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Influence of the Mother-Child Relationship on Nutrition and Physical Activity in  
Soweto, South Africa

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Influence of the Mother-Child Relationship on Nutrition and Physical Activity in  
Soweto, South Africa

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2013

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## Abstract

Influence of the Mother-Child Relationship on Nutrition and Physical Activity in  
Soweto, South Africa  
By Marcie Kirschner

**Background:** Childhood obesity is the leading nutritional issue for South African children. Overweight and obesity have a strong intergenerational link in families. However, no studies in South Africa have examined how mothers make health decisions for themselves and their children, which is pivotal because establishing healthy behaviors and attitudes in children has lifelong implications.

**Objective:** This study examined what individual, relationship, community, and societal-level factors affect South African mother's nutrition and physical activity decisions for her self and her child, and investigated where mothers received health information. Differences were compared between mothers whose child had a normal BMI-for-age compared to a child with an at-risk of being overweight and overweight BMI-for-age.

**Methods:** This qualitative study utilized individual interviews (n=22) with mothers who were participants of the Birth to 20 research study. The interview guide investigated a mother's habits and attitudes about nutrition and physical activity at the time of the interview, habits and attitudes about nutrition and physical activity over her lifetime (including while raising her child), and perceptions about nutrition and physical activity. Thematic analysis was used to determine findings that emerged from the data. Findings were compared in groups by the child's weight status.

**Results:** Influential information sources for mothers included health-focused professionals and classes, family members, people outside of the family, and media sources. Participants felt healthy eating had beneficial physiological effects on the body and exercise helped a person lose weight and get in shape. Doctors and health personnel were most influential to women whose children had a normal BMI-for-age whereas women with children who had an at-risk or overweight BMI-for-age found their mothers to be most influential. Mothers who had a child at-risk or overweight BMI-for-age breastfed less frequently and indicated less self-responsibility for health than mothers whose child had a normal BMI-for-age,

**Discussion:** By understanding the context in which Soweto's mothers make health decisions that impact herself and her children, more effective interventions can be made to target them. There is a necessity for interventions that can both increase a mother's self-efficacy regarding nutrition and exercise, while also targeting the family and community.

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## Table of Contents

<b>Distribution Agreement</b> .....	<b>i</b>
<b>Abstract</b> .....	<b>iv</b>
<b>Acknowledgements</b> .....	<b>v</b>
<b>I. Introduction</b> .....	<b>1</b>
<b>II. Review of the Literature</b> .....	<b>5</b>
<b>III. Methodology</b> .....	<b>17</b>
<b>IV. Results</b> .....	<b>27</b>
Sample Characteristics.....	27
Information Sources.....	29
Factors that Affect Decision-Making by Theory Level.....	33
Unique Qualities of Group 1.....	43
Unique Qualities of Group 2.....	45
Unique Qualities of Group 3.....	46
<b>V. Discussion</b> .....	<b>49</b>
<b>VI. References</b> .....	<b>55</b>
<b>VII. Appendices</b> .....	<b>62</b>
Appendix A: Table 1. Progression of Eligibility Criteria.....	62
Appendix B: Demographic Questionnaire.....	63
Appendix C: Interview Guide.....	66
Appendix D: Code Tree and Codebook used for Analysis.....	71
Appendