit down and do this thing. But she, she made me understand that it is not for me, it is for me and my child (someone else says "yes" in the background)." (Caregiver, FGD) "When they came and they say like it's like a crèche [preschool], nè, you are teaching your child and all that and in your mind you are thinking 'ag I don't have time for that like, how do I teach a child this and that?' You understand. So, I mean at first nè, what I did was I was not really interested, I was just doing [name of CHW] a favour. To be honest." (Caregiver, FGD)
Appropriate-ness	How well does the intervention correspond with	Separate FGDs with CHWs and caregivers after	Appropriate for caregivers. The CHWs are also	"Then after [the CHW] told me that 'This thing, it's a project with kids, so I don't know how you're going to feel about it.' Then I said 'Of course I will try and force

	caregivers' situations and needs? Are CHWs well suited for delivering this intervention?	intervention, observations during training and intervention, feedback from CHWs about training, key informant interviews.	suited to deliver the intervention based on their skills and the scope of work.	my children to have the better education and I want to see my children being happy.'" (Caregiver, FGD) "If it is done by community health workers I think it's good because they are our foot soldiers to the community. That's why they are sent… I think they are the good people for the [Amagugu Asakhula] programme." (Key informant interview)
Implementation and fidelity	To what extent was the intervention implemented as intended in the design, and consistently with the underlying theory and philosophy?	Observations, key informant interviews, separate FGDs with CHWs and caregivers after intervention.	Mixed results. Some specific descriptions by caregivers indicated high fidelity of intervention activities and content, but CHWs had also made changes to the intervention.	Caregiver 1: "Then I realised that raising a baby is like planting a seed." Caregiver 2: *"*Yes*."* Caregiver 1: "You have to give it all your attention, take care of it and love it, so that is what I learned." (FGD) "Here, all of us we were doing the training with the caregivers differently... You would have expected us to follow the manual exactly the things, 'Tell the caregivers what will affect the brain development of a child. Tell the caregivers…' like follow exactly the manual. Yet we did those things in our own understanding and in our own ways where it helped us." (Participating CHW, FGD)
Feasibility and context	How successfully can this intervention be carried out in this setting? How successfully can the necessary evaluation components of this	Recruitment and retention records, observations, key informant interviews, separate FGDs with CHWs and	Not feasible to be delivered by CHWs linked to a primary health care facility. Only partially	"Community health workers try to find every excuse not to do things and can walk around aimlessly just clocking up visits. That's what's happening." (Key informant interview) "But the strike…it strains a lot of people, meaning most of the people didn't want to go work anymore. Didn't want to work, because they were thinking 'Ah, the

	intervention be carried out in this setting? Are there contextual barriers or facilitators related to this intervention and/or its evaluation? To what extent are they modifiable, and do they necessitate further tailoring of the intervention for a full trial? Were there any factors external to the intervention that seemed to influence implementation?	caregivers after intervention.	successful implementation, and challenges suggest evaluation components will be difficult to carry out through CHWs. Considerable systemic and structural barriers to integrating the intervention to the work of CHWs.	government is failing us again.' Ah, you know. So it's yeah, it kills our jobs, like yeah, yeah it affected our job like so badly, so badly." (Key informant interview) "They can't do with an empty stomach also. They need to get paid so that they have that energy so that they can do whatever." (CHW who dropped out, FGD) "Yes, people will be like 'Okay, will we get extra money for it?' (sighs) That's not motivation, that's being selfish." (Key informant interview)

7.4.1 Adoption

In total, 41 out of 45 CHWs attended at least one of the two training sessions provided at the start of the study, and 18 attended both sessions. Twenty-six CHWs initially expressed an interest and signed up to deliver the intervention. Each CHW who agreed to participate recruited 1-2 caregivers to deliver the intervention to over the subsequent six weeks. In the end, 14 CHWs and 23 caregivers participated in the Amagugu Asakhula feasibility study.

Some initial scepticism towards the intervention was reported by both CHWs and caregivers. Among CHWs, the reluctance they had experienced was described in relation to committing to what was described as “extra work” or “too much work”. The reasons for this initial scepticism varied more amongst the caregivers, but included concerns about the required time commitment, having to do something “boring”, being expected to teach children things, or learning how to raise one’s own children despite already having experience of raising children, and fears about the intervention somehow putting children at risk. CHWs were able to mitigate these reservations through providing more information, and caregivers described becoming very enthusiastic about Amagugu Asakhula once they noticed how keen their children were to do the activities the intervention involved. Another advantage was the existing relationships that CHWs had with caregivers, as illustrated by the quotes in Table 23.

A potential barrier to adoption that came up in the key informant interviews was that both CHWs and caregivers were likely to want incentives or compensation

for participating. Indeed, the CHWs' enthusiasm towards the content of the intervention and learning new things did not ensure the consistent and continuous participation of many CHWs. While "motivation" was a word that frequently came up in both FGDs and key informant interviews, it seemed like "motivation" often denoted compensation.

Some CHWs in FGDs speculated that making sure that all CHWs really understood the purpose of the Amagugu Asakhula intervention would make them motivated from the start. However, feedback regarding the training did not suggest how to improve this aspect. It was also reported in both interviews and FGDs that there were financial barriers to adoption of the intervention. Not being paid extra for taking part in research, and some CHWs not even receiving their regular salaries on time because of challenges unrelated to the Amagugu Asakhula study, reportedly played a considerable part in so few CHWs completing the six-week intervention. The fact that most CHWs indicated that they intended to deliver the intervention after completing the training, but ended up not delivering it, speaks for the latter institutional barrier potentially being more significant. This is because CHWs who attended the training already knew that participation would not increase their salaries.

7.4.2 Acceptability

The main aspects of acceptability that were examined here were the acceptability of the intervention delivery and content of the intervention to participating caregivers, and the acceptability of the intervention to the CHWs

expected to deliver it. FGDs and informal interactions indicate that both CHWs and caregivers found the content of the intervention to be acceptable, and they explicitly expressed how relevant and enjoyable the intervention was. Many CHWs described enjoying or valuing the fact that they had learned new things, and they had made use of the content and materials with their own children or grandchildren. Even the CHWs who dropped out of the feasibility study described liking the content, and incorporating elements of it into their work with young children.

In terms of the delivery, the caregivers did not express any objections to the intervention being delivered by CHWs, and reportedly found it convenient that the sessions took place in their homes. The risk of stigmatising participants as a potential negative aspect of home visits was raised by one key informant. While it was normal for CHWs to visit families in the community, the key informant expressed concerns about having CHWs visit specific homes on a much more regular and frequent basis as a potential barrier to acceptability from the point of caregivers. However, this concern about stigma was not expressed by any caregivers, some of whom described telling neighbours about Amagugu Asakhula, and doing intervention activities with other children in their neighbourhoods too.

In terms of scheduling, there were some comments from caregivers about CHWs turning up unannounced and thus causing some inconvenience but these situations had usually been resolved by agreeing on specific times for the Amagugu Asakhula sessions. Because many of the participating caregivers were unemployed, they described having plenty of time for the home-based intervention.

Caregivers in the FGDs also suggested incorporating group sessions or activities to the intervention itself. According to them, participating in the FGD was a positive experience because of the opportunity to hear about other families' experiences.

7.4.3 Appropriateness

Both CHWs and key informants reported that the Amagugu Asakhula intervention was a good fit with the regular scope of CHWs' work, and that they were able to carry out home visits thanks to being known and trusted by community members. According to key informants and CHWs themselves, CHWs linked to a primary health care facility should, at least in theory, be able to accommodate this type of intervention within their work both in terms of its content and focus on preschool age children, as well as the home-based mode of delivery.

Similarly, the intervention resonated with the caregivers' situations in that they were able to carry out intervention activities with their children. As quotes relating to both appropriateness and acceptability illustrate, caregivers could see how the intervention aligned with their aspirations to ensure their children could learn well and be happy. Particularly those caregivers who could not afford to send their children to preschool were keen to support their children's learning and development through the activities and nurturing interactions promoted through Amagugu Asakhula. Some caregivers reported being surprised by how much their young children had learned in a short amount of

time, and this sense of achievement, combined with the children's enjoyment, was central to the appeal of the intervention.

7.4.4 Implementation and fidelity

The delivery of the six-week intervention was interrupted after the first week due to CHW strikes taking place in Gauteng Province, as well as other parts of South Africa. During the strikes, no Amagugu Asakhula sessions were run. Many of the CHWs were not doing their other work either although some continued to work in the primary health care facility even during the strike. Because of these delays, it took more than the originally scheduled six weeks for CHWs to complete the six sessions with participating caregivers. Data collection for the post-intervention evaluation was carried out three weeks after the end of the completed intervention delivery.

While intervention fidelity was not the primary focus of this feasibility study, the process evaluation findings paint a somewhat mixed picture of how well the delivery of Amagugu Asakhula matched the intended design of the intervention. Based on caregivers' detailed descriptions of activities, and reflections that they shared with each other in FGDs, there were indications that many activities and topics had been covered by CHWs according to the manual. However, there was also some evidence that recruitment and delivery did not go according to the intervention's intended procedures and criteria. It emerged that some caregivers who participated in FGDs did not have children in the targeted age range, even though the sociodemographic questionnaires returned by CHWs

indicated that they did. Moreover, although the identity of all FGD participants matched the records provided by CHWs, it emerged during the FGDs that some CHWs had not yet started the intervention with participants by the time they had been invited to post-intervention FGDs.

Due to the discrepancies in study records, the CHWs' accounts of sessions completed have been excluded as evidence of fidelity, as it was not possible to fully ascertain whose records were accurate and whose may have included inconsistencies. In addition to these indications of low fidelity, CHWs also reported outright in FGDs that they had made changes to the intervention. These changes included asking caregivers to study the intervention manual on their own, covering some sessions via messages rather than in person, and skipping or combining some sessions. Some of these changes had been made in response to specific challenges, such as difficulties scheduling the weekly sessions. It was also reported that the lack of close monitoring of the CHWs' activities enabled them to do things in their preferred way, as opposed to how the intervention had been intended.

As the quote (Table 23) about delivering the sessions in their own way suggests, it was also possible for CHWs to personalise the content, and communicate intervention messages in a way that they found helpful, as opposed to exactly how they were described in the intervention manual. However, despite it being covered in the training provided, it had not been fully clear to CHWs which aspects of the intervention are flexible, such as how the content is phrased, and which aspects are not, such as inclusion criteria, and the number, order, delivery method, and focus of sessions with participating families.

7.4.5 Feasibility and context

As was mentioned under appropriateness, both CHWs and key informants considered the intervention a good theoretical fit with the regular work and roles of CHWs linked to a public primary health care facility in Soweto. Some key informants also believed the Amagugu Asakhula intervention could be scaled up and integrated into the ward-based outreach system if found to be effective in the future. However, the CHWs' reluctance to have new or additional work incorporated into their existing roles presented a considerable barrier to feasibly implementing the Amagugu Asakhula intervention. Similarly, key informants who openly acknowledged this barrier were sceptical of how implementation could be done in practice. There were thus some contradictions both within and between the different key informant and CHW accounts.

Two clashing narratives about the challenges were expressed by CHWs and key informants respectively. CHWs tended to emphasise that they had too much to do, while key informants indicated that the CHWs were not doing enough in their role. The view that CHWs were already overworked, and too much was expected from them for their current salaries was closely linked to the strikes and labour union action taking place across the country at the time of the feasibility study. CHWs were unhappy with their precarious status as some reported that their contracts defined them as interns or trainees, rather than employees, and many were disgruntled with either the salaries they were paid, or the fact that they were not paid on time. Introducing any additional or new work to the role of CHWs would therefore require paying them more, and strengthening their status as public sector health workers. The other view was

based around the notion that CHWs were not monitored well enough, and because of this lack of accountability, as well as a perceived lack of motivation, commitment or work ethic, they were not doing as much work as could reasonably be expected of them for the money they were paid, and unlikely to willingly take on anything new.

While it is not possible to ascertain whether one of these views, a combination, or something else entirely, was the most accurate account of the situation, these organisational challenges and conflicts were described as considerable challenges to delivering Amagugu Asakhula, as well as the ward-based outreach programme more broadly. Indeed, it was recommended by both CHWs themselves and key informants that the intervention could or should be delivered through or together with other actors, such as preschools and community-based organisations. Other changes were also suggested by CHWs and caregivers but as they mainly pertain to details of the intervention content and materials, such as having more different types of flashcards for children to learn more, they are not presented here.

Some of these contextual challenges provide an opportunity to optimise the intervention by, for example, modifying it to better accommodate delays and disruptions in the future. However, the insight the strikes provided into the overall functioning of the ward-based outreach system, and the primary health care facility's operations more generally, paints a more complex and volatile picture. Views expressed by both key informants and CHWs in FGDs pointed to issues with supervision, accountability, resistance to change, and practical challenges of balancing work in the community with demands for being present in the facility. Resentment and frustration were expressed among both CHWs

and management, but I have decided not to publicly share quotes that may exacerbate existing tensions.

7.5 Discussion

7.5.1 Implications, challenges and solutions

> *"Interventions are developed with attention to ensuring the intervention will be used in the real world if found to be effective at the evaluation phase."*[164] *(p.6)*

In this study, I have investigated the acceptability and feasibility of delivering the Amagugu Asakhula intervention through CHWs linked to a primary health care facility in Soweto. My analysis indicates that the intervention and its delivery are both acceptable and, in theory, appropriate, but due to contextual challenges, the delivery of the intervention is, in practice, not feasible via CHWs who are linked to a primary health care facility. This is in line with other studies examining CHWs in South Africa and other LMIC settings, as CHWs have become a cadre of health workers to whom various new tasks and roles are shifted, without necessarily much consultation or consideration of their capacity in terms of time, working conditions or skills, and their work is often restricted by systemic challenges.[279,283–285] Earlier research in South Africa has also identified the lack of supervision or monitoring a challenge for the ward-based outreach system and CHWs.[286]

The hesitant adoption of the intervention by CHWs is not a complete surprise against this background. From the point of view of scalability and sustainability,

it may seem ideal to utilise existing public health system structures in delivering interventions, but it is likely more realistic to consider other options for delivering the Amagugu Asakhula intervention. However, the recognised potential for utilising CHWs in delivering childhood obesity prevention interventions in HICs[273] and in Cape Town[263] may still be realised in Soweto. Employing CHWs linked to community-based organisations as opposed to public primary health care facilities would mean delivery through CHWs whose time is dedicated to the intervention, and compensated for, as opposed to having an increased workload without increased compensation. This route through community-based organisations is not without its own challenges and implications, such as higher costs and more limited potential for scalability and sustainability than the public sector. Implementation of CHW programmes through community-based organisations has also been criticised for lacking accountability.[279]

The implications of choosing one delivery mode over another on the desired outcomes of healthy behaviours and, ultimately, obesity prevention, are worth considering. Indeed, targeting preschools instead of families would change the behavioural focus from the routines at home to those within the realms of the preschool. As my qualitative research presented in previous chapters suggests, the preschool environment may already be a somewhat healthy or health-promoting setting, whereas parents in Soweto may need more support to establish healthy habits around, for example, what their children eat and how much they sleep during the night. My analysis presented in this chapter indicates that the Amagugu Asakhula intervention was appealing, relevant and acceptable to caregivers, but particularly to those parents who could not afford to send their children to preschool. These parents have the most to gain in

terms of supporting early childhood development through other means. Delivering interventions only through preschools may thus serve to further disadvantage children and families who are likely to already be in the most vulnerable position.

The positive views expressed by caregivers regarding the value of sharing experiences in a group suggest that group activities of some sort could be advantageous to incorporate to the current individual caregiver-centred approach. This further speaks in favour of either delivering interventions in groups rather than to individual caregivers, or incorporating some group-based activities or sessions to the current Amagugu Asakhula intervention. However, this would have implications for both costs and logistics, as getting entire groups of caregivers to attend sessions would require coordination and likely also incentives and reimbursement of transport costs. The practical need for and ethical challenges of incentivising intervention participation has been discussed in a recent study on health promotion in Soweto.[287]

While there were some evident challenges to adoption among both CHWs and caregivers, the reported phenomenon of eventually adopting and accepting the intervention after initial hesitation is an important finding for ensuring successful recruitment and adoption in future interventions. The acceptability of the intervention is also promising considering the sensitive and complex nature of childhood obesity, and the need for promoting children's healthy behaviours without perpetuating weight stigma, as discussed in Chapter 5 and 6. Indeed, children, caregivers and CHWs enjoying the Amagugu Asakhula intervention speaks in favour of utilising nurturing care interventions for childhood obesity prevention.

The challenges in recruitment and initial adoption further point to the importance of broader and earlier community and stakeholder engagement, comprehensive and clear information regarding the intervention from the start, and the need for better understanding the determinants of participation in research or interventions in this setting. Given that children's reactions to the intervention were significant for the adoption and acceptability of the intervention, it may be useful to incorporate more practical or experiential learning to the training of CHWs, and deliberately utilise testimonials from CHWs who have tried the intervention activities with children in their own family for recruiting caregivers into the intervention. There may also be a need to allow more time for training and information about the intervention to sink in among CHWs before decisions about participation are required.

For continuity and sustainability of the Amagugu Asakhula intervention, or other behavioural interventions in this setting, it is also important to note that as in the original pilot study in Cape Town, some of the most salient and appealing aspects of the intervention involved having fun and learning together. Indeed, Amagugu Asakhula's focus on development, rather than explicitly addressing health behaviours and obesity seemed to work well in this setting, as it did in Cape Town.[263] The interest shown by children could potentially support sustained behaviour change if it encourages parents to keep using intervention materials and in other ways carry on with activities and interactions promoted through the intervention. As such, the feedback from caregivers and CHWs on materials and activities is of central importance though not reported here in detail.

There are also other practical lessons to be drawn from this study for future implementation and evaluation of Amagugu Asakhula or other obesity prevention interventions. For example, the findings related to fidelity indicate that there is a need for more thorough, accessible and effective training of CHWs when it comes to both the intervention content and its delivery. Inaccurate reporting had a strong impact on data quality, demonstrating the need for enhanced training. This issue is especially pertinent when it comes to any expected research contributions, such as recruitment of eligible participants, carrying out the consent process with caregivers, and collecting basic questionnaire data or any other data CHWs are responsible for collecting. In particular, these concerns will need to be resolved if a definitive trial is carried out to ensure that outcome data that will be used to evaluate effectiveness of the intervention is of sufficiently high quality, and that ethical standards are adhered to in obtaining caregivers' informed and voluntary consent for participation.

In addition to more comprehensive training, the findings suggest a need to develop specific strategies to monitor and ensure the fidelity of the intervention in order to accurately evaluate the effectiveness of the intervention in the future.[288] Another approach is also to allow for greater flexibility in future evaluations, and try to capture what implications such modifications may have on implementation and outcomes through process evaluation methodology. Indeed, the updated MRC guidance for developing complex interventions underscores the importance of flexibility, creativity and openness to change.[164]

Overall, this study raised some questions about how to proceed based on findings from a feasibility study, as no quantitative threshold or prespecified

progression criteria were set to determine whether to proceed to an effectiveness trial of the intervention. This is a contentious and often overlooked topic, and there are calls for increased transparency and guidance on this aspect of exploratory studies.[275] Indeed, there was no specific decision-making process for determining whether or not the Amagugu Asakhula intervention delivery through CHWs linked to a primary health care facility in Soweto was feasible. However, the qualitative methods I employed in combination with the use of multiple process evaluation concepts and a theoretical framework to guide this investigation enabled multifaceted learning and a relatively complete, complex and nuanced picture of intervention delivery. For example, while promising findings relating to acceptability and appropriateness give a positive impression of the intervention itself, there are several alarming features in the data relating to feasibility, fidelity and the context that fundamentally speak against this particular delivery approach. Moreover, as detailed above, there are several findings that can support the optimisation of the intervention in the future, demonstrating that the chosen data collection and analysis methods were appropriate for fulfilling the aims of this study.

7.5.2 Strengths and limitations

As I was responsible for carrying out the entire feasibility study, from introducing the intervention and recruiting CHWs to providing the training and evaluating the intervention delivery, it is important to consider the role of observer bias, which is a typical limitation of intervention research.[190,289] Such observer or research bias is likely to result in the exaggeration of positive aspects at the

cost of more critical observations. Moreover, as the data collection took place at the primary health care facility, participants may have felt uncomfortable expressing critical views despite interviews and FGDs being conducted in closed rooms. However, I did not need to rely on formal accounts provided by respondents alone to arrive at my interpretation of the intervention delivery. This was due to the aforementioned rapport I had established with some CHWs in particular, and the numerous site visits that offered ample opportunities for informal observation of the functioning of the ward-based outreach programme more broadly. The sharing of some critical and contentious opinions in interviews and FGDs also suggests that a level of trust between myself and the participants had been established.

Another major limitation was the weak reliability and quality of data collected by the CHWs, but the fact that this shortcoming was identified through other data sources can be interpreted as triangulation providing a level of protection from falsified data. Indeed, as the findings related to the context and feasibility of the intervention illustrate, this was a challenging study to complete. In addition to being somewhat challenged by the intrinsic limitations I have detailed above, external factors such as the strikes also hindered the optimal delivery of the Amagugu Asakhula intervention. However, in terms of learning from formative and exploratory research, this feasibility study provides many important insights. I will provide further reflections on these challenges of carrying out intervention research in Soweto and LMIC settings more broadly in Chapter 8.

7.6 Conclusions

This feasibility study contributes to the optimisation of the Amagugu Asakhula intervention, further testing of it and particularly its delivery, and to the development of other interventions in this setting. I have demonstrated that delivering the Amagugu Asakhula intervention through CHWs linked to a primary health care facility was acceptable to caregivers of preschool children, and to the CHWs in terms of the content of the intervention. However, this delivery mode was not found to be feasible for further implementation and testing due to organisational constraints related to the ward-based outreach system of which the public sector CHWs in South Africa are part. Delivery through CHWs who are linked to a community-based organisation instead of a public primary health care facility is recommended although this recommendation comes with potentially higher implementation costs. Future studies should test the effectiveness of such approaches in preventing childhood obesity and promoting nurturing care and healthy behaviours in early childhood in South Africa.

7.7 Contributions

I designed this study together with Esther van Sluijs and Catherine Draper. I developed the study protocol with some input from Stephanie Jong, and obtained funding from the Cambridge MRC Doctoral Training Programme and the Oppenheimer Memorial Trust in South Africa. Catherine Draper and I obtained ethical approval from the University of the Witwatersrand, and I further

obtained permission from the Johannesburg Health District to conduct research at the primary health care facility in Soweto. Following Catherine Draper's initial contact with the facility management, I set up training and recruitment for the study with guidance from a team of CHWs. I delivered the training, managed all records, carried out observations, wrote field notes, and conducted all interviews and FGDs. I transcribed FGDs with CHWs myself, managed the professional transcription of the caregiver FGDs and key informant interviews, and checked the professionally transcribed data against original recordings. I managed and analysed the data using MAXQDA (Release 12.2.0) software. I developed the analysis strategy with guidance from Stephanie Jong, Esther van Sluijs and Catherine Draper. I carried out all coding and theme development, and had discussions with Catherine Draper, Esther van Sluijs and Stephanie Jong about the analysis. I also received feedback from all three researchers on drafts of this chapter.

8 Discussion

8.1 Overview

The aim of my thesis was to assess the state of the evidence related to childhood obesity prevention in Africa, and South Africa specifically, and to conduct formative research to inform the development and evaluation of obesity prevention interventions. The specific objectives were:

- To review the effectiveness of childhood obesity prevention interventions in African countries on anthropometric and behavioural outcomes (Chapter 3)
- To identify barriers and facilitators to childhood obesity prevention interventions in African settings based on existing evidence (Chapter 3)
- To examine how caregivers of young children in an urban low-income setting perceive overweight, obesity, and related behaviours (Chapter 5, Chapter 6)
- To understand what barriers and facilitators to addressing childhood obesity and unhealthy behaviours are of relevance to caregivers in an urban low-income setting (Chapter 6)
- To test the feasibility and acceptability of a home-based, community health worker-delivered intervention to promote healthy behaviours among preschool age children in an urban low-income setting (Chapter 7)

In the sections that follow, I will discuss my thesis findings in relation to the extant literature, and critically examine the implications, strengths and limitations of my research, as well as providing an account of how I have practiced reflexivity and some of the challenges I have encountered in this

research process. Finally, I will conclude my thesis with some recommendations for a way forward.

8.2 Thesis findings

My thesis has examined childhood obesity, its prevention and behavioural determinants in Africa, with a specific focus on the urban low-income setting of Soweto in South Africa. The topic, and my approach to examining obesity as part of a wider challenge and double or triple burden of malnutrition in LMICs is timely. Indeed, we are in the middle of the United Nations Decade of Action on Nutrition (2016-2025),[290] which urges member states to take action to eliminate "malnutrition in all its forms". Moreover, the 2019 Lancet Commission Report on the The Global Syndemic of Obesity, Undernutrition, and Climate Change,[59] as well as the recent Lancet Series on the Double Burden of Malnutrition,[11,20,57,105] shed light on and call for both research and action on the growing burden of overweight and obesity in LMICs. These publications underscore the interconnectedness of obesity, undernutrition and environmental implications of nutrition transitions. While I have not addressed the links between childhood obesity and climate change in my thesis, I do acknowledge the shared complexity and related upstream causes of these phenomena. My research contribution is focused on understanding the existing evidence on childhood obesity prevention in African countries, and informing future interventions through in-depth qualitative insights. In response to my PhD aims and objectives, I conducted a systematic review of childhood obesity prevention interventions in African countries; an in-depth qualitative study of parents'

perspectives on preschoolers' weight, size and health behaviours in Soweto; and a feasibility study of a nurturing care intervention targeting health behaviours of preschoolers in Soweto. In the following sections I summarise my key findings before discussing methodological considerations and reflections about the research process.

8.2.1 Lack of interventions targeting preschool age children or non-school settings in Africa

Through my systematic review, I mapped the extent and quality of existing evidence of behavioural interventions aiming to prevent childhood obesity in African settings. I identified a particular dearth of evidence when it comes to interventions targeting younger children, such as preschoolers, in African settings and the evidence base was largely comprised of school-based interventions. While the majority of included studies had been conducted in South Africa, none of the South African interventions had targeted preschool age children. I therefore decided to focus my research on 3-5-year-old children in South Africa, as understanding their health behaviours in more depth would contribute towards future intervention development in an under-researched group. I also identified research gaps in terms of interventions that target other settings than schools.

8.2.2 Low quality of evidence and few process evaluations

Based on the quality assessment I carried out in my systematic review, the included studies were predominantly of weak quality. These findings also emphasised the need for transparent reporting about intervention research, because some shortcomings that resulted in low quality scores were due to reporting rather than study design or methods. Nevertheless, many study designs also fell short of being able to report intervention-attributable effects. In addition, there was a dearth of published process evaluations or other intervention- and implementation-related reporting. A systematic review of school-based interventions targeting nutrition and physical activity, and body weight status in Africa was published after mine, and it largely corroborates my assessment of the quality and extent of the evidence base.[291]

8.2.3 Obesity is not a priority for parents in Soweto

In my qualitative study, I found that that participating parents were more concerned with underweight than overweight. There are social dimensions to this, with negative comments from other children or adults reportedly being aimed at underweight more typically than overweight. Larger bodies may also receive negative attention, but there are still positive connotations to preschoolers being bigger as long as their weight or size does not hinder their health or activities in any way. This analysis both contributes new evidence and adds nuance to existing literature on the topic in South Africa, as it is the first to

focus on the parental views of the preschool age group, but also challenges the notion of overweight in young children being a positive preference.[242,243]

I also found that children's weight and growth were often considered beyond the control of parents. Instead, they were seen as more determined by genetic and biological aspects according to parents who can be expected to experience a limited sense of agency in their life and parenthood. This is in line with other recent research on young women's health behaviours in Soweto,[120] and likely to reflect the overall scenario of nutrition transitions being driven by upstream factors far beyond the control of individuals.[57] My findings resonate with those of a qualitative study in Nepal, in which mothers of school-age children reported feeling powerless in relation to both children's preferences and obesogenic environments.[292]

In my study, weight was not necessarily considered indicative of health, and the participating parents in Soweto considered health to be of greater importance than weight-related issues if children were not noticeably affected by the latter. According to the participating parents, overweight and obesity could have negative consequences for children's physical health, but they could also harm children through stigma and bullying.

A review, which compared the associations between parenting practices and child health and developmental outcomes in Sub-Saharan Africa with those in HICs, found that such associations were broadly similar across country settings in the existing evidence base.[293] This points to the transferability of such findings in HIC settings to LMIC settings in Africa, but as my research

highlights, it is important to ensure that local contextual factors are well understood in adapting interventions.

When it comes to qualitative evidence of parent perspectives on preschoolers' movement and dietary behaviours in other settings, there are both similarities and differences when compared to the findings from Soweto. A recent qualitative study examined such parenting practices in Brazilian immigrant families in the United States, and to a lesser degree also considered the social contextual factors involved.[294] Brazilian parents reported actively discouraging screen time in favour of physical activity, and setting such boundaries in a more health-centred manner than the Sowetan parents, who mostly restricted screen time for more pragmatic reasons. This suggests differences in awareness about the health implications of movement behaviours. Similar to the Sowetan context, traffic-related concerns, financial constraints and limited space were cited by the Brazilian parents as limiting opportunities to play and be active, especially in terms of any organised activities.

Interestingly, the views expressed by Sowetan parents seem to correspond less with those of Malawian parents in a qualitative study focusing on preschoolers' physical activity and child development,[295] and more with those in HIC settings.[296–301] As Pulakka and colleagues[295] summarise, HIC studies from predominantly urban settings emphasise factors such as safety concerns and poor access to play areas as barriers to physical activity that largely resemble barriers described by Sowetan parents. On the other hand, parents in rural Malawi described factors like adequate nutrition, parental example or modelling, having friends or siblings, attending preschool and having access to sports equipment as enabling physical activity,[295] whereas the Sowetan parents

tended to describe children's activity as something occurring very naturally, such as "running around" without needing much stimulation from parents. The built environment and other characteristics that distinguish urban from rural are central considerations in examining young children's health behaviours.[123,124,126] The findings from low-income or migrant communities and predominantly urban settings in HICs do seem to resonate with the lived experiences of Sowetan parents so some extent, but more qualitative research is needed in rural South African settings to provide a fuller picture of barriers and facilitators to preschoolers' dietary and movement behaviours.

8.2.4 Upstream challenges and downstream opportunities for childhood obesity prevention

Through my qualitative inquiry, I identified barriers to preschoolers' health behaviours. According to parents, these were largely environment- and resource-related, such as the cost and convenience of different foods, and also related to the social dynamics of children interacting with other children and parents who may not have the same ideas about, for example, restricting intake of sugary snacks. Factors beyond parents' control, such as unemployment, crime and poverty made it difficult for parents to realise their aspirations. The prominence of such structural issues in my qualitative inquiry also speaks to the importance of informing upstream, policy level interventions (see Chapter 1 and Chapter 2) through the lived experiences of people.

Parents also found it difficult to ensure that their children ate healthy food, and many described letting their children decide about such things because it was so difficult to maintain control. Similarly, bedtimes were sometimes decided by the preschoolers as opposed to parents because parents found that children would not listen to their attempts to set boundaries. Other recent research in South Africa has found similar challenges among parents in low-income settings.[254] These challenges around routines and boundaries came across as more realistic to address through behavioural interventions than some of the structural and upstream factors that also had a bearing on parenthood and children's health-related behaviours.

To my knowledge, the research presented in chapters 4-6 was the first study to qualitatively examine South African preschoolers' dietary and movement behaviours together. There is some recent qualitative research on South African preschoolers' physical activity in different settings with broadly similar findings to mine.[236,254] Beyond that, the existing qualitative literature on preschool learners' health behaviours, including parents' feeding behaviour, is largely comprised of HIC studies,[237,302,303] while such evidence exists for infants and adolescents in LMICs.[238,241,304,305] However, some similarities can also be observed between my findings from Soweto and studies with low-income families in HIC settings. For example, a thematic analysis of low-income mothers' aspirations and challenges in feeding their preschool age children in the United States found that mothers' aspirations to limit sugar intake were not necessarily about weight-related concerns, but instead, focused on preventing hyperactivity and tooth decay. Mothers felt challenged by children's requests and other adults' behaviours when it came to limiting snacking.[306] These

findings resonate with some of the experiences and perspectives of the Sowetan parents, and highlight the need to ensure that interventions and health messages are framed in a way that corresponds with the realities and aspirations of families.

Beyond downstream opportunities for interventions, my research also further highlights the urgent need to find larger, multisectoral solutions to child malnutrition in South Africa, and address the underlying challenges such as inequality and food insecurity through changing systems and policies, rather than relying on behavioural interventions alone. There is thus a clear need for policies and action on the national level and across sectors, but such processes are slow and complex compared to smaller and local interventions, as was also noted in a recent evaluation of policy responses aiming to address the upstream risk factors of NCDs in Caribbean countries.[307] Nevertheless, complexity should not be invoked as a "smoke screen",[308] conveniently excusing policy inaction.

8.2.5 Amagugu Asakhula: Acceptable intervention, but not feasible to deliver

In my feasibility study of the nurturing care and obesity prevention intervention Amagugu Asakhula, I found that delivery of the intervention that targeted caregivers of preschoolers in Soweto was not feasible through CHWs linked to a primary health care facility. This was because of considerable contextual implementation challenges, including the reluctance of CHWs in the public sector to incorporate new tasks into their roles without additional pay. The

community health workers were also dissatisfied with many aspects of their working conditions, most notably not getting paid on time.

However, I did find the Amagugu Asakhula intervention to be acceptable to, and liked by, both caregivers and CHWs. The process evaluation methods I used thus help disentangle the intervention content from its delivery. While there were initial challenges in terms of adopting the intervention, the content and home-based nature of the Amagugu Asakhula intervention were relevant and appropriate, and my findings regarding optimising the implementation can be put into practice in future evaluations of the intervention. My findings reflect recognised challenges of implementing health promotion programmes or interventions through CHWs in other LMIC settings.[279,283–285] Nevertheless, the low feasibility of intervention delivery through public sector CHWs does not fully negate the recognised potential in HICs to deliver obesity prevention interventions through CHWs, as CHWs linked to a community-based organisation were able to successfully deliver the Amagugu Asakhula intervention in a previous pilot study in Cape Town.[263]

8.3 Implications and recommendations

> *"[O]ne should never take the standard description of townships as poor to mean that township life was poor. But what, then, of the problems of the area? Problems there are, aplenty."*
>
> Jacob Dlamini[309] (p.63) writing about Katlehong

> *"But for far too long […] the hypervisible problems of poverty, crime and disease, have come to define township life in ways that do nothing to educate us about the practices of everyday life in townships. In a sense, to define townships in terms of their problems is to reduce township residents themselves to problems – instead of seeing them as people with problems, some of which are personal and others collective: just like every human being on earth, in fact."*
>
> Ibid.[309] (p.118)

My thesis has both mapped and contributed to filling research gaps concerning childhood obesity and children's health behaviours in South Africa. Through utilising social-ecological models, I have been able to identify barriers and facilitators to healthy habits across different spheres of influence. Structural, upstream barriers, such as poverty or crime, are very difficult to overcome through the means of public health interventions, whereas addressing more proximal factors, such as routines in the home, may involve opportunities for behavioural interventions.

Through my feasibility study of the Amagugu Asakhula intervention in Soweto (Chapter 6), I have developed recommendations regarding feasible and acceptable ways of delivering interventions that target parents of Sowetan preschoolers. The central change going forward should be to deliver the intervention through CHWs who are not part of the public primary health care system, but rather linked to community-based organisations. The well-received nurturing care approach and intervention content demonstrated great promise for further testing, and thus a trial design that enables the evaluation of the

intervention's effects on outcomes such as children's health-related behaviours and anthropometric outcomes should be adopted. This should also involve process evaluation components in order to maximise learning from any future evaluations.

Instead of defining Soweto or the people of Soweto in terms of problems,[309] I have tried to identify realistic opportunities for modifying children's behaviours in a healthier direction, without overlooking the complexity of more distal and structural barriers that limit the choices and agency people may have. While these larger problems can seem impossible to overcome, it is important to work towards improvements that can be made, and that can potentially make a difference for the health, wellbeing and development of young children in South Africa.

Instead of waiting for robust and nationally representative evidence of children's health behaviours to emerge, I have chosen to focus more closely on identifying what *could* be done in one specific setting, rather than determining what *should* be done without having any indications of whether it can be done in practice. I have not been able to answer whether what *could* be done will be effective in achieving the desired outcomes, but with the help of theory, existing evidence, and new in-depth evidence from my own research, I can recommend avenues for new interventions to explore. Given the complexity of even small behavioural interventions and attempts at behaviour change, my findings regarding barriers and facilitators to children's healthy behaviours are important. Despite my focus on small downstream opportunities rather than targeting the underlying upstream drivers of obesity, my focus on formative research and small-scale

feasibility of interventions makes a unique contribution to facilitating intervention development and evaluation in low-income settings in South Africa.

Interventions need to be non-stigmatising, perhaps through focusing on healthy behaviours rather than obesity or undernutrition in isolation. Such interventions fall under the newly launched "double-duty actions"[59,105] framework for addressing the double burden of malnutrition. Double-duty actions mean interventions that simultaneously address undernutrition and overnutrition. In theory, this should be a more cost-effective approach than addressing different forms of malnutrition separately.[20] However, the focus of such actions is on higher levels of policy and systemic change, and as Hawkes and colleagues point out, "The capacity to deliver double-duty actions does not yet exist and will need to be built and appropriately funded."[105] (p. 151). As it is likely that the upstream changes will take time to take effect, a focus on intervention opportunities on the more downstream, behavioural dimensions of childhood obesity in South Africa is warranted in the meantime.

While I have argued for a focus on healthy behaviours that could benefit all children regardless of weight, it is important to also explicitly express the need for cautious approaches to childhood obesity prevention in settings where undernutrition also persists. Focusing on one form of childhood malnutrition may have harmful unintended consequences on other forms of malnutrition, and the recommended future focus on double-duty actions will need to incorporate this awareness and caution.[105,310]

In the process of completing my PhD, I changed my perspective from a specific focus on obesity to a broader understanding of obesity as only one

manifestation of malnutrition in South Africa. Incorporating this recognition from the start may have shaped the research to be more open-ended, and it would have ensured a much broader scope for the systematic review. Nevertheless, the focus on environments and circumstances in addition to behaviours facilitated a holistic understanding of child malnutrition in Soweto through the qualitative work I undertook.

8.4 Methodological considerations, strengths and limitations

8.4.1 Cross-cutting methodological considerations

My research has been predominantly qualitative, and these methodological considerations thus focus on reflexive thematic analysis using a contextualist approach. In my systematic review, I followed PRISMA guidelines for the conduct and reporting of systematic reviews, and the specific methodological considerations that relate to the systematic review are discussed in Chapter 3.

There are many ways to evaluate qualitative research, and due to the heterogeneity and evolution of qualitative methods, it is important to assess studies against relevant criteria. A recent overview[311] critiques popular methods for 'enhancing' trustworthiness and rigor as being largely ineffective or incompatible with qualitative research. Similarly, 'universal'[312] and stable criteria for evaluating qualitative research are criticised for not accounting for methodological diversity, but also for being only selectively and partially used by

researchers.[311] In the following sections, I will briefly discuss criteria that are compatible with contextualist approaches to inductive and deductive thematic analysis before discussing specific strengths and limitations of my research.

8.4.1.1.Generalisability and transferability

> *"Qualitative health research findings are typically signified by appeals to analytical or idiographic generalizability and transferability, or to transformative understanding: one that changes researchers, participants, and/or the way participants, problems, and events are viewed."*
>
> Margarete Sandelowski[313] (p.1380) on using qualitative research

There is only limited merit in applying the concept of generalisability to qualitative research, as these are often directly adopted from quantitative, positivist traditions.[311,313,314] Carminati[314] argues that generalisability can be achieved in qualitative research if it is the explicit aim of the research, but overall, the emphasis in qualitative research is on depth rather than relevance to other settings. In this sense, I make no claims about generalisability. However, as the quote from Sandelowski suggests, by changing the way participants, problems and events are viewed, the depth and insights provided by qualitative research can transform the reader's understanding of a topic or setting, which in turn can be utilised and applied beyond the specific context in which a study has been conducted.

The aim of my qualitative work was not to generalise, but to facilitate a deeper understanding of childhood obesity and related behaviours in the specific, not representative, setting of Soweto. This can be difficult to justify as public health research often involves comparison. In this sense, the concept of transferability,

which is more specific to qualitative research than generalisability, is relevant to consider. As Sandelowski[313] points out, the responsibility to transfer findings from one setting to another is often left to the reader, who may or may not be familiar with another setting for which the findings bear some relevance, rather than the qualitative researcher. Tracy refers to these aspects of qualitative research as 'resonance', focusing on the ability of research to "meaningfully reverberate and affect an audience."[312] (p.844)

Through detailed and accessible descriptions of the setting and my analyses, I have tried to enable resonance for the benefit of the reader. Given the dearth of literature from other African settings on the topics I have explored through my research, I have not been able to challenge the tendency of leaving generalisability or transferability up to the reader. Regardless of whether my specific findings can be applied in other settings, my qualitative work demonstrates the value of conducting context-specific formative research when developing and evaluating health interventions in low-income settings. Most importantly, the research I conducted fulfils the aim and objectives of informing future interventions in Soweto.

8.4.1.2.Rigor and credibility

> *"Thus, without being able to do the necessary work of making contact, however subtle or approximate, with the independent social reality a researcher cannot objectively sort out the trustworthy from the untrustworthy interpretations through member checking and, subsequently, that method remains ineffective for enhancing rigor."*
>
> Smith and McGannon[311] (p.106)

Many popular methods for enhancing or ensuring rigor and credibility of qualitative research, such as checking accuracy of analyses with the help of participants (member checking) or carrying out independent duplicate coding and theme development (inter-rater reliability), are largely incompatible with reflexive thematic analysis.[218,311] Instead, I have drawn on the extensive guidance provided by the original developers of reflexive thematic analysis, Braun and Clarke.[159,218,219,315] Most pertinently, this has involved ensuring that the theoretical underpinnings and analytical approach are aligned (conceptual coherence), and ensuring that themes are fully developed, reflecting analysis, rather than a summary of predefined domains. In the Amagugu Asakhula feasibility study, the deductive analysis involved predefined themes, but due to the abstract nature of concepts like "appropriateness", the process still reflects analysis as opposed to mere categorisation. Overall, credibility of the findings was ensured through providing rich contextual descriptions, and sufficient evidence in quotes of how the themes reflected the underlying data.

Instead of assessing inter-rater reliability, my supervisors acted as "critical friends"[311] through providing reflections on my description and justification of themes at different stages of the analyses. This was helpful for refining themes, and ensuring that findings were well evidenced so that a reader can follow the analysis and thus make judgments about its credibility. Member reflections[311]

would have been a preferred method to member checking, but this was not possible to carry out. The reasons for, and implications of, this are discussed further under the heading of limitations.

8.4.2 Strengths

One of the strengths of my PhD research is the consistent focus on context in both my own research and in the research I have reviewed. This approach has enabled setting-specific learning, and to some extent helped to overcome the dearth of evidence on early childhood obesity prevention in South Africa. In other words, through focusing on implementation lessons, contextual barriers and facilitators, and hearing directly from parents about their circumstances, I have been able to identify opportunities for action regardless of existing research gaps.

As Figure 5 in Chapter 2 illustrates, the behavioural epidemiology framework suggests that in any given context, the behavioural risk factors, epidemiology of behaviours, and determinants of those behaviours must be well understood before they can be effectively addressed through interventions. However, with a developing evidence base, paired with an urgent public health concern, it is important to have some degree of flexibility when it comes to the intervention development process. Similarly, the emphasis on flexibility and creativity in the updated MRC guidance for developing complex highlights the need for a process that is open to changes and new evidence. I argue that these aspects

are even more pertinent when applied to under-researched topics in LMIC settings, such as childhood obesity and NCDs.

My in-depth qualitative work, in particular the interviews with Sowetan parents, is another strength that has greatly supported efforts to make sense of individual perspectives and behaviours within a wider context of environmental and structural factors. My research process was slow, and both due to external delays and generous research exchange funding, I was able to spend several relatively long periods of time in South Africa. Particularly in global health research or any kind of cross-cultural endeavour, this kind of immersion is important both for improving one's understanding of the setting and for avoiding extractive or exploitative forms of research and collaboration.[266,316,317] Indeed, the power dynamics of global health research are being increasingly challenged in current discourse around the need to decolonise and reform global health,[316,318–321] and the journal Lancet Global Health has called for an end to "parasitic" and "parachute research"[322] that involves very short research visits to LMICs by academics based elsewhere, usually HICs.

One aspect that helped try to overcome the challenges of cross-cultural communication was that I was able to interview participants and moderate FGDs myself, in English. I have found it extremely challenging to conduct in-depth interviews together with an interpreter in the past,[323] and this is a known challenge in qualitative research outside one's own setting.[266] Although the fact that English is widely spoken in South Africa is part of Britain's colonial and imperial legacy, it did make the processes of recruitment, informed consent, rapport-building and interviewing easier and more straightforward. I was also able to probe and ask for clarifications directly, and more easily engage with

participants about the purposes of my research, which contributed towards richer data and more ethical qualitative data collection as well as easier analysis phases.

8.4.3 Limitations

There are also considerable limitations to my research that warrant reflection. One major limiting factor and challenge is the overall lack of high-quality evidence of direct application of interventions in my setting and age group of interest. As I discuss in my systematic review, there are structural and systemic reasons for this, including inequalities in research funding and capacity. Additionally, during my PhD research and process of peer review and publication of the systematic review, I encountered resistance from global public health research communities to recognise that childhood obesity prevention in LMICs is a legitimate area of research focus. I am hopeful that such resistance will start to wane following prominently published evidence of a double or even triple burden of malnutrition in many LMICs.[11,57] Researchers need to recognise that nutrition transitions in African settings mean that focusing on undernutrition alone can no longer be justified.[52,102,324]

Numerous factors should be taken into consideration when reviewing the limitations stemming directly from my research methods and process. While I will discuss my positionality as a researcher more extensively in the subsequent section, the decisions I have made within the research process merit further questioning. One challenge was the heavy focus on contextualising findings

while the context was relatively new and unfamiliar to me. This means that my interpretations of the context are prone to misunderstandings. However, it also means that I have relied on my data and inductive analysis in forming these interpretations, as I have not had a strong existing understanding of how things are in this particular context. Moreover, as mentioned in preceding chapters, my openness about my limited understanding often helped elicit detailed and explicit explanations from participants, which allowed me to gain deeper insights about the setting. This openness also involved thorough discussions with my local Sowetan fieldwork assistant about possible interpretations and contextual details during data collection.

As described in earlier chapters, I chose to focus on manifest content analysis of my qualitative data as opposed to interpreting latent meaning in interviews and FGDs. The rationale for this was to avoid misinterpretation due to cultural and linguistic differences. However, despite limiting my analysis to manifest content, it is entirely possible that some misguided interpretation has taken place. What appears manifest to me according to my level of understanding English and South African colloquialisms may have meant something entirely different to participants. I cannot fully rule out the possibility of misunderstandings or misinterpretations arising from the cross-cultural nature of the research.[325] Nevertheless, the discussions I had with my local fieldwork assistant, and my regular exchanges with and guidance from other researchers helped me to actively work towards a well evidenced analysis. In particular, the input from my local South African supervisor, who has extensive experience of qualitative and intervention-related research in Soweto and similar settings

across South Africa, helped ensure that all claims can be traced back to a reasonable interpretation of manifest content.

I take responsibility for not going through all my transcripts and interpretations systematically with my fieldwork assistant, or engaging in member reflections[311] with the participants themselves. My analysis predominantly took place while I was in Cambridge, at which point I was no longer able to engage my fieldwork assistant in the process. During the feasibility study I did not work with a local research assistant, but I was able to discuss my impressions and interpretations with some CHWs who I had built considerable rapport with throughout the study. Overall, my findings have not been 'legitimised' by the participants themselves, but it is also important to consider how this shortcoming not only relates to the practical limitations of my fieldwork but also issues around trust in cross-cultural communication, especially in the context of historical inequities.

As Chisomo Kalinga describes in a commentary about international research collaborations, it may take a much longer time and more encounters with research participants than typically afforded in qualitative research to gain the trust of participants.[325] This may not mean silence in the meantime, but rehearsed narratives or superficial accounts as opposed to sharing genuine views with an unfamiliar researcher, and this is relevant to consider in relation to my contextualist approach. I have no way of knowing whether any research participants deliberately changed their narratives or chose not to tell me things because of not trusting me, but my critical realist epistemology means I am inclined to interpret people's accounts as some form of 'truth' regardless. My choice to do several distinct PhD projects, with distinct plans and budgets, meant I was not in a position to conduct several interviews or FGDs with the

same participants, nor would I have felt comfortable to make greater demands on people's time given the difficulties I experienced in recruiting and scheduling with participants. While these are important limitations to consider, they do not mean that the evidence I have generated through my PhD research is to be fully dismissed. The following section will focus on how critical reflexivity helps to navigate the subjectivities the researcher introduces to the research process.

8.5 Reflexivity and research challenges

8.5.1 Practising reflexivity

> *"A reflexive approach towards qualitative research demystifies the knowledge construction process and moral positions of the study and researcher and holds the study and the researcher accountable."*
>
> Supriya Subramani[326] (p. 8) on practising reflexivity

As introduced in Chapter 2, practicing reflexivity is an important approach to addressing subjectivity in qualitative research. Because of the training I have received in qualitative research methods, I started reflecting on my positionality and role early on in my PhD process, but as Subramani[326] points out, there are also particular "reflexive moments", meaning situations and encounters that bring the importance of reflexivity to the fore, in research. In this section, I will describe the aspects of my subjectivity and positionality that I have reflected on during my PhD research.

I am a 30-year-old, White, Finnish, normal-weight woman working towards a PhD from an exclusive British academic institution. My academic background is

in social science and public health. I am not a parent. Already before my PhD, but particularly as I prepared for my fieldwork, I thought a lot about the potential power imbalance arising from my geopolitical, educational, racial, and thin privileges. I also thought a lot about the fact that my research stems from an interventionist public health approach which carries neo-colonial or other paternalistic connotations, and can result in actual reinforcement of such agendas. I considered whether I, a foreigner and outsider in Soweto, should be doing this work. Even after extensive reflection, I am not certain of the implications of my decision to do this research. However, I have carried on despite my reservations, and I have done my best to do my participants' contributions justice, and not harm anyone through my research. I continue to question the legitimacy of conducting research in a setting I cannot claim to represent. Nevertheless, I am also deeply committed to contributing something to the public health community's understanding of under-researched topics, with relevance for policy or practice that can improve people's wellbeing.

This uncomfortable intersection is where I find myself after three years of fieldwork-dominated PhD research. In practice, my encounters with research participants were easier than I had expected, and I believe a genuine rapport was established with many of them. I am enormously grateful for the access people granted me into their own lives and homes. Moreover, I was reassured that the power dynamics were not a complete barrier to gaining some insights into people's opinions and realities because some participants felt comfortable enough to challenge the purpose of my research with critical questions, or share deeply personal and difficult experiences with me beyond the scope of my research questions. Indeed, I was asked by some participants what I was going

to do with my research findings, or whether I was just doing research “for fun”. While I explained that my intention is to inform practice through my research, and try to understand what might work in terms of ensuring children in Soweto grow and develop in a healthy way, I was always aware that I had no concrete promises to make.

Research impact is a great responsibility I am trying to bear appropriately. Through my PhD research, I am trying to inform and develop interventions while respecting and listening to the views of the individuals who are meant to benefit from them. My critical social science background makes me question the need to “intervene” in people’s lives, but because of my public health research training I am also inclined to think that research should aim to *improve* health in addition to understanding it.

During my fieldwork, I was always open about being an (obvious) outsider, and the fact that I am in many ways ignorant about the circumstances people face in Soweto, as well as many aspects of parenthood. Although my etic position can be seen as limiting my understanding and interpretation of research findings, I would also argue that this made it easier to ask people to explain things, and not assume that I knew what they meant. This generally resulted in rich and in-depth descriptions and participant accounts. However, it may also have led to misunderstandings on my part. I have not claimed to provide a “thick description”[327] of life in Soweto in the anthropological sense of researching human behaviour, as I cannot claim to understand the social and cultural context to such an extent. All mistakes or misrepresentations are mine, whether they stem from the cross-cultural nature of the research or anything else.

In reflecting on my positionality, I have made note of specific assumptions, subjectivities and ways in which my perspective has changed throughout my research. These include:

- My tendency to assume that people need something and are not as financially secure as myself. However, I have also listened to participants telling me they are happy with their situations.
- My commitment to identifying intervention ideas, although I have also tried to prioritise families' dignity over academic problem solving. My recommendations are based on this commitment.
- My shift away from a primary focus and interest in obesity alone, which I have found to be an unhelpful stance as my understanding of the research setting has deepened. I have therefore strived for a more open approach to the continuum of malnutrition from undernutrition to obesity, and the role of behaviours in it all, without neglecting structural factors beyond individuals' control.

Apart from reflecting on my personal characteristics, views and experiences, and how these interact with or influence my research, it is important to consider the wider social and political context of my PhD research. Green and Thorogood encourage researchers to ask why certain research questions can or need to be asked at certain times.[162] Why is it that childhood obesity in an African setting demands attention now, when undernutrition is yet to be solved? The growing recognition of the double burden of nutrition in LMIC settings posits that these different forms of malnutrition are in fact complementary, and not separate, research topics. I have certainly tried to treat them as such, because the patterns of nutrition challenges are not clear-cut and distinct from each other

in South Africa, and the promotion healthy behaviours and enabling environments could benefit all children regardless of weight status.

8.5.2 Authorship and representation

> *"In fact, authorship per se is not the fundamental issue; undoing what those imbalances represent—a continuity of the colonial project in global health—is often the issue. And the ongoing discussions on authorship in academic global health is an opportunity to have the necessary conversations that go beyond mere representation on lists of authors—through open self-reflections or reflexivity."*
>
> Seye Abimbola[328] (p. 4) on representation and authorial reflexivity

In addition to the complex dynamics of fieldwork, I am also aware of the problematic tendency for researchers from HICs to dominate publications presenting research from LMICs. There is a necessary discourse currently taking place on this topic and the broader need for decolonising global health and social sciences.[320,328,329] I am still in the process of learning how best to contribute to those agendas, which I believe in but have not yet managed to realise through my research. I have collaborated closely with South African researchers, including a fieldwork assistant who is a resident of one of the study neighbourhoods in Soweto, and I have a South African University affiliation. I have followed principles for ethical research collaborations based on my training, previous experiences, and existing guidance.[266,330] Nevertheless, I cannot help but feel like the principle of "Nothing about us without us",[331] which originates from disability rights movements in South Africa and Eastern Europe but is now widely used with reference to representation of disenfranchised groups in decision-making, is not being fully realised in the work that I am trying to publish.

According to the framework introduced by Seye Abimbola regarding authorial reflexivity,[328] I believe I am writing with a foreign pose for both a foreign and a local gaze. I am a foreign researcher in South Africa but I would like my work to be of relevance and interest for both local and international researchers. However, I am still grappling with what exactly that means for my research in practice, and in terms of the ethics of writing about "township problems"[309] without having any real insider perspective involved in the analysis and interpretation of my research data. As the quote from Seye Abimbola suggests, grappling with these questions means grappling with the burden of history. There are structural factors, such as access to tertiary education and research funding in LMICs, at play here too, and it would be naïve to expect my PhD research to solve all such issues. However, through open self-reflections and reflexivity, I am trying to take part in the process of improving the situation, and I will carry this commitment forward in my future research.

8.5.3 Research challenges

One intellectual challenge that I have experienced throughout my PhD process is that of maintaining a sufficiently narrow and specialised focus to contribute something specific, but without overlooking the complexity and interconnectedness of, for example, different forms of malnutrition, and different behaviours. Nutrition and physical activity are related but different specialties of which I cannot claim to be an expert, and yet my research ventures into both fields without fully focusing on either. As I have examined childhood obesity through a contextualist, behavioural and predominantly qualitative lens, my

thesis provides a description of how childhood obesity and its prevention slot into social-ecological webs of influence in a particular setting. While I have not been able to provide definitive solutions to the growing problem of childhood obesity in South Africa, I have contributed to a better understanding of it through fulfilling my aim and objectives.

In terms of the more practical challenges I encountered, the best illustration is an additional PhD project and thesis chapter that, in the end, did not make it into this final version. The additional project was one of the first studies I embarked on during my PhD. The planning for it began in January 2017 when I first visited South Africa to establish collaborations with South African colleagues and start getting some impressions of the research setting. This was to be my only fully quantitative research project, a secondary analysis using data from a famous cohort study that is still running in Soweto since 1990[232] (see Chapter 4 for more description).

My analyses aimed to establish early life determinants of obesity throughout childhood and adolescence. Following development of an analysis plan, initial discussions with the local collaborators revealed that some of the data I intended to use were not yet available for analysis, and that there were some concerns about the analytical relevance of some of the variables. I revised my analysis plan multiple times, attempted some analyses, and tried to complete the project. However, in consultation with my supervisory team, I gradually realised that the limitations of the available variables together with the age of the data (most of which was collected in the 1990s) limited the value of the work in the context of my PhD. I finally dropped this project at the end of my third

year, in September 2019, having learned a great deal about statistical analysis and quantitative data management, but without much to show for it in the thesis.

In addition to this cumbersome process, I also experienced some challenges and delays in obtaining ethical approval from the University of the Witwatersrand, and when trying to gain access to my research grants in order to pay for intervention materials and other project costs. Similarly, the strikes that affected the Amagugu Asakhula feasibility study resulted in considerable delays, and left very little time for the final evaluation of the intervention. The underlying reasons for all these delays are outside the research itself, but still have a bearing on the research process. In particular, when planning overseas fieldwork, it is difficult to factor in unforeseeable delays even when it is safe to assume that there will be some.

The fieldwork in South Africa also involved taking considerable personal risks that would not necessarily have been present had I done qualitative research in another setting. Together with my supervisors and advisors, I made every effort to assess and mitigate risks to my personal safety, as well as that of my fieldwork assistant. However, the level of vigilance required for driving to research locations on my own and for carrying out data collection, especially when visiting people's homes, took up considerable energy and focus. This is another reason why conducting several interviews with the same participants, or extensively consulting them about my analysis and interpretations, would have been a very difficult undertaking.

Overall, the research projects I have completed have required considerable trade-offs between what might be ideal in terms of research, and what is

realistic in practice. It is therefore important to bear in mind the very concrete as well as the very subtle ways in which high-quality research can be difficult to carry out in LMIC settings. Nevertheless, I have been able to fulfil the aim and objectives of this thesis through the research I have undertaken. Further research is needed in order to develop effective approaches to childhood obesity prevention in Soweto, and South Africa more broadly, but my PhD findings make a useful contribution towards that goal by offering context-specific insight and recommendations.

8.6 Conclusions and way forward

There is a need to address the growing challenge of childhood obesity in South Africa, and tackling the structural drivers of this will require enormous changes and political will. However, my research has found that there is some potential to address the problem through behavioural interventions that are relevant to families' realities, and that can promote and support healthy behaviours of children in urban low-income settings such as Soweto. Nurturing care interventions, such as Amagugu Asakhula, are a promising avenue for that, but CHWs linked to a community-based organisation as opposed to public primary health care facilities are likely to be a more successful mode of delivery.

Overall, my thesis conclusions centre on the need to conduct more high-quality research on childhood obesity prevention in South Africa and other LMIC settings. This includes the need for process evaluations to help disentangle the complex reality of interventions, and transparent reporting on formative

research and trial results, even where interventions are found to be ineffective. I have made a contribution towards informing interventions targeting preschoolers in urban low-income settings in South Africa, but there is a need for further research on young children's health behaviours, such as compliance with dietary and physical activity guidelines.

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APPENDIX A: PUBLICATIONS AND PRESENTATIONS

Part of the work described in this thesis has been published or presented elsewhere. Details are shown below.

Publications:

Klingberg S, Draper CE, Micklesfield LK, Benjamin-Neelon SE and van Sluijs EMF. Childhood Obesity Prevention in Africa: A Systematic Review of Intervention Effectiveness and Implementation. International Journal of Environmental Research and Public Health. 2019;16(7):1212. doi:10.3390/ijerph16071212 (Chapter 3)

Klingberg S, van Sluijs EMF and Draper CE. “The thing is, kids don’t grow the same”: Parent perspectives on preschoolers’ weight and size in Soweto, South Africa. PLoS One. 2020;15(4):e0231094. doi:10.1371/journal.pone.0231094 (Chapters 4-5)

Oral presentations:

Klingberg S. Chair and convenor of the symposium ‘The role, opportunities, and challenges of feasibility and pilot studies in behavioural nutrition and physical activity research’ at the International Society of Behavioral Nutrition and Physical Activity (ISBNPA) annual meeting, Prague, 5 June 2019. (Chapter 7)

Klingberg S, Draper C, Micklesfield L, Benjamin-Neelon S, van Sluijs E. Childhood Obesity Prevention in Africa: A Systematic Review of Intervention

Effectiveness and Implementation. Oral presentation at the International Society of Behavioral Nutrition and Physical Activity (ISBNPA) annual meeting, Hong Kong, 5 June 2018. (Chapter 3)

Poster presentations:

Klingberg S, van Sluijs E, Draper C. Parent perspectives on childhood obesity and preschool children's health behaviours in Soweto, South Africa: a qualitative study. Poster presentation at the MRC Quinquennial Review site visit to the MRC Epidemiology Unit, Cambridge, 13 November 2019. (Chapters 4-6)

Klingberg S, van Sluijs E, Draper C. Parent perspectives on preschool children's health behaviours in Soweto, South Africa: a qualitative study. Poster presentation at the International Society of Behavioral Nutrition and Physical Activity (ISBNPA) annual meeting, Prague, 6 June 2019. (Chapters 4-6)

APPENDIX B: SCIENCE COMMUNICATION OUTPUTS

Part of the work described in this thesis has featured in essays submitted to the annual MRC Max Perutz Science Writing Award essay competition between 2017 and 2019. Two of the entries were shortlisted, and all three are included below.

MRC Max Perutz Science Writing Award 2017, shortlisted article

Childhood obesity in South Africa – is it a problem?

It's mid-morning at a primary school in a South African township. The sun is almost at its highest point, and the schoolyard is crowded with children in school uniforms who are having their first break of the day. What are they doing? In my version of this scenario, the children are gathering around snack vendors, spending their lunch money on crisps, or perhaps ice lollies.

After doing some field work in South Africa earlier this year, this is my most vivid memory from visiting schools. Snacks, everywhere. But if snacks were not the first thing you thought of, I am not surprised. The simplified image of hunger and famine in Africa seems difficult to shake, and in reality undernutrition is still a big problem in South Africa. However, it has been joined by the challenges many wealthier nations have been battling for years: overweight and obesity.

My research thus looks at possible ways to prevent childhood obesity in a township called Soweto in South Africa. I am interested in understanding what works, and what doesn't, when it comes to promoting healthy eating and

exercise among children in this urban setting that has seen many rapid changes over the years. I am currently going through existing research on childhood obesity to identify what makes prevention programmes succeed or fail. Over the coming years, I will be examining the causes of weight gain in childhood years, and what can be done to make environments that South African children spend a lot of time in, like day-care, more conducive to forming healthy habits.

When I tell people here in the UK what I do, they often ask me whether childhood obesity really is a problem in South Africa. Unfortunately, it is. One in four girls age 2 to 14, and one in six boys in the same age group, are overweight or obese. However, current figures are not the only reason why it is worthwhile to dedicate research to addressing childhood obesity in South Africa. In public health, it is important to think about how health conditions affect us at different stages of our lives. We know that children who are overweight or obese are likely to be overweight or obese as adults. They may also be affected by diseases related to obesity, such as diabetes, later in life or already at a young age. A striking statistic from South Africa is that two thirds of adult women are overweight or obese, and so it is clear that the problem only gets worse as children get older. Preventing childhood obesity is therefore not only about improving children's health, which is an essential goal on its own. It is also related to preventing obesity, ill-health, and premature deaths among adults.

Research has shown that it is very difficult to get people to lose weight once they are already overweight or obese. Therefore, it makes sense to explore opportunities to prevent overweight and obesity from arising in the first place. In addition, if prevention is successful, savings can be made in terms of treating

obesity-related illnesses in the future. This is worth remembering because a majority of the world's overweight or obese children under the age of five live in low- and middle-income countries like South Africa. These are also the countries with the most limited budgets for public health and health care, particularly when it comes to what are called non-communicable, as opposed to infectious, diseases. With this in mind, one of the motivations for researching exactly what works to prevent childhood obesity is to help ensure that money is not wasted on programmes that have no impact.

Another reason to research childhood obesity prevention in South Africa is that relatively little is known about it. While much is being done to tackle the problem of undernutrition in African countries, childhood obesity has not received as much attention yet. Therefore, most of what is known about addressing obesity among children is based on research in completely different settings, like the United States and European countries. Since obesity is linked to what we eat and how physically active we are, and these behaviours are context-specific, it is important not to assume that research from one country can be directly applied in another.

Ultimately, I am working towards designing a prevention programme that uses what we already know about addressing childhood obesity in other settings but is tailored to the specific context of Soweto. For example, schools in many countries restrict children's snacking in different ways – would these approaches work in Soweto? Childhood obesity is certainly a problem in South Africa, and it is becoming a global one. Nevertheless, we will continue to need locally appropriate solutions, while drawing on lessons from around the world.

MRC Max Perutz Science Writing Award 2018, shortlisted article

Obesity prevention: Learning to do no harm.

“Our daughter doesn’t usually eat this for breakfast,” said the woman across the table from me. We were having breakfast together at a small lodge in South Africa, and I had just answered this fellow guest’s question about the topic of my PhD research. In hindsight, I probably shouldn’t have told her I study childhood obesity when we were having a nice conversation over a shared meal.

The woman’s 3-year-old daughter was eating sugary cereal, and I had not noticed this until I realised the mother’s embarrassment. If I had to guess, I would have assumed they were both a ‘healthy’ weight, and yet mentioning obesity had clearly alarmed the mother. Since then, I have been thinking a lot about how to promote health without promoting fears.

Childhood obesity is a significant public health concern but it is also a difficult one. I mean this both in the sense that it is genuinely difficult to address childhood obesity, and that it is a difficult topic to discuss. Nevertheless, we must discuss it because overweight, obesity, and related behaviours such as lack of sufficient physical activity, are associated with numerous severe health problems in childhood and beyond.

My research focuses on childhood obesity in South Africa where over half of adult women, and nearly half of adult men, are overweight or have obesity. Framing childhood obesity prevention in a way that can constructively engage parents rather than stigmatise them is a real challenge.

Particularly on social media, discussions around obesity prevention often suggest the problem is not the phenomenon of unhealthy excess weight gain but rather the people who ‘let’ this happen to them or their children. TV shows about obesity have names like Fat Fight and Biggest Loser. Even a recent Cancer Research UK campaign highlighting the link between obesity and certain cancers was criticised for being fat-shaming.

While the link to cancer is supported by scientific evidence, it is understandable that such a campaign would cause debate. It seems easy to forget that people’s health, illnesses, appearance, and habits are not necessarily separate from their sense of identity. If obesity is part of who I am, how does it feel to hear that who I am can cause cancer?

It is well-documented that many health problems, including overweight and obesity, are patterned by society’s existing inequalities. Diagnoses often come with stigma attached, and stigma in itself can be harmful to health and well-being, as well as disadvantage people in many other ways. Thus, we ought to consider how research and health promotion efforts may inadvertently contribute to such harm. We should also not assume that weight-related stigma means the same thing across cultures and settings.

In my research, I am learning to approach these topics through interviewing parents of preschool-age children in South Africa about their perceptions and circumstances. How do parents interpret health and healthy behaviours? What constrains them, and what might help them? Such insights will help design childhood obesity prevention efforts that can hopefully resonate with the lived experiences of families.

As part of my PhD research, I have also reviewed childhood obesity prevention programmes in different African countries to understand what works and what doesn't. I have not come across any studies that have found fat-shaming, parent-blaming, humiliation, or any kind of judging, an effective way to address overweight and obesity. Nevertheless, I can see how people might expect shame or fear to motivate healthy habits and weight-loss.

Behavioural science has helpfully identified some conditions that seem to define how well fear-arousing health messages work. Firstly, people need to believe that changing their behaviour would actually make them healthier or safer. Secondly, people need to believe in their own ability to change their behaviour. Losing weight in the longer term is notoriously difficult, and so evoking people's fears without also encouraging them to think they can do something about it is unlikely to work.

So, while I don't yet know what exactly will work to prevent childhood obesity in South Africa, I do know this: parents may have different views on what is healthy and what is best for their children but we should stop trying to scare them into changing their views and habits. It's not nice, and it probably won't work.

MRC Max Perutz Science Writing Award 2019, submitted article

Making impossible changes

“They should stop selling a lot of junk food… I’d change that, but it’s not possible.” This is what Karabo,* the father of a 4-year-old boy, said to me when I interviewed him. He was one of 16 parents of preschoolers in Soweto, South Africa, who kindly volunteered some of their time to take part in my research on childhood obesity prevention. Karabo was concerned about how much unhealthy food was available close to his home, and he described to me the variety of takeaways and snacks sold in the neighbourhood.

The house that Karabo shares with his mother and his son is on a quiet street in the densely populated township. Most families in the area have very small yards. Since there is not much traffic, Karabo and his neighbours consider it safe enough for children to play out in the street when it is light outside. Just a few houses down, there is a stand where a street vendor sells sweets. The service station selling crisps, fried food and more sweets is not far either. There are always some children, even among the preschoolers, who have pocket money. The snacks then get shared. Karabo told me that he had tried to ask the nearest street vendor not to sell anything to his son, but the boy would still frequently come home with his tongue coloured bright blue from the sweets he had eaten.

Most other homes that I visited in Soweto were on much busier streets where children could not play outside the gates because of passing cars. Here, the parents lamented the lack of safe parks or playgrounds. They talked about

changes they would like to make in their homes or communities but did not think were possible. Some wished they could live somewhere safer or with more space for their children to play, but they could not afford to move. The desired parks or playgrounds might not be a solution either because some parents suspected they would get vandalised and destroyed before long.

Many of the things that parents believed would improve their children's health, wellbeing and happiness were beyond their direct control. This helps explain why rates of childhood obesity are so high in South Africa. Among children aged 2-14 years, about one in four girls and one in six boys have overweight or obesity. However, concerns about obesity have not replaced the problem of undernutrition among low income households in South Africa. Many families in Soweto experience some degree of food insecurity, and several parents told me that their only or biggest problem was not having a job. Social grants and family members with an income help to support these families but there might not be enough food for the entire month.

I knew most of this in the form of statistics before doing my fieldwork. However, through comparing the experiences and perspectives of the parents I interviewed I have been able to gain a richer understanding of how the surroundings and circumstances of children affect their opportunities to engage in healthy behaviours. Now, I am more interested in how to promote healthy habits in children regardless of weight. Physical activity and healthy eating can benefit all children, but many of the factors beyond parents' control are beyond my control as a researcher too. I have not figured out how to make Soweto a safer place for children, nor have I managed to convince shops and vendors to stop selling sweets.

However, together with colleagues in South Africa, I have been exploring the possibility of training community health workers to support families in trying to be healthier. The idea is to ensure that parents understand the full benefits of children's healthy habits, and to help them do things that are within their control without judging them for the things that they cannot change. For example, many parents themselves pointed out that fruit and vegetables are also widely available in Soweto, but the challenge is getting children to eat them. Finding solutions together with community health workers may help overcome some, but obviously not all, of the barriers that families face. We do not yet know how effective this approach is in changing health-related habits but both community health workers and participating families have been enthusiastic about the programme.

Based on the work that I have done so far, I know more about both challenges and opportunities in promoting children's health in South Africa. Through continuing with this research, I want to support families make healthy changes that are within their control. In the longer term I also hope to contribute to the bigger changes that seem impossible for now, such as making the environments in which children live healthier and safer.

*The research participant's name has been changed.

APPENDIX C: SUPPLEMENTARY MATERIAL FOR CHAPTER 3

Search terms (including MeSH terms)

Search Term 1:

child* or childhood/ or child growth/ or child nutrition/ or adolescen* or "young person*" or "young people" or teen* or youth* or boy* or girl* or juvenile* or juvenile/ or ”early childhood” or pre-school or preschool or kindergarten or nursery or nursery school/ or school-age or ”child care” or childcare or ”primary school” or primary school/ or ”elementary school” or ”middle school” or middle school/ or middle school student/ or ”high school” or high school/ or high school student/ or p!ediatric* or preadolescen* or pre-adolescen*

Search Term 2:

overweight or obes* or obesity/ or bmi or ”body mass” or body mass/ or ”body mass index” or ”body-mass index” or ”body weight” or body weight/ or ”body composition” or weight or ”weight status” or ”body size” or fatness or ”body fat” or adipos* or ”nutritional status” or nutritional status/

Search Term 3:

"physical* activ*" or physical activity/ or sport* or sport/ or youth sport/ or "physical education" or physical education/ or "physical training" or exercis* or exercise/ or "energy expenditure" or energy expenditure/ or "physical inactivity" or physical inactivity/ or "physical fitness" or "active travel" or sedentary or motor activity/ or physical exertion/ or "physical education and training" or ”physical activity environment” or fitness or fitness/ or inactivity or ”dietary intake” or dietary intake/ or ”dietary behavio!r*” or eating or eating/ or diet* or diet/ or nutrition* or nutrition/ or ”nutrition* intervention*” or lifestyle* or life-style* or feeding* or feeding behaviour/ or ”sedentary behavio!r*” or sedentary lifestyle/ or food* or food/ or ”food intake” or food intake/ or ”food environment” or meal* or ”dietary diversity” or ”fruit consumption” or fruit* or fruit/ or sugar* or sugar/ or sugar intake/ or snack* or ”sugar-sweetened beverage*” or drink* or ”fast food*” or fast food/ or ”health* behavio!r*” or ”unhealthy behavio!r*” or family-based or community-based or home-based or school-based or parent* or teacher* or ”active lesson*” or ”school lunch” or lunchbox or ”lunch box” or ”school food” or tuckshop* or vendor* or ”food price*” or weight-related or ”junk food” or ”screen time” or ”television viewing” or television viewing/ or TV or ”computer use” or ”portion size*” or portion size/ or exergame or MVPA

Search Term 4:

Africa/ or Algeria or Angola or Benin or Botswana or ”Burkina Faso” or Burundi or Cameroon or ”Cape Verde” or ”Central African Republic” or Chad or Comoros or Congo or ”Democratic Republic of Congo” or Djibouti or Egypt or ”Equatorial Guinea” or Eritrea or Ethiopia or Gabon or Gambia or Ghana or Guinea or ”Guinea Bissau” or ”Ivory Coast” or ”Cote d’Ivoire” or Kenya or Lesotho or Liberia or Libya or Madagascar or Malawi or Mali or Mauritania or Mauritius or Morocco or Mozambique or Mozambique or Namibia or Niger or Nigeria or Principe or Rwanda or ”Sao Tome” or Senegal or Seychelles or ”Sierra Leone” or Somalia or ”South Africa*” or ”South Sudan” or Sudan or Swaziland or Tanzania or Togo or Tunisia or Uganda or ”Western Sahara” or Zambia or Zimbabwe or ”Central Africa” or ”Central African” or ”West Africa*” or ”Western Africa*” or ”East Africa*” or ”Eastern Africa*” or ”North Africa*” or ”Northern Africa*” or ”Southern Africa*” or ”sub Saharan Africa*” or ”sub-Saharan Africa*” or ”Africa South of Sahara”

African journals screened based on recommendations

- African Journal for Physical, Health Education, Recreation and Dance
- South African Journal of Sports Medicine
- Journal of Public Health in Africa
- South African Medical Journal
- South African Journal for Research in Sport, Physical Education and Recreation
- African Journal for Physical Activity and Health Sciences
- South African Journal of Clinical Nutrition
- South African Family Practice
- South African Journal of Child Health

Measured outcomes and reported effects of included studies

Study	Measured outcomes of relevance	Reported effects
DoH Health Promoting Schools **Nyawose & Naidoo 2016**	Sports and PA participation (learner questionnaires that have been used in other South African studies and "have been shown to be valid and reliable"), Fitness (Eurofit Physical Fitness Test Battery (Eurofit, 1993)). Height and weight.	Weight: I: 41.18±9.04 → 41.09 ±9.84, p=0.003*; C: 41.33 ±7.76 → 42.68 ±7.71, p<0.0005* Sit-and-reach: I: 33.47±5.55 → 34.10±5.85, p=0.43*; C: 29.74±7.54 → 30.03±7.88, p=0.501 Sit-ups: I: 18.24±4.88 → 19.20±4.87, p=0.007*; C: 17.48±2.68 → 17.94±3.31, p=0.414 Shuttle run: I: 20.55±2.04 → 19.47±4.10, p<0.0005*; C: 22.29±8.58 → 21.35±2.10, p=0.649 Plate tapping: I: 15.33±2.29 → 13.24±1.74, p<0.0005*; C: 14.11±1.98 → 13.52±1.83, p=0.002* Flamingo balance: I: 12.24±4.76 → 13.36±4.62, p=0.011*; C: 12.45±3.29 → 16.25±5.48, p<0.0005*

		Standing long jump: I: 136.10±21.75 → 133.41±19.95, p=0.306; C: 150.47±26.35 → 149.20±20.57, p=0.306 Prevalence of overweight or obesity 0% in both I and C * p< 0.05
Gum Marom Kids League (GMKL) **Richards et al. 2014**	Physical fitness (Cardiorespiratory fitness was measured using the multi-stage fitness test (MFT), Muscle power and strength measured through standing broad jump (SBJ), Anthropometric outcomes (BMI-for-age (BFA) and height-for-age (HFA) z-scores based on 2007 normative values using the WHO AnthroPlus software). Mental health outcomes reported but not extracted here.	Multi-stage fitness test, km/hr (baseline = BL, follow-up = F-U) I: Boys BL 11.14, boys F-U 11.46[#], girls BL 10.10, girls F-U 10.43[#] Waitlist: Boys BL 11.10, boys F-U 11.58[#] C: Boys BL 10.96, boys F-U 11.29[#], girls BL 9.70, girls F-U 10.19[#] Standing broad jump, cm I: Boys BL 187.55, boys F-U 181.59[#], girls BL 166.53, girls F-U 167.52 Waitlist: Boys BL 184.21, boys F-U 186.55 C: Boys BL 181.80, boys F-U 181.68, girls BL 163.42, girls F-U 163.29 BMI-for-age, z-score I: Boys BL −0.65, boys F-U −0.74, girls BL −0.27, girls F-U −0.32 Waitlist: Boys BL −0.64, boys F-U −0.71 C: Boys BL −0.66, boys F-U −0.67, girls BL −0.21, girls F-U −0.25[#] [#]=Statistically significant within-group change (p<0.05)

Harrabi et al. 2010	Pre-tested self-administered questionnaire for knowledge, behaviours, and intentions about smoking, dietary habits, and physical activity. Anthropometric measurements were also taken (height and weight) but not reported.	Eating at least 5 fruits and vegetables per day, pre-post: I: 45.3 → 55.4, p=0.06 C: 48.3 → 57.9, p=0.03 Practice more than 30 min of physical activity for at least six days a week, pre-post: I: 17.5 → 35.9, $p<10^{-3}$* C: 27.2 → 36.9, $p<10^{-3}$ *Percentage change reported as significantly higher by authors
HealthKick **Steyn et al. 2015,** **De Villiers et al. 2016,** **Uys et al. 2016**	Dietary diversity score (unquantified 24-h recall), fat consumption, sugar consumption, other components of DDS (unquantified24-h recall). Fitness (Measured using modified Eurofit) and KAB (validated questionnaire). nutritional behaviour (score) (collected via questionnaire which was pilot tested but not validated, anthropometry methods not specified, nor what was primary/secondary)	*Dietary diversity score:* BL to FU2 estimated intervention effect 0.04 (−0.37; 0.46) p=0.826 Fat consumption: BL to FU2 estimated intervention effect −0.03(−0.26; 0.20) p=0.809. Sugar consumption: BL to FU2 estimated intervention effect −0.27 (−0.68; 0.13) p=0.165 Nutritional behaviour score: BL to FU2 estimated intervention effect .09 (.47, .64) p=0.743 Multilevel Model Analysis of Fitness Tests between Intervention and Control Groups,

		adjusted results 2009-2010 Sit-and-Reach (cm): -0.15 (-1.28, 0.97) Sit-ups: 2.17 (1.22, 3.13)* Shuttle Run (sec): 0.85 (-0.89, 2.59) Standing Long Jump (cm): 1.71 (-1.89, 5.30) Multilevel Model Analysis of Fitness Tests between Intervention and Control Groups, adjusted results 2010-2011 Sit-and-Reach (cm): -1.29 (-2.43, -0.14)* Sit-ups: 1.62 (0.65, 2.59)* Shuttle Run (sec): 3.32 (1.56, 5.08)* Standing Long Jump (cm): -5.75 (-9.39, -2.11)*
Healthnutz **Draper et al. 2010**	Anthropometric measurements (height and weight), physical fitness. Fitness: Eurofit Fitness Testing protocol, which has been adapted for use in a South African setting. Other questionnaires based on validated questionnaires from similar settings, and	Pre-post assessments Weight (kg) I: 35.8 ± 8.6 → 37.1 ± 8.7; C: 36.9 ± 8.4 → 37.1 ± 8.4 P-value for group x time interaction p<0.005 *Sit and reach* I: 14.6 ± 5.9 → 19 ± 6.8; C: 24.5 ± 16 → 14 ± 9.7

	pilot-tested.	P-value for group x time interaction p<0.001 *Sit ups* I: 16 ± 6 → 17.8 ± 6.1; C: 15.2 ± 5.4 → 15.5 ± 5.1 P-value for group x time interaction p<0.02 *Shuttle run* I: 48.5 ± 5.1 → 46.2 ± 4.6; C: 47.2 ± 4.6 → 48.6 ± 5.5 P-value for group x time interaction p<0.0001 Long jump I: 124.6 ± 25.7 → 134.3 ± 25.7; C: 120.4 ± 18.8 → 135 ± 19.7 P-value for group x time interaction p=0.135 *Ball throw* I: 22 ± 7.2 → 23.1 ± 7.5; C: 21.7 ± 6.2 → 21.8 ± 6.9 P-value for group x time interaction p=0.106
Hochfeld et al. 2016	Anthropometric measurements (height, weight, BMI using standard protocols)	Severely stunted -4.7%, Stunted 0.3%, Not stunted 4.3%, Severely overweight -4.3%, Overweight -3.1%,

		Within BMI guidelines for age 10%, Wasted -0.7%, Severely wasted -1.9%.
Kebaili et al. 2014	Nutrition-related behaviours. A pre-tested self-administered questionnaire was used to collect these data.	Pre-post changes: “Ideal” breakfast intake I: 4.4% → 10.5%, $p< 10^{-3}$; C: 4.5% → 2.8%, p=0.44 Daily breakfast intake I: 58.2% → 67.5%, $p< 10^{-3}$; C: 53.5% → 53.2%, p=0.883 Daily dairy products intake I: 61.3% → 74.4%, $p< 10^{-3}$; C: 51.6% → 57.1%, p=0.001 FVC of five or more times every I: 29.3% → 31.1%, p=0.683; C: 25.3% → 34.3%, p=0.38 Snacking at the evening I: 59.4% → 52.1%, $p< 10^{-3}$; C: 62.1% → 95.1%, p=0.087 Soft drink intake every day

		I: 22.6% → 18.8%, p=0.003; C: 22% → 20.5%, p=0.319 Fast food intake (three or more times/week) I: 42.5% → 30.9%, p< 10^{-3}; C: 40.5% → 41.2%, p=0.765
Maatoug et al. 2015	Eating habits, physical activity, screen time. All reported by parents, not reported whether instruments used were validated.	Dietary behaviour – nibbling (prevalence, %) I: Executive mother: 75.4 → 61.5, p=0.01 Housewife/worker mother: 78.7 → 71.8, p=0.17 Executive father: 76.3 → 63.3, p=0.01 Worker father: 79.3 → 70.4, p=0.09 C: Executive mother: 85.7 → 74.1, p=0.08 Housewife/worker mother: 83.5 → 74.7, p=0.04 Executive father: 86.1 → 76.7, p=0.08 Worker father: 83.5 → 72.9, p=0.05 Dietary behaviour – balanced eating habits (prevalence, %) I: Executive mother: 19.6 → 31.1, p=0.002 Housewife/worker mother: 13.9 → 21.5, p=0.09 Executive father: 17.8 → 31.1, p=0.007

		Worker father: 14.7 → 21, p=0.19 C: Executive mother: 12.2 → 15.5, p=0.59 Housewife/worker mother: 7.9 → 15.1, p=0.05 Executive father: 10.7 → 15.1, p=0.36 Worker father: 8.3 → 15.3, p=0.01 Practice of physical activity outdoors the kindergarten (prevalence, %) I: Executive mother: 70.4 → 76.1, p=0.28 Housewife/worker mother: 75.4 → 71.9, p=0.51 Executive father: 69.3 → 75.3, p=0.22 Worker father: 76.5 → 72.5, p=0.43 C: Executive mother: 66.3 → 58.6, p=0.37 Housewife/worker mother: 64.4 → 65.3, p=0.87 Executive father: 62.6 → 68.6, p=0.35 Worker father: 66.9 → 58.6, p=0.17 Spend less than 2 hours per day in screen viewing (prevalence, %) I:

		Executive mother: 75.4 → 89, p=0.002 Housewife/worker mother: 79.2 → 90.7, p=0.005 Executive father: 71.6 → 89.3, p=<10^{-3} Worker father: 83.2 → 90.3, p=0.09 C: Executive mother: 70.8 → 69.1, p=0.9 Housewife/worker mother: 67.1 → 75.2, p=0.11 Executive father: 66.9 → 70.7, p=0.5 Worker father: 70.3 → 75.4, p=0.35 Going to the kindergarten on foot (prevalence, %) I: Executive mother: 22.8 → 24.5, p=0.72 Housewife/worker mother: 49.6 → 42.7, p=0.22 Executive father: 28.0 → 32.6, p=0.41 Worker father: 43.9 → 35.2, p=0.15 C: Executive mother: 52.1 → 39.7, p=0.09 Housewife/worker mother: 74.2 → 76.2, p=0.69 Executive father: 56.2 → 53.5, p=0.75 Worker father: 75.4 → 73.9, p=0.76
"Masikhusele iKamva Lethu"	Dietary behaviour: Fruit and vegetable consumption over	Met 5-a-Day guideline in the past 30 days, adjusted odds ratio:

(“Let Us Protect Our Future.”) **Jemmott et al.**	past 30 days (self-report using 7-item food frequency questionnaire developed by the National Cancer Institute, no mention of context-specific validation). Physical activity: Self-reported PA over past 7 days (CDC-developed 3 items, no mention of whether these were validated for the context). The authors report measures to increase validity of self-reported behaviour but not clear if instruments validated.	1.30 (95% CI: 1.07, 1.58), p=0.008. Servings of fruit per day in the past 30 days, adjusted odds ratio: 0.54 (95% CI: 0.18, 0.90) p=0.003. Servings of vegetables per day in the past 30 days, adjusted odds ratio: 0.77 (95% CI: 0.38, 1.16) p=0.0001. Met physical activity guideline in past 7 days, adjusted odds ratio: 1.56 (95% CI: 1.29, 1.89) p<0.0001. Days intensive cardiovascular physical activity in past 7 days, adjusted odds ratio: 0.44 (95% CI: 0.27, 0.60) p<0.0001. Days moderate cardiovascular physical activity in past 7 days, adjusted odds ratio: 0.67 (95% CI: 0.47, 0.86) p<0.0001. Days strength-building physical activity in past 7 days, adjusted odds ratio: 0.35 (95% CI: 0.15, 0.56) p=0.0006.
Nutrition and Physical Activity (NAP) Pilot	Physical activity (self-report), practices of learners towards PA (learner questionnaire, not reported whether	Increase in the number of learners performing chores around the house 10% (p>0.05)

Naidoo et al. 2009	validated).	Proportion of learners who did exercise ‘more than 5 times’ per week 20% → 43% Increase in learners participating in physical activity ‘more than 5 times’ per week after school 35% → 55% (p<0.05) Proportion of learners who ‘do not participate’ 7% → 2% (p<0.05) Sit-and-reach test (cm) Boys, pre-post: 29.11±6.05 → 29.38±6.45 Girls, pre-post: 30.73±6.52 → 31.62±6.89 Sit-ups Boys, pre-post: 18±3 → 20±4* Girls, pre-post: 15±4 → 16±4* Standing broad jump (m) Boys, pre-post: 1.50±0.21 → 1.60±0.21 Girls, pre-post: 1.30±0.17 → 1.30±0.19

		BMI (kg.m^{-2}) Boys, pre-post: 19.15±0.52 → 19.95±0.63 Girls, pre-post: 19.94±0.37 → 20.59±0.38
Nutrition and Physical Activity (NAP) **Naidoo & Coopoo 2012**	Physical activity (self-reported, learner questionnaire) and fitness (Eurofit Physical Fitness Test Battery, 1993). Height and weight.	Pre-post changes: Sit-and-Reach (cm) I: 28.97± 6.31 → 35.07**±9.47 C: 30.30± 5.54 → 33.53**±6.80 Sit-ups I: 13.37±4.21 → 16.40**±5.44 C: 13.23±3.98 → 15.32**±3.54 5m Shuttle Run (seconds) I: 47.53±5.40 → 46.44*±7.23 C: 50.49±4.02 → 49.34±4.00 Standing Broad Jump (m) I: 1.50±0.26 → 1.65**±0.38 C: 1.50*±0.21 → 1.55*±0.24 Body Mass Index (BMI)

		I: 18.90±0.33 → 19.60±0.30 C: 18.90±0.27 → 19.15±0.28
PLAY **Naude et al. 2008, Lennox & Pienaar 2013**	Body composition. BMI measured without specifying methods, and body fat % measured using Bod Pod, and triceps (TSKF) and subscapular (SSKF) skinfolds. Physical activity (24-hour recall questionnaire) for a weekday and one day during the weekend, energy expenditure (accelerometry data from six students, and analysed using Actical software), aerobic capacity ("The Bleep test"). Only PA and anthropometric outcomes extracted here.	Post assessment measurements by group BMI, girls: High attendance: 20.39±0.12 Medium attendance: 20.34±0.12 Control: 20.32±0.14 p=0.92 Waist circumference, girls: High attendance: 63.85±0.30 Medium attendance: 63.96±0.30 Control: 62.49±0.38 p<0.001* Body fat %, girls: High attendance: 27.00±0.50 Medium attendance: 28.01±0.52 Control: 29.35±0.85 p=0.05

		Skinfolds, girls: High attendance: 28.97±0.79 Medium attendance: 27.43±0.77 Control: 33.78±0.97 p<0.001* BMI, boys: High attendance: 18.55±0.12 Medium attendance: 18.23±0.07 Control: 18.19±0.13 p=0.05 Waist circumference, boys: High attendance: 62.56±0.40 Medium attendance: 63.12±0.25 Control: 62.53±0.44 p=0.6 Body fat %, boys: High attendance: 17.65±0.83 Medium attendance: 16.75±0.54

		Control: 19.94±1.11 p=0.04* Skinfolds, boys: High attendance: 14.39±0.54 Medium attendance: 14.85±0.34 Control: 17.44±0.60 p<0.001* Week METs/16h 1 High attendance pre-post: 79.69 → 81.86 2 Medium attendance pre-post: 81.43 → 82.05 3 Low attendance pre-post: 83.04 → 82.92 Control pre-post: 84.12 → 84.75 Week PA 1 pre-post: 2.0 → 2.0 2 pre-post: 2.2 → 2.1 3 pre-post: 2.3 → 2.2 C pre-post: 1.92 → 1.94 Week TV time

		1 pre-post: 1.7 → 2.7* 2 pre-post: 1.7 → 2.3* 3 pre-post: 1.9 → 2.4* C pre-post: 2.44 → 2.68 Bleep test 1 pre-post: 4.6 → 4.5 2 pre-post: 5.5 → 5.0 3 pre-post: 5.5 → 5.09 C pre-post: 4.45 → 4.07 Weekend METs/16h 1 pre-post: 74.32 → 75.08 2 pre-post: 78.66 → 76.75 3 pre-post: 77.37 → 75.85 C pre-post: 73.40 → 77.80 Weekend PA 1 pre-post: 2.4 → 2.0* 2 pre-post: 2.2 → 2.0 3 pre-post: 2.1 → 2.3

		C pre-post: 1.8 → 1.66 Weekend TV time 1 pre-post: 2.5 → 3.7* 2 pre-post: 3.2 → 3.7 3 pre-post: 3.1 → 3.7* C pre-post: 3.39 → 4.01 *p<0.05
"Schools in Health" **Maatoug et al. 2015**	Overweight/obesity (standard anthropometric measurements), physical activity and dietary behaviour (standardised, pretested questionnaire)	Recommended amount of fruit and vegetables consumed: I: 30.0 → 33.2, p=0.03; C: 40.2 → 35.0, p=0.001 Consumption of fried food (rarely or never): I: 7.5 → 7.8, p=0.64; C: 7.0 → 7.0, p=0.99 Consumption of fast-food (never in past week): I: 29.8 → 28.4, p=0.33; C: 40.6 → 39.3, p=0.43 Recommended physical activity: I: 29.1 → 25.5, p=0.01; C: 21.1 → 21.2, p=0.89 Walk or bike to school:

		I: 72.2 → 74.0, p=0.19; C: 79.4 → 71.1, p<.001 Sedentary time on school day (>2 h): I: 38.1 → 40.1, p=0.19; C: 34.3 → 35.4, p=0.48 Sedentary time on Sunday (>2 h): I: 64.1 → 65.1, p=0.54; C: 65.3 → 60.1, p<.001 Prevalence of normal weight: I: 72.4% → 75.5%, p=0.03; C: 80.0% → 77.0%, p=0.02 Prevalence of overweight: I: 20.6% → 18.0%, p=0.03; C: 15.5% → 16.1%, p=0.58 Prevalence of obesity: I: 7.0% → 6.5%, p=0.51; C: 4.5% → 6.9%, p<0.001 Intervention effect on risk of overweight/obesity: I: 0.84 (0.73–0.97) p=0.02; C: 1.13 (0.97–1.32) p=0.12
Walter 2014	Physical activity (objectively measured using Actigraph accelerometry).	PA change from pre to post assessment: Total METs 0.10 ± 0.22 Sedentary -16.90 ± 39.89

		Light 10.45 ± 30.12 MVPA 6.46 ± 16.64 Sedentary time, pre-post: 66% of the school day (237 minutes) → 61% (220 minutes) (t=-3.77, p=0.0005, d=0.42) MVPA time, pre-post: 36 minutes → 42 minutes (t=3.45, p=0.001, d=0.39)

C = control group; I = intervention group; NR = not reported; PA = physical activity; PE = physical education

APPENDIX D: SUPPLEMENTARY MATERIAL FOR CHAPTER 4

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Miss Sonja Klingberg

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M180257

NAME: (Principal Investigator)	Miss Sonja Klingberg
DEPARTMENT:	MRC/Wis Developmental Pathways to Health Research Unit Soweto
PROJECT TITLE:	Health behaviours and childhood obesity in context - a qualitative exploration of caregiver perspectives and home settings of preschool age children in Sowetan, South Africa
DATE CONSIDERED:	23/02/2018
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Dr Catherine Draper
APPROVED BY:	[redacted] Prof C Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	30/04/2018

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary in Room 301, Third floor, Faculty of Health Sciences, Phillip Tobias Building, 29 Princess of Wales Terrace, Parktown, 2193, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in February and will therefore be due in the month of February each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature _____ Date _____

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Research protocol

Health behaviours and childhood obesity in context – a qualitative exploration of caregiver perspectives and home settings of preschool age children in Soweto, South Africa

Sonja Klingberg

PhD Student, MRC Epidemiology Unit, University of Cambridge &

Honorary Researcher, MRC/Wits Developmental Pathways for Health Research Unit, University of the Witwatersrand

Background

There is a need to better understand the conditions under which childhood obesity develops in low- and middle-income countries. While there is now a growing body of literature relating to childhood obesity that focuses on primary school learners and adolescents in low resource settings, less is known about younger children. For example, a recent review of qualitative studies examining barriers and facilitators to preschool age children's physical activity found such qualitative research from low- and middle-income country contexts largely missing.(1)

Childhood obesity is a relatively recent but growing public health issue in South Africa, and qualitative research involving adolescents has shown that there are complex, and sometimes conflicting, social and cultural norms and ideals related to body size and shape, as well as physical activity and healthy eating.(2–5) It is therefore valuable to gain a better understanding of how parents and caregivers of young children view children's body size, obesity, and health behaviours, as well as their role as carers in relation to these. Such qualitative work in Indonesia has found, for example, that carers believe "chubbier" children to be healthier.(6) In-depth qualitative research will be conducted in an urban low resource setting in South Africa in order to better understand how childhood obesity and related behaviours are perceived by parents and caregivers.

The rationale for conducting in-depth qualitative research on caregiver perspectives and home settings of preschool age children is to inform future interventions targeting 2-6-year-old children in urban low resource settings in South Africa. Since obesity is a complex public health issue, qualitative research provides opportunities to gain deep, context-specific insights about the individual, family, social, and environmental factors contributing to obesity. Seeing as preschool age children have limited individual agency, it is important to investigate the role and views of parents and caregivers.

Study aim and objectives

The aim of this study is to gain a better understanding of how parents or caregivers of young children in Soweto, South Africa, view childhood obesity and related health behaviours, and to situate the phenomenon of childhood obesity, and behaviours associated with obesity, in the context of the home environment in which preschool age children in Soweto live.

Objectives:

- To explore caregiver perceptions, beliefs, and priorities regarding childhood obesity and health behaviours among preschool age children in Soweto.
- To shed light on the social (family) and physical (home) environments in which preschool age children grow up in Soweto in order to contextualise health-related behaviours, and adiposity trends, of young children in an urban South African setting.

Data collection methods

In order to fulfil these objectives, the research will utilise several methods of qualitative data collection, such as:

- In-depth interviews with caregivers of preschool age children
  - Interviews will be conducted in the homes of participants with the assistance of a local qualitative fieldworker
  - Interviews will ideally take place when the children are at home so that observations about their behaviour, such as playing or screen time, can be made in connection with the interviews
  - Interviews will be audio recorded with permission from participants
- Ethnographic field notes and observations about preschool age children's home environments
  - With the permission of participants, written field notes and observations will be recorded in connection with the in-depth interviews
  - Observations will cover both physical characteristics of the home environment and neighbourhood, and interactions with participants

Participants

Parents or primary caregivers of children age 2-6 in Soweto, South Africa. Participants can be men or women over the age of 18. Participants should be fluent in English, and willing to be interviewed in English.

Sample and recruitment

The main channel for participant recruitment will be through existing contacts with preschools in the Soweto area in Johannesburg. Caregivers of preschool age children will be given information about the study via preschools, and

invited to participate. Data collection methods will be piloted with one or a few caregivers. The minimum sample size for in-depth interviews is 10, and up to about 20 interviews can be conducted. The exact number will depend on the extent to which completely new information or topics arise with each new interview (i.e. to what degree ‘saturation’ has been reached(7)), and how well the research objectives have been fulfilled. In this setting, participants are more likely to be women than men but if men are recruited, the sample must include at least 4-5 men to provide some understanding of potential gender-specific findings.

Process

Interviews and observations will be carried out in the homes of participants by a researcher and a trained qualitative fieldworker familiar with the local setting. For safety reasons, no visits will be carried out by an unaccompanied researcher. The field team will follow an agreed protocol for home visits, and keep supervisors informed about plans, times and locations of home visits so that safety risks can be mitigated.

While no incentive for participation will be promised to participants in order to avoid influencing their decision to take part in the study, each participant will be given a supermarket voucher worth R150 as a thank you for their participation. This is seen as justified because some participants may wish to offer the research team some refreshments during the home visit, and they should not incur any costs from participating in the study.

Analysis

The aforementioned data collection methods will generate a large qualitative dataset which will require different approaches to analysis. In-depth interviews will be conducted and analysed with a grounded theory approach8 in order to gain a comprehensive understanding of the perspectives of caregivers, and allow for the interview approach to develop with each consecutive interview. This means that some analysis will take place already simultaneously with data collection, and each new interview will be guided by findings from the previous. Observations and field notes will be used to complement, and to some extent triangulate, these findings.

Ethical considerations

Ethical approval is being sought through the appropriate channels at the University of the Witwatersrand, Johannesburg, South Africa, and the University of Cambridge. The study will be sponsored and insured by the University of Cambridge. The study adheres to the Declaration of Helsinki Ethical Principles for Medical Research Involving Human Subjects and the laws of South Africa.

Participation in the research is voluntary, and written consent will be sought from all participants after providing them with comprehensive verbal and written information about the study. Participants will be made aware that they can withdraw their participation at any time without providing an explanation. No

parents or caregivers under the age of 18 will be recruited to the study. Participation in the research will not be incentivised, nor does it incur costs on the participants. There is no direct benefit from participating in the study. No direct risks to participants' physical health or wellbeing are associated with participation but discussing personal views on, for example, parenting or other sensitive topics, may be emotionally upsetting to some participants. Participants will be referred to counselling resources in their community where needed, and are free to stop the interview at any time without giving an explanation. If any information about incidents of deliberate neglect or physical, sexual or emotional abuse of a child is brought to the attention of the research team, it will be reported to appropriate authorities such as child welfare or the police.

Data management

Data will be stored securely, and personal information will be kept confidential. After each interview, recordings will be transferred from the audio recorder to password-protected, encrypted hard drives, and deleted from the recorder. Hard copies of questionnaires and consent forms will be stored separate from each other at the University of the Witwatersrand in locked filing cabinets. Each participant will be assigned a participant number, and the list connecting participant number to participant name will be stored separately from data and consent forms. Only members of the research team, and an external transcriber who will have to adhere to the same strict confidentiality requirements as the team, will have access to the interview data. Anonymised data will be transferred to the MRC Epidemiology Unit at the University of Cambridge according to data transfer agreements between the institutions, and stored on a secured network drive on computers in the MRC Epidemiology Unit. Data and participant records will be destroyed after 20 years. Participants will be made aware that the information they provide will be anonymised, and used for publication in peer-reviewed scientific journals, and presented at scientific conferences.

Reflexivity

It is important to consider challenges arising from the cross-cultural nature of this study. Soweto is a predominantly black, historically disadvantaged and deprived township, whereas the researcher who will be recruiting and interviewing participants is a white 28-year-old European woman, who despite being a PhD student, is likely to be seen primarily as a wealthy foreigner, or assumed to be a wealthy white South African in the context of Soweto.

For these reasons, potential participants will not be promised any incentive when invited to participate. Mentioning gifts or incentives in the information sheet might raise expectations that participating in research conducted by a visiting researcher would bring monetary benefits, and it would not be appropriate to attract participation through such means. Nevertheless, modest supermarket vouchers (value R150) will be provided at the end of home visits to show participants appreciation for their time, and to reimburse any costs they may have incurred if they have decided to provide refreshments to the research team.

There may be challenging dynamics arising not only from perceptions or expectations (implicit or explicit) related to race or ethnicity from either participants or the researcher, but also the fact that the researcher is a clear 'outsider' who does not have a deep understanding of the local setting in the way that residents of the research context do. This will be mitigated as much as possible by being open about that lack of emic knowledge or perspective in interactions with research participants, and asking them to be as explicit as possible in their descriptions or views so that the risk of making false assumptions based on an etic perspective can be minimised. The researcher will strive to listen to participants in a respectful and empathetic way, without passing judgment about the views and circumstances they share in interviews. In terms of gender, it is expected that most potential participants are women, particularly biological mothers of preschool age children. However, seeing as men may also be recruited into the study, it is possible that some additional challenges to communication may arise from men being interviewed by a woman, and this may be mitigated by seeking advice from local researchers, and working closely with local research assistants who may be either men or women, depending on what seems to be most conducive for data collection.

Timeline

February 2017 – March 2018: Obtain ethical approval

Late March 2018: Identify preschools to recruit from, approach first preschool, recruit participants from first preschool, pilot interview(s)

April 2018: Conduct first interviews, start field observations, recruit and interview participants from other preschools

May 2018: Conduct remaining interviews, continue field observations, and carry out initial grounded theory analyses

June – August 2018: Analyse data

July – September 2018: Write up findings for publication

Dissemination

The findings from this study will be used in a PhD thesis, and submitted for publication in peer-reviewed open access journals. They may also be presented at conferences, symposia or other academic events. None of these formats will include identifying information about participants. Findings may also be fed back to participants via the preschools, and they will inform other projects carried out as part of the PhD research, including the development of an intervention for the prevention of childhood obesity.

Budget

Item	Unit cost	Number of units	Total cost
Audio recorder	R 1,500	1	R 1,500

Gift vouchers	R 150	20	R 3,000
Printing			R 500
Fieldworker salary (part time, 50%)	R 8,000/month	2	R 16,000
Transcription	R 800/interview	20	R 16,000
Petrol	R 500/full tank	1	R 500
Total in R:	R 37,500		
Total in £:	£ 2,225		

The budget described here is to be covered by a Flexible Supplement grant from the Medical Research Council. Other costs of conducting this study are covered by PhD funding from the UK Medical Research Council, and PhD exchange funding from the Newton Fund.

References

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3. Sedibe M, Griffiths P, Doak C, Feeley A, Voorend C, Norris S. Narratives of urban female adolescents in South Africa: dietary and physical activity practices in an obesogenic environment. South African J Clin Nutr. 2014;27(3).

4. Sedibe HM, Kahn K, Edin K, et al. Qualitative study exploring healthy eating practices and physical activity among adolescent girls in rural South Africa. BMC Pediatr. 2014;14(1). doi:10.1186/1471-2431-14-211.

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6. Rachmi CN, Hunter CL, Li M, Baur LA. Perceptions of overweight by primary carers (mothers/grandmothers) of under five and elementary school-aged children in Bandung, Indonesia: a qualitative study. Int J Behav Nutr Phys Act. 2017;14. doi:10.1186/s12966-017-0556-1.

7. Green J, Thorogood N. Qualitative Methods for Health Research. 3rd ed. SAGE Publications Ltd; 2014.

8. Glaser BG, Strauss AL. The Discovery of Grounded Theory: Strategies for Qualitative Research. Transaction Publishers; 2009.

Preschool information sheet

Dear Sir / Madam,

You are receiving this letter because you are the director or representative of a creche in Soweto. We are a research team from the University of the Witwatersrand, based at Chris Hani Baragwanath Hospital here in Soweto. We are doing a research project about the health of preschool age children in Soweto, and we are particularly interested in understanding more about how parents and caregivers view their children's health and weight.

At the moment, we are trying to identify Sowetan parents and caregivers of preschool age children who might volunteer to be interviewed by a researcher as part of our study. We would therefore like to ask for your kind assistance in giving out invitation letters about our study to the parents and caregivers of the children in your preschool. That way they can get in contact with us if they are interested in participating.

Our study has been approved by the Ethics Committee of the University (reference number M180257), and we follow strict ethical guidelines in the research we carry out. If you have any questions about this, you are free to contact researcher Sonja Klingberg at [redacted] or representatives of the Ethics Committee at the University of the Witwatersrand: Ms Zanele Ndlovu at [redacted] or [redacted].

If you are willing to distribute information letters about our study to the parents or caregivers of your preschool's children, you can contact us at [redacted] so

that we can bring you letters to hand out. If we do not hear back from you within one week, we will follow up this letter via telephone but if you tell us that you do not want to take part in handing out information we will not contact you further.

Kind regards,

Sonja Klingberg
Honorary Researcher
MRC/Wits Developmental Pathways for Health Research Unit
University of the Witwatersrand

Caregiver information sheet

Health behaviours and childhood obesity in context – a qualitative exploration of care-giver perspectives and home settings of preschool age children in Soweto, South Africa

Dear parent / legal guardian,

Who are we, and why are we doing this study?

My name is Sonja Klingberg, and I am a researcher with the University of the Witwatersrand. I also do research at the University of Cambridge in England. Our research team is doing a study on health-related habits of preschool children. This is because we want to find out what parents and caregivers think about the health and development of preschool children, and what they consider important for their children. This study will help us to understand how parents and caregivers could be supported in ensuring their children maintain a healthy weight.

How are you involved?

We wish to talk to the legal guardians of preschool children. Your child's preschool has agreed to let us contact you through this letter, and we would now like to invite you to be part of our research project.

What are we asking for?

We would like to invite you to participate in our study. This means we would like to schedule a time suitable to you when we (myself and another member of the research team) could come meet you in your home so that we can ask you about your thoughts and opinions regarding children's health and weight, and

being a parent or caregiver to a preschool child. During the visit, we would first ask you some standard questions about you and your family – this is called a questionnaire. Then we would ask you to tell us your thoughts and opinions about different topics relating to children's weight and health – this part is called an interview.

The reason why we ask to come meet you in your home is that we would like to learn about the home environments of preschool age children, for example, by seeing where children play. If you accept our invitation and agree to participate, we will also make written notes about your neighbourhood and home. This could be things like what the traffic is like near your home, and where your child or children usually sleep or play. The total visit would take 1-2 hours of your time, and the discussions would be audio recorded (no video).

Are there any risks involved in this study?

Participating in this study will not put you or your child at risk, or cause physical harm. However, talking about health and family life may make some people feel uncomfortable. If you agree to a meeting you can freely decide what you are willing to share and discuss. If you have any questions about this before deciding whether to participate you can contact us at [redacted]. In case of any distress or discomfort during the interview, or if you should require someone to talk to after the interview, we will connect you to Sister Thoko at [redacted] for counselling services. Sister Thoko is a resident trained nurse counsellor based at our research unit at Chris Hani Baragwanath Hospital. She has been working as a professional nurse for over 20 years.

Do you have to participate?

No. Taking part in our study is completely voluntary and your decision to participate or not will not affect you, your child, or your access to any kind of health services. If you do not wish to participate this will not affect your relationship with your child's preschool in any way. If you decide to participate, you are also free to change your mind about that at any point, and stop being part of the study without having to explain to us why you no longer wish to participate.

How will we protect you and your child?

We follow strict rules in order to keep information we collect confidential. Any information about you will have your name and address removed so that you cannot be recognised from it, and it will not be used or made available for any purpose other than for research. We will not use your name, your child's name or the name of your child's preschool when we report on the results of our study, so both you and your child will remain anonymous.

As the research team, we may not be able to maintain as confidential information about known or reasonably suspected incidents of deliberate neglect or physical, sexual or emotional abuse of a child. If we are given such information, we have to report it to the authorities such as child welfare or the police.

What are the benefits of this study?

There is no direct benefit to you or your child for taking part in the study. However, this study will help us to better understand the health and family situations of preschool children. Since there has not been research like this in South Africa before, this study will help us discover new information. This

information will help us come up with new ways in which families and preschools can promote healthy habits in preschool children. We believe these healthy habits will have a positive impact on children's health and development. There is no cost to you if you decide to participate in our study.

What will happen to the information you give us for this study?

If you agree to participate, only the research team and our professional transcriber will have access to your data. We will protect your identity, and keep your personal information safe. The things you tell us may be included in reports, articles or talks presenting the findings from this study but we will not use your name or any other identifying information when we report on the findings. With your permission, information will be stored anonymously at the University of the Witwatersrand in locked filing cabinets. It will also be kept electronically on a secured network drive on computers in our partner institution, the University of Cambridge in the United Kingdom. Your identifying information will be kept separately so that what you have said will not be connected to your name or other personal information. We are happy to explain any part of this process to you if you have any questions.

Next steps

We hope that you find this information helpful. If you have any questions about the study, please feel free to contact Sonja Klingberg at [redacted] to find out more. If you are willing to participate, please could you contact Sonja Klingberg or Karabo Setlhafuno at [redacted]. If you prefer, you can also let the staff at your child's preschool know, as they can help you contact us to schedule a meeting.

Kind regards,

Sonja Klingberg

Honorary Researcher

MRC/Wits Developmental Pathways for Health Research Unit (DPHRU), University of the Witwatersrand

Tel. [redacted]

If you have any questions or thoughts regarding the ethics of this study, please contact Ms. Zanele Ndlovu at [redacted], and reference ethics number M180257. This study adheres to the guidelines described in the Declaration of Helsinki Ethical Principles for Medical Research Involving Human Subjects (WMA 2013).

Participant consent form

Health behaviours and childhood obesity in context – a qualitative exploration of caregiver perspectives and home settings of preschool age children in Soweto, South Africa

Ethics reference number: M180257

Name of chief investigator: Sonja Klingberg

Please initial or thumbprint each box

I confirm that I have read and understood the information sheet titled “Caregiver information sheet”, dated 7 May 2018, and have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

I understand that the study will involve an interview. ☐

I understand that participation in the study is voluntary, and I have the right to withdraw from the study at any time without any adverse consequences resulting from that. ☐

I understand that my name and other personal information will not be part of any publication of research findings. ☐

I agree to participate in this study. ☐

Name of participant:

_____

Signature/mark/thumbprint of participant:

_____

Witness (if mark/thumbprint):

_____

Date: _____

Name of researcher: Sonja Klingberg

Signature of researcher: _____

Date: _____

Should you have any queries regarding the ethics of this study, please contact:
Ms Zanele Ndlovu at [redacted]

Participant consent form for audio recording

Health behaviours and childhood obesity in context – a qualitative exploration of caregiver perspectives and home settings of preschool age children in Soweto, South Africa

Ethics reference number: M180257

Name of chief investigator: Sonja Klingberg

Please initial or thumbprint each box

I confirm that I have read and understood the information sheet titled “Caregiver information sheet”, dated 7 May 2018, and have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐
I understand that the study will involve an interview.	☐
I understand that participation in the study is voluntary, and I have the right to withdraw from the study at any time without any adverse consequences resulting from that.	☐
I understand that my name and other personal information will not be part of any publication of research findings.	☐
I agree to participate in this study.	☐
I confirm that I give my permission to audio record my interview, and I understand that the recording will be transcribed and anonymised before used for research.	☐

Name of participant:

_____

Signature/mark/thumbprint of participant:

_____

Witness (if mark/thumbprint): _____

Date: _____

Name of researcher: Sonja Klingberg

Signature of researcher: _____

Date: _____

Should you have any queries regarding the ethics of this study, please contact:
Ms Zanele Ndlovu at [redacted]

Caregiver questionnaire

Health behaviours and childhood obesity in context – a qualitative exploration of caregiver perspectives and home settings of preschool age children in Soweto, South Africa

Today's date:	Participant #:
Caregiver's age:	Neighbourhood (not too specific):
Preschool child's age (or ages):	Preschool child's gender(s):

You and your family (Questions asked by interviewer before interview)

1. What is your home language? (tick ONE)

	English		isiXhosa		Zulu		Tsonga/Shangaan
	Afrikaans		Sotho		Pedi		Tswana
	Venda		isiNdebele		isiswati		Other (please state):

2. Are there other children in your household? How many and how old are they?

Other children	Child's age	Boy or girl?	Relation to you
1		O Boy O Girl	
2		O Boy O Girl	
3		O Boy O Girl	
4		O Boy O Girl	
5		O Boy O Girl	
6		O Boy O Girl	
7		O Boy O Girl	

3. What relationship are you to the preschool child or children in your care? (tick ONE)

	Mother		Father		Grandparent
	Aunt		Uncle		Other (please state):

4. If mother, ask: Is the father of the preschool child living with you and the child?

	Yes		No

If father, ask: Are you living together with the mother of the child?

	Yes		No

5. What is your current marital status? (tick ONE)

	Married		Living together		Divorced
	Separated		Widowed		Never married

6. What is your highest level of education? (tick ONE)

	Grade 6 / Standard 4 and below		Grade 7-9 / Standard 5-7
	Grade 10-11 / Standard 8-9		Grade 12 / Standard 10 / Matric
	Tertiary diploma / Certificate		University degree

7. Who in the household works? What do they (/you) do? Do you receive any social grants? Does the other parent pay for maintenance/do they maintain their children?

8. How much time per week does your child spend in day care or being cared for by someone other (who?) than you? (e.g. how many hours per week day, how many hours per weekend day?) FEES PER MONTH

Toy checklist (done by fieldworker during interview)

Tick in the boxes next to the toys or equipment you observe in caregiver's home, and write down the amount/number that you observe (e.g. 2 TVs).

Soccer/basket/net balls		Tennis balls (or small balls)	
Basketball/netball ring		Skipping rope	
Bean bags		Jungle gym	
Bats/racquets/golf clubs		Slide	
Sand pit		Swings	
Frisbee		Tricycle/bicycle/scooter	
Pool or beach toys		Trampoline	
Bowls/Skittles/10-Pin Bowls		Swimming pool/splash pool	
Other:		Other:	

Children's books		Puzzles	
Colouring books/pages		Crayons/koki pens/pencil crayons	
Lego/Duplo/other building blocks		Children's scissors	
Dolls		Fluffy toys	
Board games		Dress-up clothes	
Card games		Other games:	
Other:		Other:	

TV		Video/DVD player	
Digital tablet, e.g. iPad		Smart phone	
Video games, e.g. Playstation, X-Box		Satellite dish (for TV)	
Computer		Internet access	
Other:		Other:	

Overall observations

After the interview, the interviewer should write detailed field notes about the interview, interactions with the participant, any observations about the child and participant and their interactions, the home environment, the neighbourhood, and anything else that comes to mind that could potentially be of any relevance for contextualising the interview. These field notes can inform a probing strategy and topics to follow up on in other interviews.

Interview guide for in-depth **interviews**

Health behaviours and childhood obesity in context – a qualitative exploration of caregiver perspectives and home settings of preschool age children in Soweto, South Africa

Aim

The aim of this study is to gain a better understanding of how parents or caregivers of young children in Soweto, South Africa, view childhood obesity and related health behaviours, and to situate the phenomenon of childhood obesity, and behaviours associated with obesity, in the context of the home environment in which preschool age children in Soweto live.

Objectives

- To explore caregiver perceptions, beliefs, and priorities regarding childhood obesity and health behaviours among preschool age children in Soweto.
- To shed light on the family and home environments in which preschool age children grow up in Soweto in order to contextualise health-related behaviours, and adiposity trends, of young children in an urban South African setting.

Process

This is meant to be a very open and exploratory method of interviewing participants. Particularly in the first few interviews, the interviewing technique and focus will develop based on what participants say, and this will inform the approach taken in interviews that follow. Below are broad topics and questions

that the interviews are expected to touch upon but it is to be expected that completely new topics (of relevance to the aim) will emerge in interviews, and these can be raised and explored with other participants to find out how pertinent the issues in question are in this setting. The example questions are meant as an illustration of how questions may be presented in the interview but are not meant to be followed strictly if the participant is already speaking freely about topics of relevance. The questions can be formulated on the spot depending on the rapport with the participant but they should be open-ended, and not come across as a test of the participant's knowledge about health as that may make them uncomfortable, and lead them to answer in a socially desirable way.

The interview visit should start with some polite greetings and small talk, as well as ensuring that the participant is comfortable, has all necessary information, and has given consent. The interview itself will start with the sociodemographic questions, and then move into the more personal and open in-depth interview. It may be good to explain that as a foreign researcher, I may not understand everything and so I am likely to ask for clarification, and that the participant should feel free to explain things assuming I know very little about the topics they are sharing about.

Topics with example questions

Children's weight and size in relation to health

- We are interested in your opinions. Can you please tell us what you think makes a child of preschool age look healthy? What about unhealthy?
- What is your opinion about a healthy size?
- If you see a very big child, what do you think?
- What about overweight or obesity. How serious or dangerous do you consider it if a preschool child is overweight?

Habits, behaviours, and the neighbourhood

- How easy or difficult is it to get healthy food in your neighbourhood? What do you think about this?
- When it comes to food and meals, can you describe how this works in your household? Who makes decisions, who procures food, who prepares food, and what meals do your child typically eat at home? What about day care, do you provide any food or money for meals at day care?
- If you think about wanting the children in your family and neighbourhood to be healthy, what kind of foods should there be more of, and what kind of foods should there be less of? Why do you think there is too much/too little of ___?
- When your child is at home, what kind of things does he or she do when he or she is awake? Can you show me where in the home?
- What opportunities are there for your child to play outside or be active in some other way? OR Where, other than inside your home, does your child spend time e.g. playing?

- What is this neighbourhood like for children? How do you feel about your child being outdoors?
- Does your child play with toys or equipment? What kind of things? Can you show me?
- Can you describe the sleeping situation in your household? (This might be obvious from the size of the home.)
- Where do(es) your preschool age child(ren) sleep? When do they go to sleep, and when do others go to sleep? What time does everyone normally wake up?
- “What time do the children sleep?” AND if necessary to ask, also WHERE

Role as parent/caregiver

- I am interested to hear about your experience of being a parent/caregiver. What do you think is the most important thing you do for your child?
- If you think specifically about your child’s growth and weight, what is your role?
- What kind of challenges have you faced as a parent/caregiver when it comes to your child’s health and development?

Aspirations as a parent/caregiver

- What would you like to do differently with your child, if anything?
- What would help your situation as a caregiver/parent in ensuring your child can grow in a healthy way? (careful here to not make it sound like I can provide the help/resources needed)

Examples of probes to be used throughout the interview

What do you think is the reason for that? Why do you think that? What makes you say that? How do you feel about that? Can you tell me more about that? If you could change that, what would be different about the situation? May I check if I have understood you correctly? Who decides that? What makes that possible/difficult/easy/etc.? What is more important out of the things you mentioned, ____ or ___? Why?

APPENDIX E: SUPPLEMENTARY MATERIAL FOR CHAPTER 7

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Dr Catherine Draper et al

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M181063

NAME: (Principal Investigator)	Dr Catherine Draper et al
DEPARTMENT:	MRC/Wits Rural Public Health and Health Transitions Research Unit Chiawelo, Soweto
PROJECT TITLE:	Feasibility and accessibility of a caregiver support intervention to promote healthy behaviours in early childhood: A pilot study of the Amagugu Asakhula intervention
DATE CONSIDERED:	26/10/2018
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	[redacted]
APPROVED BY:	Doctor CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	05/12/2018

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the Third Floor, Faculty of Health Sciences, Phillip Tobias Building, 29 Princess of Wales Terrace, Parktown, 2193, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in **October** and will therefore be due in the month of **October** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

[redacted]

Principal Investigator Signature

14·12·2018

Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Joburg
a world class African city

JOHANNESBURG HEALTH DISTRICT

Enquiries: Dr EM Ohaju
[redacted]

Hillbrow CHC: Administration Building
Cr Smith Str. & Klein Street
Private Bag X21, Johannesburg
South Africa, 2017

Wits - Human Research Ethics Committee(Medical)
University of The Witwatersrand,
Johannesburg, South Africa
[redacted]

DRC Ref: 2019-01-013

NHRD Ref no: GP_201901_020

Dear: Dr Catherine Draper

TITLE: ***Feasibility and acceptability of a caregiver support intervention to promote healthy behaviours in early childhood: a pilot study of the Amagugu Asakhula intervention***

Your application for research approval refers.

The District Research Committee has reviewed your application. This letter serves as an in-principle approval to access the Districts Health facilities (mentioned below) for the above project subject to following conditions:

- The facility to be visited: [redacted]
- This facility will be visited from **22/02/2019 to 29/01/2020**
- The research can only commence after you submit an ethics clearance certificate from a recognized institution.
- You will report to the Facility Manager before initiating the study.

Region	Regional Health Manager	Contact No.	Cell phone
[redacted]			

The following conditions must be observed:

- Participants' rights and confidentiality will be maintained all the time.
- No resources (Financial, material and human resources) from the above facilities will be used for the study. Neither the District nor the facility will incur any additional cost for this study.
- The study will comply with **Publicly Financed Research and Development Act, 2008 (Act 51 of 2008) and its related Regulations**.
- You will submit a copy (electronic and hard copy) of your final report. In addition, you will submit a six-monthly progress report to the District Research Committee.

- Your supervisor and University of The Witwatersrand will ensure that these reports are being submitted timeously to the District Research Committee.
- The District must be acknowledged in all the reports/publications generated from the research and a copy of these reports/publications must be submitted to the District Research Committee.

We reserve our right to withdraw our approval, if you breach any of the conditions mentioned above.

Please feel free to contact us, if you have any further queries. On behalf of the District Research Committee, we would like to thank you for choosing our District to conduct such an important study.

Regards,

[redacted]

Dr E.M Ohaju
Chairperson: District Research Committee
Johannesburg Health District
Date: 26/02/2019

[redacted]

Mrs M.L Morewane
Chief Director
Johannesburg Health District
Date: 26/02/2019

RESEARCH PROPOSAL

Feasibility and acceptability of a caregiver support intervention to promote healthy behaviours in early childhood: a pilot study of the Amagugu Asakhula intervention

Principal investigator:

Dr Catherine Draper1,2

Research team:

Ms Sonja Klingberg (PhD exchange student)3,1

Dr Esther van Sluijs3

Dr Tamsen Rochat2,4

Affiliations:

1. MRC/Wits Developmental Pathways for Health Research Unit, Department of Paediatrics, Faculty of Health Sciences, University of the Witwatersrand

2. Division of Exercise Science and Sports Medicine, Department of Human Biology, Faculty of Health Sciences, University of Cape Town

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Rationale

The high proportion of young children in low- and middle-income countries (LMICs) at risk of not meeting their developmental potential is an issue receiving global attention (1). Early childhood development interventions in LMICs can play a key role in addressing this issue in order to diminish the perpetuation of disadvantage into subsequent generations (2). Interventions that integrate child development and nutrition have been shown to benefit child development outcomes (3), with sustained effects (4). Furthermore, stimulation interventions that are home-based have been shown to be feasible (5-7), some of which are delivered by community-based workers (5,7). These interventions, particularly those that are home-based, should promote nurturing interactions, which are crucial for the mitigation of risks for poor developmental outcomes in early childhood (2,8). The components of nurturing care include: safety and security; responsive caregiving behaviours, attitudes and knowledge (including those related to health); nutrition; stimulation (including play); and early learning (8,9). Nurturing interactions occur when caregivers respond attentively to their young child’s attempts to discover and relate to the world around them. Caregivers engaging in nurturing interactions also endeavour to provide their child with learning opportunities that are age-appropriate, safe and enjoyable for those involved (2).

Early childhood obesity is another global challenge, including in LMICs (10). Dietary habits and movement behaviours, including physical activity, sedentary behaviour (screen time, in particular) and sleep are understood to play a role in the prevention of obesity in young children (11). Furthermore, engaging in the recommended amounts of movement behaviours has been shown to be beneficial for cognitive development in preschool children (12-14). The home and family environment are acknowledged as important influencers of these obesity-related behaviours (15). However, relatively few home-based interventions have been evaluated, and the majority have been implemented in the United States, with some effect on behaviours, but no effect on weight-related outcomes (16). Similar home-based interventions with older children have also shown null results (17). Obesity prevention interventions targeting preschool children that have been implemented in the home setting by community-based workers and tailored to the cultural context have shown promising findings with regards to feasibility, and changes in obesity-related behaviours (18-21).

Concerns about the quality of education, as well as levels of numeracy and literacy in low-income South African settings are widespread; these have been argued to perpetuate poverty in these settings, such that children who ‘start behind, stay behind’ (22,23). Furthermore, in South Africa, 18.2% and 4.7% of 2-5 year old children were reported to be overweight and obese respectively in 2013 (24). Research from a low-income urban South African setting, has shown that obesity in the preschool years (±3-5 years of age) predicts obesity in late adolescence: boys who were obese at 4-8 years were 19.7 times more likely to be obese at 18 years. Girls who were obese at 4-8 years were 42.3 times more likely to be obese at 18 years (25). However, despite these concerns, there have been no early childhood obesity-prevention interventions evaluated in South Africa (26). And although stimulation interventions have shown success at improving caregiver and child interactions in low-income settings (27-29), there have been no interventions that have promoted healthy behaviours (related to obesity prevention) as well as nurturing interactions in order to address a range of early childhood development and health outcomes.

The Amagugu intervention was originally developed to support mothers to disclose their HIV-status to their children in another rural South African setting, and was delivered by lay counsellors. Amagugu is a Zulu term for ‘treasures’, which captures the notion that children are precious and that it is worth investing in their futures. Amagugu was found to be feasible and acceptable to mothers and counsellors in low-income settings (30,31). It was also found to lead to improvements in mothers' and children's mental health and parenting stress (irrespective of disclosure). This included reductions in mother’s psychological distress and parenting stress scores, reductions in child emotional and behavioural problems, and improvements in the parent-child relationship (32).

Adaption of the Amagugu intervention

The original Amagugu intervention has been adapted by replacing the HIV disclosure messages with messages focusing on children's cognitive development (particularly executive function), physical activity, screen time, diet and sleep, while keeping the emphasis on strengthening the relationship between the caregiver and her child/grandchild. The name of the adapted intervention is 'Amagugu Asakhula', which means 'treasures that are still growing'.

The Amagugu Asakhula materials have been adapted from the original materials in collaboration with developers of the original intervention. Amagugu Asakhula will still be conducted over 6 sessions, and will be delivered by community health workers (CHWs) to the caregiver in the home setting. An outline of the 6 sessions is provided at the end of this document. The sessions are intended to be implemented over a period of approximately 6 weeks (i.e. 1 session per week). Apart from imparting knowledge from CHWs to caregivers, various activities have been embedded in the intervention to promote physical activity and the development of fine and gross motor skills, numeracy and literacy, as well as opportunities for nurturing interactions. Various self-monitoring activities have also been included in order to encourage behaviour change.

In our experience of conducting research with preschool children in low-income communities, the vast majority of preschool children have been primarily raised by a female caregiver. This is why Amagugu Asakhula (as well as the original Amagugu intervention), and hence the study being proposed will only include female participants. Male caregivers will not be included in this study.

While extensive evaluation has been carried out with the original Amagugu intervention, the feasibility of implementing Amagugu Asakhula has only been evaluated in one low-income in setting in Cape Town, although with very promising results. In preparation for a randomised controlled trial to evaluate effectiveness, additional work is required to evaluate the feasibility and acceptability of Amagugu Asakhula in other low-income settings, and the feasibility of outcome measures needs to also be evaluated. Furthermore, the feasibility of integrating this intervention into CHWs' scope of work needs to be established in order to obtain insight into the scalability of this intervention and its alignment with health systems in South Africa. Evaluating feasibility is a crucial component of the process of developing complex interventions, according to the guidelines from the UK Medical Research Council (33).

Study aim, objectives and research questions

The aim of this pilot study is therefore to assess the feasibility and acceptability of a home-based intervention with caregivers of preschool children in a low-income, urban setting to promote nurturing interactions and healthy behaviours.

The objectives of the study will be to:

1. Train community health workers to deliver the intervention.

2. Pilot the intervention to assess its feasibility and acceptability, including:

a. Recruitment and retention of caregivers and CHWs in the intervention,

b. Fidelity of implementation of the intervention by CHWs already working in a community,

c. Integration of the intervention into CHWs' scope of work.

3. Investigate factors that will influence implementation, such as feasibility, acceptability, adoption, appropriateness, and fidelity of the intervention.

4. Qualitatively investigate CHWs and caregivers' experiences of the intervention, from the perspective of CHWs and caregivers.

5. Qualitatively investigate the appropriateness of the intervention, as well as its potential adoption, coverage and sustainability, from the perspective of key informants.

6. To inform the design of a randomised controlled trial to evaluate the effectiveness of the intervention.

The main research questions that will therefore be addressed are:

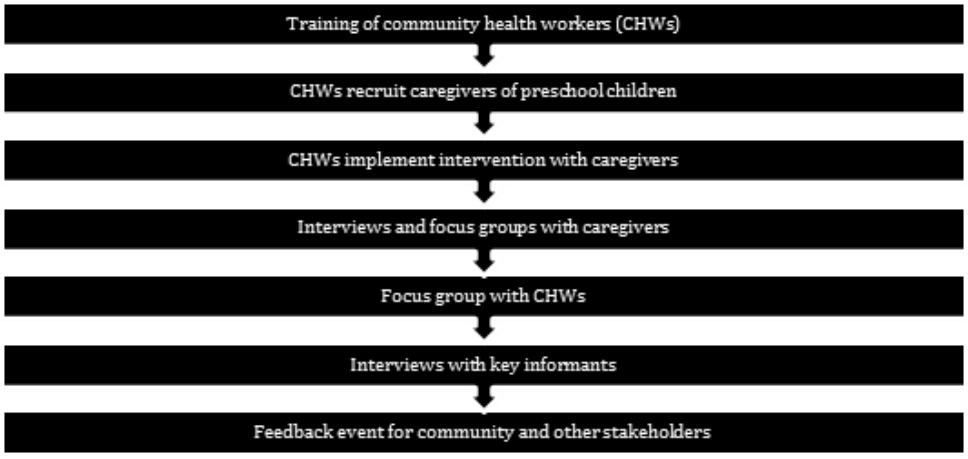
1. Can Amagugu Asakhula be delivered by CHWs and integrated into community-based health services that align with South African health systems policy, with potential for scaling up?

2. Is this model of delivery acceptable to CHWs and to the families they work with?

3. In what ways does Amagugu Asakhula and its evaluation need to be optimised prior to a randomised controlled trial?

Methods

A flow chart of the study methods is provided below.



Sample and recruitment

Community health workers

Twenty CHWs employed by the [redacted] Community Health Centre (CHC) in Soweto will be trained to deliver the intervention in the [redacted] community. To participate in this study, these CHWs should meet the following criteria:

- Willingness to be involved with the study and implement the intervention;
- Availability for the training sessions (2 half-day sessions); and
- Personal motivation to promote the intervention messages.

Caregivers

For the implementation of the intervention, a convenience sample of up to 60 caregivers of preschool children (3-5 years old and attending preschool) will be recruited through the CHC. These caregivers will be recruited from the homes in which the CHWs are already working. Each of the CHWs will identify between 1 and 3 caregivers with whom they can implement the intervention to assess its feasibility and acceptability. These caregivers will be selected from the pool of families that the CHWs are already working with. Initial discussions with [redacted], indicate that this will be feasible.

The caregivers to be recruited to participate in this study can either be the biological mother of a preschool child, or another female caregiver, e.g. grandmother, or aunt. Caregivers must be at least 18 years old (and therefore able to provide informed consent). There is no upper age limit for caregivers being recruited for this study, since we do not want to exclude older grandmothers who are raising a preschool child. The main inclusion criterion is that they are the primary caregiver of a preschool child between the ages of 3-5 years old.

Key informants

Five key informants will be recruited for individual interviews. CHWs will be asked to recommend individuals who would be able to act as key informants for this study. These key informants will be health services staff who work with CHWs and/or other community-based services in Soweto, and specifically in [community].

Procedure

Training of community health workers – Objective 1

The training of CHWs will take place over 2 half-day sessions in order to fit in with the CHWs schedule. CHWs will receive a certificate to state that they completed the training for the Amagugu Asakhula pilot study, and refreshments will be provided during the training. This training will be conducted at a time and venue convenient to the CHWs.

The training will cover the following:

- Rationale for the intervention and the intervention approach.
- Detailed description of the 6 intervention sessions.
- Discussion of the logistical aspects of the intervention, i.e. contacting caregivers, planning intervention sessions etc.
- Opportunities to practice and experience the intervention activities.
- Opportunities to reflect on the intervention materials and process, and ask any questions if any aspects of the intervention are unclear.

The training will be conducted by the Principal Investigator, who has a background in Psychology and Public Health, as well as experience in the community-based interventions, nutrition, early childhood physical activity, and cognitive development in early childhood. There will also be an observer to the training (PhD student, Sonja Klingberg), who will take notes of their observations and impressions during the training. The Principal Investigator will also document observations and impressions from the training. At the end of the training (included in the time allocated for training), an opportunity will be given for CHWs to provide verbal feedback on the training.

At the end of the training, CHWs will be provided with an opportunity to give feedback on the training, and as well as provide anonymous written feedback on the training. This written feedback will be in the form of the following questions:

- What part of the training did you enjoy the most?
- What part of the training did you find the most helpful?
- Which part of the training do you think we can improve?
- Do you feel the training was enough for you to implement Amagugu Asakhula with caregivers?
- How do you feel about implementing Amagugu Asakhula with caregivers?

Since CHWs perceptions of the effectiveness and sufficiency of the training may change after implementing the intervention, they will be asked about their perceptions of the training in the post-implementation focus groups (see Focus group guide).

Intervention implementation – Objectives 2 and 3

The intervention will entail 6 one-on-one sessions, plus an initial visit to complete consent forms and the questionnaire, and a group session at the end of the intervention to re-administer the questionnaire, and to celebrate the end of the intervention. The CHWs will be provided all the materials required to implement the intervention with their identified caregivers.

CHWs implementing the intervention will be required to document their experiences and observations from each session in a fieldwork diary, using the following template:

Session number:

Name of CHW: Study ID of caregiver:

Date of session: Time of session:

Which family members were present at session:

On a scale of 1 to 10, how would you rate this session (1=worst, 10=best)?

What parts of the session went well?

Why do you think these went well?

What parts of the session did not go so well?

Why do you think these did not go so well?

This fieldwork diary will help to determine the feasibility of the intervention in terms of the retention of caregivers in the intervention, and caregivers' adherence to intervention sessions. CHWs will also ask to photograph (with caregivers' consent) the screen time, diet and sleep diaries completed by the caregivers as part of the intervention. This will provide information on the feasibility of these intervention activities, as well as intervention fidelity.

Qualitative methods – Objectives 3, 4 and 5

A sub-sample of the caregivers will be invited to be participate in an individual interview (n=6) or focus group (2 groups, n=16). Two focus groups (n=16) will also be conducted with the CHWs. These focus groups and interviews will take place once implementation of the intervention is complete, and will provide insight into the factors influencing intervention feasibility and fidelity, as well as CHW and caregivers' experiences of the intervention.

The purpose of the interviews with key informants (n=5) will be to obtain their perspective on the feasibility and acceptability of the intervention, as well as the appropriateness and potential adoption, coverage and sustainability of integrating the intervention into CHWs' scope of work. Key informants would also be able to give insight into the implementation cost of integrating the intervention into existing community-based health services.

All interviews and focus groups will be conducted in English, and will take place at a time and place convenient for the participants. Refreshments will be provided at the focus groups. All interviews and focus groups will be approximately an hour in length; they will be audio recorded, with permission from participants, and transcribed verbatim for later analysis.

At baseline only, there will also be a questionnaire for caregivers enquiring about the following socio-demographic information relating to the caregiver:

relationship to the child, presence of the child's father, marital status, education level, home language, and number of children in the household. These questions will not be included in the post-implementation testing, given that it is unlikely that they will have changed substantially over 2-3 months.

Data synthesis and analysis

A deductive approach (36) will be taken for the analysis of focus group data. Information addressing objectives 2 – 5 of the study will be extracted. Other process evaluation data (including that pertaining to training) will also be collated in order to address these objectives.

Ethical considerations

This study adheres to the guidelines described in the Declaration of Helsinki Ethical Principles for Medical Research Involving Human Subjects (Fortaleza, Brazil, 2013), the International Conference on Harmonisation and the European Good Clinical Practice (GCP) guidelines, the South African GCP guidelines, and the laws of South Africa. Participants will not be included unless they have signed a consent form, after the investigator has provided substantial verbal and written explanation of the study. Participants will be informed that their participation in the study is entirely voluntary and that they have the right to withdraw from the study at any time without stating a reason. All the information collected during the study will be stored in a computer database in a secure facility. It will be kept confidential, will only be available to the members of the research team, and will be used for publication in peer-reviewed scientific journals and submitted for presentation at scientific conferences. The participants' anonymity will be ensured should the data be published. Data will be destroyed after a period of 5 years.

All information sheets and consent forms will be available in English, and translated into local languages if requested by participants. Participants will be provided with the contact details of the Principal Investigator and PhD student, and will be able to ask any questions they have about the study. If necessary, they will be contacted by someone who speaks their home language to address any further questions.

All consent forms will outline the research being done (including the purpose and benefits of the research), and explain that they (or their child/grandchild) may withdraw from the study at any time, without prejudice. Furthermore, it will be highlighted that the research results will be treated anonymously, without revealing the identity of participants or the health facility or community-based organisation to which they are affiliated.

There are no obvious physical risks associated with participation in this study. However, this intervention involves CHWs interacting with caregivers around cultural aspects of childcare. There is a slight risk that caregivers may not respond positively to these interactions, and CHWs will need to manage these

sensitive situations. If participants feel any distress as a result of their participation, the research team will refer them to a trained counsellor at the [redacted] Community Health Centre, or at the Chris Hani Baragwanath Hospital, where the DPHRU is based. Children who participate in this study who require referral for any developmental delay or problematic health behaviours, will be referred to the relevant health professional at the [redacted] Community Health Centre, or at the Chris Hani Baragwanath Hospital, where the DPHRU is based.

The direct benefit of this study is the information and insight contributed towards the development of the Amagugu Asakhula intervention. This intervention ultimately has the potential to benefit caregivers and preschool children. There are further benefits for CHWs, caregivers and children who participate in the study.

CHWs who take part in this study will have the opportunity to learn something about how to help caregivers promote the health and development of their young children. CHWs selected for the training will have the opportunity to learn how to implement the intervention, and will receive a certificate to state that they completed the training for the pilot study of Amagugu Asakhula. CHWs selected to implement the programme will have the opportunity to implement the intervention, and therefore develop their skills in the area of early childhood development. CHWs involved in implementing the intervention will receive a certificate stating this. They may also be in a position to implement the intervention in the future, if the opportunity arises.

Caregivers who take part in this study will have the opportunity to learn something about how to promote the health and development of her preschool child/grandchild, and will hopefully feel closer to her child (or children, if there is more than 1 preschool child in the home) after participating in the intervention. Caregivers participating in the study will also receive some activities to do with her child that she can keep after the study is finished.

The caregivers' children will benefit from these activities, and will also enjoy and benefit from the programme activities that involve them. The reason that children may benefit from these activities is because they will have the opportunity for positive interactions with their caregiver, and to receive additional positive attention from their caregiver. These interactions will hopefully increase the child's sense of affection and love from their caregiver. Furthermore, if caregivers take on a more engaged role in their child's development as a result of this intervention, the child's performance in certain developmental domains may improve.

Time line

August – December 2018	Obtain ethical approval
March 2019	Train community health workers and fieldworker
	Collect baseline data
April – May 2019	Implement intervention
May 2019	Conduct focus groups and interviews
March - May 2019	Collate process evaluation data
May - October 2019	Write up full study findings
November - December 2019	Dissemination and feedback event for community and stakeholders

Budget

Item	Cost	Units	Total
Fieldwork assistant (2 months)	R3000	2	R6 000
Airtime – fieldwork assistant	R500	2	R1 000
Programme materials	R100	60	R6 000
Training materials	R100	60	R6 000
Training refreshments	R100	60	R6 000
Focus group refreshments	R250	4	R1 000
Interview and focus group transcription	R900	15	R13 500
Dissemination event	R5000	1	R5 000
Unanticipated costs, e.g. stationary, transport costs	R5000	1	R5 000
TOTAL			R49 500

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CHW information sheet

Amagugu Asakhula Pilot Study

Dear community health worker,

Who are we, and why are we doing this study?

I am Dr Catherine Draper, a researcher with Wits University. Our team has developed a programme to help promote the health and development of preschool children. The programme is called ‘Amagugu Asakhula’, which means ‘treasures that are still growing’ in Zulu and Xhosa. The reason for this name is that young children are precious treasures, and they need as much help as possible to grow and develop, so that they can do well in life. This programme includes things such as cognitive development (which is to do with the brain), as well health behaviours, like physical activity, screen time, diet, and sleep. The programme aims to help caregivers connect more with their preschool child so that they can become closer.

The Amagugu Asakhula programme is designed to be delivered by community health workers, like you, to caregivers (mothers, grannies, aunties etc.) of young children, in their homes. We would like to invite you to be part of a pilot study. The aim of this pilot study is to see how this programme works, and if there are any things that we can change or improve about the programme.

How are you involved?

To be part of this study, you will need to attend two half-day training sessions so that you can deliver the programme. At the end of the training, you will be asked to provide some written and verbal feedback on the training (at the end of the training). With your permission, this feedback will be audio recorded, and we will also take some notes during the training. The written feedback that you give us on the training will remain anonymous.

You will then be asked to implement the programme with 2-3 caregivers of preschool children from families whom you already see as part of your work. You will conduct 6 sessions with each caregiver (±1 session per week), one-on-one in their home, and one group session at the end. Each session will be ±1 hour.

We would like to stay in touch with you to find out how things are going, and will take notes from these conversations. We will also ask you to keep a fieldwork diary to keep track of how the programme is going, and if things are going according to plan. At the end, we would like you to be part of a group discussion with other community health workers to get your feedback on how the programme went. With your permission, this interview will be audio recorded as well.

When and where will the study take place?

The workshop and the training will take place at a community venue in [community], and the sessions with the caregivers will take place at the caregivers' homes.

How will we protect your identity?

In order to understand how well the Amagugu Asakhula programme works, we will use the information we get from recording the various sessions and interviews with you, as well as the notes you take if you implement the programme, and our notes. However, when we put all this information together in our report, we will not use your name, any of the caregiver or children's names, when we report on the results of our study, so you will remain anonymous. We understand that participating in this study is your choice. If you feel upset as a result of participating in this study, we can refer you to a counsellor at [redacted] Community Health Centre, or at Chris Hani Baragwanath Hospital.

What are the benefits of this study?

If you take part in this study, you will have the opportunity to learn something about how to help caregivers promote the health and development of their young children. You will have the opportunity to learn how to implement the Amagugu Asakhula programme, and will receive a certificate to state that you completed the training for the pilot study of the Amagugu Asakhula programme. You will also have the opportunity to put the programme into practice, and therefore develop your skills as a community health worker. This is something valuable that you could put on your CV. Apart from the benefits to you as a community health worker, this study will help us to make sure that the Amagugu Asakhula programme can be the best programme possible. If the programme works well, then it ultimately has the potential to benefit caregivers and preschool children.

Any questions?

If you have any questions about the study, please contact Dr Catherine Draper at [redacted].

If you have any questions related to the ethics of this study please contact: Prof Penny, Chairperson of the University of the Witwatersrand, Human Research Ethics Committee (HREC), which is an independent committee established to help protect the rights of research participants at [redacted].

Thank you for your time and attention

Kind regards

Dr Catherine Draper

Caregiver information sheet

Health behaviours and development of preschool children

Dear parent / legal guardian,

Who are we, and why are we doing this study?

I am Dr Catherine Draper, a researcher with Wits University. Our team has developed a programme to help promote the health and development of preschool children. The programme is called ‘Amagugu Asakhula’, which means ‘treasures that are still growing’ in Zulu and Xhosa. The reason for this name is that young children are precious treasures, and they need as much help as possible to grow and develop, so that they can do well in life. This programme includes things such as cognitive development (which is to do with the brain), as well health behaviours, like physical activity, screen time, diet, and sleep. The programme aims to help caregivers connect more with their preschool child so that they can become closer.

The Amagugu Asakhula programme is designed to be delivered by community health workers, with caregivers like you in your home. We would like to invite you to be part of a pilot study. The aim of this pilot study is to see how this programme works, and if there are any things that we can change or improve about the programme.

How are you involved?

If you and your child would like to be part of this study, it would involve having 6 sessions with a community health worker, who you may already know, and who has been trained to deliver the Amagugu Asakhula programme with caregivers. These sessions would take place in your home, and the community health worker will arrange convenient times with you for these sessions.

You will also have a session before you start with the community health worker that will involve answering some questions about you and your family. This includes some basic information, like your date of birth, and your relationship to the child (e.g. mother, grandmother etc.). We also have a few questions about things your child has at home and what they like to do, as well as how you feel as a caregiver. The rest of the sessions would be a combination of sessions on your own with the community health worker, and occasionally bringing in other family members for the session.

In order to help us learn as much as possible about how the Amagugu Asakhula programme works, we would like to also have a look at some things in your home (e.g. toys your child has, if you have a TV). And the community health worker will also ask if she can take some photographs of some of the activities you will do as part of the programme. You can let the community health worker know if you are not happy for her to do this.

Are there any risks related to participating in this study?

There are no physical risks associated with participating in this study. If you feel upset as a result of participating in this study, we can refer you to a counsellor at [redacted] Community Health Centre, or at Chris Hani Baragwanath Hospital.

How will we protect you and your child during the study?

We will not use your name, your child's name, or the name of your child's preschool when we report on the results of our study, so you and your child will remain anonymous. We understand that participating in this study is your choice.

As the research team, we may not be able to keep confidential, information about known or reasonably suspected incidents of sexual abuse of a child. If we are given such information, we may report it to the authorities such as child welfare or the police.

What are the benefits of this study?

If you take part in this study, you will have the opportunity to learn something about how to promote the health and development of your preschool child, and we will provide you with feedback at the end of the study. And we hope that by the end of the study you will feel closer to your child. Your child will benefit from this, and will also enjoy and benefit from the programme activities that involve them. As part of the study, you will also receive some activities to do with your child that you can keep after the study is finished.

Apart from the benefits to you as a caregiver, this study will help us to make sure that the Amagugu Asakhula programme can be the best programme possible. If the programme works well, then it ultimately has the potential to benefit other caregivers and their preschool children.

Any questions?

If you have any questions about the study, please contact Dr Catherine Draper at [redacted].

If you have any questions related to the ethics of this study please contact: Prof Penny, Chairperson of the University of the Witwatersrand, Human Research Ethics Committee (HREC), which is an independent committee established to help protect the rights of research participants at [redacted].

Thank you for your time and attention

Kind regards

Dr Catherine Draper

Key informant information sheet

Amagugu Asakhula Pilot Study

Dear key informant,

Who are we, and why are we doing this study?

I am Dr Catherine Draper, a researcher with Wits University. Our team has developed a programme to help promote the health and development of preschool children. The programme is called ‘Amagugu Asakhula’, which means ‘treasures that are still growing’ in Zulu and Xhosa. The reason for this name is that young children are precious treasures, and they need as much help as possible to grow and develop, so that they can do well in life. This programme includes things such as cognitive development, as well health behaviours, like physical activity, screen time, diet, and sleep. The programme aims to help caregivers connect more with their preschool child.

The Amagugu Asakhula programme is designed to be delivered by community health workers to caregivers (mothers, grannies, aunties etc.) of young children, in their homes. We would like to invite you to be part of a pilot study. The aim of this pilot study is to see how this programme works, and if there are any things that we can change or improve about the programme.

How are you involved?

To be part of this study, you will need to participate in an interview to find out what you think of the programme, how you think it has worked, and what you think we could do to implement the progrmme in the future. With your permission, this interview will be audio recorded, and will take place at a time and location that is convenient for you.

How will we protect your identity?

We will not use your name, any of the caregiver or children’s names, when we report on the results of our study, so you will remain anonymous. We understand that participating in this study is your choice. If you feel upset as a result of participating in this study, we can refer you to a counsellor at [redacted] Community Health Centre, or at Chris Hani Baragwanath Hospital.

What are the benefits of this study?

If you take part in this study, you will have the opportunity to learn something about how to help caregivers promote the health and development of their young children. This study will help us to make sure that the Amagugu Asakhula programme can be the best programme possible. If the programme works well, then it ultimately has the potential to benefit caregivers and preschool children.

Any questions?

If you have any questions about the study, please contact Dr Catherine Draper at [redacted]. If you have any questions related to the ethics of this study please contact: Prof Penny, Chairperson of the University of the Witwatersrand, Human Research Ethics Committee (HREC), which is an independent committee established to help protect the rights of research participants at [redacted].

Thank you for your time and attention

Kind regards

Dr Catherine Draper

Consent form for CHW participation in the study

Amagugu Asakhula Pilot Study

I agree to be a participant in this study. The goals and methods of the study are clear to me. I understand that the study will involve completing questionnaires and being involved in a focus group and other group discussions. All the details and purposes of this study have been explained to me. I understand that my data will not be anonymous to the researchers involved. I understand that I have the right to refuse to participate in the study.

I agree for my participation in the study on condition that:

1. I can withdraw from the study at any time voluntarily and that no adverse consequences will follow on withdrawal from the study.

2. I have the right not to answer any or all questions posed in the questionnaires and focus group and not to participate in any or all of the procedures / assessments.

3. The University of the Witwatersrand Human Ethics committee has approved the study protocol and procedures.

4. All results will be treated with the strictest confidentiality.

5. Only group results, and not my individual results, will be published in scientific journals and in the media.

6. The study scientific team is committed to treating participants with respect and privacy through focus groups conducted in private and follow-up counselling available on request.

Name: _____

Signature / mark / thumbprint: _____

Witness (if mark / thumbprint): _____

Date: _____

Name of research assistant: _____

Signature of research assistant: _____

Date: _____

Consent form for CHW audio recording

I have read and understood the project information sheet, and I understand that it is up to me whether or not the focus group is audio recorded. I understand that if I do not wish to be recorded, it will not in any way affect how the focus group facilitator treats me. I understand that if the focus group is recorded, the tape will be destroyed five years after the interview. I understand that I can ask the person facilitating the focus group to stop recording, and to stop the focus group completely at any time. I understand that the information that I give will be treated in the strictest of confidence, and that my name will not be used when the results are typed up.

□ Yes, I give permission for the focus group to be audio recorded.

□ No, I do not give permission for the focus group to be audio recorded.

Name: _____

Signature / mark / thumbprint: _____

Witness (if mark / thumbprint): _____

Date: _____

Name of research assistant: _____

Signature of research assistant: _____

Date: _____

Consent form for caregivers' participation in the study

Amagugu Asakhula Pilot Study

I agree to be a participant in this study. The goals and methods of the study are clear to me. I understand that the study will involve completing questionnaires, being interviewed, and possibly being involved in a focus group. All the details and purposes of this study have been explained to me. I understand that my data will not be anonymous to the researchers involved. I understand that I have the right to refuse to participate in the study.

I agree for my participation in the study on condition that:

1. I can withdraw from the study at any time voluntarily and that no adverse consequences will follow on withdrawal from the study.

2. I have the right not to answer any or all questions posed in the questionnaires, interview and focus group and not to participate in any or all of the procedures / assessments.

3. The University of the Witwatersrand Human Ethics committee has approved the study protocol and procedures.

4. All results will be treated with the strictest confidentiality.

5. Only group results, and not my individual results, will be published in scientific journals and in the media.

6. The study scientific team is committed to treating participants with respect and privacy through interviews and focus groups conducted in private and follow-up counselling available on request.

Name of caregiver: _____

Signature / mark / thumbprint of caregiver: _____

Witness (if mark / thumbprint): _____

Date: _____

Name of research assistant: _____

Signature of research assistant: _____

Date: _____

Consent form for caregiver audio recording

I have read and understood the project information sheet, and I understand that it is up to me whether or not the interview / focus group is audio recorded. I understand that if I do not wish to be recorded, it will not in any way affect how the interviewer / focus group facilitator treats me. I understand that if the interview / focus group is recorded, the tape will be destroyed five years after the interview. I understand that I can ask the person interviewing me / facilitating the focus group to stop recording, and to stop the interview / focus group completely at any time. I understand that the information that I give will be treated in the strictest of confidence, and that my name will not be used when the results are typed up.

□ Yes, I give permission for the interview / focus group to be audio recorded.

□ No, I do not give permission for the interview / focus group to be audio recorded.

Name of caregiver: _____

Signature / mark / thumbprint of caregiver:

_____

Witness (if mark / thumbprint): _____

Date: _____

Name of research assistant:

_____

Signature of research assistant: _____

Date: _____

Consent form for key informants' participation in the study

Amagugu Asakhula Pilot Study

I agree to be a participant in this study. The goals and methods of the study are clear to me. I understand that the study will involve being interviewed. All the details and purposes of this study have been explained to me. I understand that my data will not be anonymous to the researchers involved. I understand that I have the right to refuse to participate in the study.

I agree for my participation in the study on condition that:

1. I can withdraw from the study at any time voluntarily and that no adverse consequences will follow on withdrawal from the study.

2. I have the right not to answer any or all questions posed in the interview.

3. The University of the Witwatersrand Human Ethics committee has approved the study protocol and procedures.

4. All results will be treated with the strictest confidentiality.

5. Only group results, and not my individual results, will be published in scientific journals and in the media.

6. The study scientific team is committed to treating participants with respect and privacy through interviews conducted in private and follow-up counselling available on request.

Name: _____

Signature / mark / thumbprint: _____

Witness (if mark / thumbprint): _____

Date: _____

Name of research assistant: _____

Signature of research assistant: _____

Date: _____

Consent form for key informants' audio recording

I have read and understood the project information sheet, and I understand that it is up to me whether or not the interview is audio recorded. I understand that if I do not wish to be recorded, it will not in any way affect how the interviewer treats me. I understand that if the interview is recorded, the tape will be destroyed five years after the interview. I understand that I can ask the person interviewing me to stop recording, and to stop the interview completely at any time. I understand that the information that I give will be treated in the strictest of confidence, and that my name will not be used when the results are typed up.

□ Yes, I give permission for the interview to be audio recorded.

□ No, I do not give permission for the interview to be audio recorded.

Name of: _____

Signature / mark / thumbprint: _____

Witness (if mark / thumbprint): _____

Date: _____

Name of research assistant: _____

Signature of research assistant: _____

Date: _____

Amagugu Asakhula caregiver questionnaire

Today's date:	Caregiver ID:
Preschool child's ID:	Caregiver's date of birth:
Preschool child's date of birth:	Preschool child gender:

1. What relationship are you to the preschool child in this study? (tick ONE)

O	Mother	O	Grandmother
O	Aunt	O	Other (please state):

2. What is your current marital status? (tick ONE)

O	Married	O	Living together	O	Divorced
O	Separated	O	Widowed	O	Never married

3. What is your highest level of education? (tick ONE)

O	Grade 6 / Standard 4 and below	O	Grade 7-9 / Standard 5-7
O	Grade 10-11 / Standard 8-9	O	Grade 12 / Standard 10 / Matric
O	Tertiary diploma / Certificate	O	University degree

4. What is your home language? (tick ONE)

O	English	O	isiXhosa	O	Zulu	O	Tsonga/Shangaan
O	Afrikaans	O	Sotho	O	Pedi	O	Tswana
O	Other (please state):						

5. Please use the table below to tell us about the other children in your household:

Other children	Child's date of birth	Boy or girl?
1		O Boy O Girl
2		O Boy O Girl
3		O Boy O Girl
4		O Boy O Girl
5		O Boy O Girl
6		O Boy O Girl

6. What time does your child usually go to sleep at night, and wake up in the morning?

		School nights (Sun-Thurs)	Weekend (Fri & Sat)
Time to sleep at night			
		School mornings (Mon-Fri)	Weekend (Sat & Sun)
Time to wake up in the morning			

7. How often is there a bedtime routine for this child (e.g., bath time, saying goodnight, storytelling, etc)

O	Never	O	Less than once a week	O	Once a week
O	Most days	O	Every day	O	Don't know

8. During the past week, on how many days did you or other household members read to this child?

0	1	2	3	4	5	6	7

9. During the past week, on how many days did your child have sweets and/or chips?

0	1	2	3	4	5	6	7

10. During the past week, on how many days did your child have fizzy drinks, juice and/or cooldrinks?

0	1	2	3	4	5	6	7

11. During the past week, how many fruits and vegetables did your child usually have every day?

Fruits:		Vegetables:	

12. How much time does your child spend on screens in a typical 24-hour day?

This includes any electronic screen device such as a smart phone, tablet, video game, or watch television or movies, videos on the internet while they were sitting or lying down.

Hours:		Minutes:	

Observation

(Done by CHW / fieldworker, with caregiver's assistance)

Briefly describe the sleeping situation (e.g. All 4 family members sleep in 1 bed in the bedroom OR The caregiver and her husband sleep in the bedroom, and the 3 children sleep in the lounge on 2 beds).

Tick in the boxes next to the toys or equipment you observe in caregiver's home, and write down the amount/number that you observe (e.g. 2 TVs).

Children's books		Puzzles	
Colouring books/pages		Crayons/koki pens/pencil crayons	
Lego/Duplo/other building blocks		Board/card games	
Other toys/games for quiet play:		Other toys/games for quiet play:	
TV		Video/DVD player	
Digital tablet, e.g. iPad		Smart phone	
Video games, e.g. Playstation, X-Box		Satellite dish (for TV)	
Computer		Internet access	

Thank you for completing this questionnaire!

Focus group guide

Purpose of the focus group discussion:

The purpose of this focus group discussion is to hear what those who were involved in the Amagugu Asakhula intervention think about intervention – whether it was feasible and acceptable, and why. This includes the community health workers who delivered the intervention, as well as the caregivers were beneficiaries of the intervention.

Date: _____

Starting Time: _____ Ending Time: _____

Please fill out and attach the participant register.

Name of Facilitator:
_____

Name of Note Taker:
_____

Name of Observer:
_____

- DIRECTIONS: The qualitative focus group begins with open-ended questions that point to starting a dialogue. The interviewer should encourage the study participants to do most of the talking but should use the questions listed here as a guide. After you ask each question, wait for the study participants to respond and go on to the next question when you are satisfied with the answer. If it seems as though the study participants did not understand a question, then repeat it or ask it in another way. If the study participants go on talking without much prompting, then let them guide the conversation. Bold indicates major questions and probes are in parentheses. Mentally check off these questions as they are asked so you do not repeat a question if it has been discussed previously.
- Remember to audio record each focus group. Use a backup recorder to prevent technological problems.

Note to the Facilitator:

Introduce yourself at the beginning of the session, explain who you work with, why you are here, and introduce everyone on the team who is with you observing, taking notes, or helping in anyway.

Introduction: Hello, my name is _____. I am working with researchers at the Developmental Pathways to Health Research Unit (DPHRU) on the Amagugu Asakhula intervention. We are interested in hearing what you think about Amagugu Asakhula. This should not take more than about one hour. Do not worry. There are NO right or wrong answers. Your ideas and answers to our questions are very important to us. You are free to join this group discussion, and free to answer or not to answer the questions we are going to ask. You should feel very free to express whatever you are thinking. Your responses are confidential and anonymous. Please feel free to ask for clarification if you do not understand a question. Do you agree to join this group?

(Introduce the others on the team) Do we have your permission to continue?

Note to Note-Taker: Try to capture the major ideas and something about the majority of participants agreeing or not agreeing. Always note the specific question that the facilitator and participants are referring to. If the facilitator asks a question that is not on the guide, note the question as it is asked and try to capture the answers. If you need more space, use the extra paper and note the name of the group and the corresponding number of the question.

Note to Observer: You can take notes about the answers also, but focus on the dynamics of the group and how people are reacting to the questions and to the discussion. If you can, make a note about who are the most active participants so that we can follow-up with them.

Guide questions:

- Overall, what did you think of Amagugu Asakhula?
- How did you feel being part of this programme?
- What did you feel you learnt about the concepts that were covered in the programme, e.g. cognitive development, physical activity, caregiver's role in promoting their child's health and development.
- Did these concepts make sense to you?
- Did you feel these concepts were relevant for caregivers of preschool children in your community?
- How did you think the programme worked in terms of all the practical things, such as:
    - Scheduling a regular session, once per week
    - Having home-based sessions
    - The length of sessions
    - The number of sessions
    - Anything else?
- Which the activities and materials did you like, or think went well? Prompt:
    - Tree picture
    - Bean growing kit
    - Family map and materials
    - Flashcards
    - Screen time, sleep and food diaries
    - Blackboard for star chart
- Do you think that any of the activities did not go well / materials did not work?
- Were there any challenges that you experienced with the programme?
- Only community health workers: How did you feel about the training you received? Was there any additional support that you required?

Feedback on the Amagugu Asakhula intervention

Key informant interview guide

Purpose of the interviews:

The purpose of these interviews is to hear what key informants have to say about the feasibility and acceptability of the intervention, as well as the appropriateness and potential adoption, coverage and sustainability of integrating the intervention into community health workers' scope of work.

Date: _____

Starting Time: _____ Ending Time: _____

Name of Interviewer:

_____

Name of Interpreter (if present):

_____

- DIRECTIONS: The qualitative interview consists of open-ended questions that allow caregivers to describe their views and experiences in their own words. The interviewer should encourage the study participants to do most of the talking but should use the questions listed here as a guide. After you ask each question, wait for the study participants to respond and go on to the next question when you are satisfied with the answer. If it seems as though the study participants did not understand a question, then repeat it or ask it in another way. If the study participants go on talking without much prompting, then let them guide the conversation. Mentally check off these questions as they are asked so you do not repeat a question if it has been discussed previously.
- Remember to audio record each interview. Use a backup recorder to prevent technological problems.

Note to the Interviewer:

Introduce yourself at the beginning of the session, explain who you work with, why you are here, and introduce everyone on the team who is with you observing, interpreting, taking notes, or helping in anyway.

Introduction: Hello, my name is _____. I am working with researchers at the Developmental Pathways to Health Research Unit (DPHRU) on the Amagugu Asakhula intervention. We are interested in hearing what you think about Amagugu Asakhula. This should not take more than about one hour. Do not worry. There are NO right or wrong answers. Your ideas and answers to our questions are very important to us. You are free to answer or not to answer the questions we are going to ask. You should feel very free to express whatever you are thinking. Your responses are confidential and anonymous. Please feel free to ask for clarification if you do not understand a question. Do you agree to participate in this interview? Do we have your permission to continue?

Guide questions:

- What are your impressions of the feasibility of the Amagugu Asakhula intervention?
    - How do you think it works with community health workers?
    - How do you think they were able to integrate it into their work with families?
- What are your impressions of the acceptability of the intervention?
    - How acceptable do you think it was to community health workers?
    - How acceptable do you think it was to families?
- How scalable do you think the intervention is?
- What do you think about the potential adoption of this intervention into usual care of community health workers?
- What do you think about the reach or coverage of this intervention, if it's delivered by community health workers?
    - How do you think this would differ in different communities?
- Do you think the intervention could be taken up by government, or do you think this should be driven by the NGO sector?
- Do you have any other feedback or suggestions about the intervention?

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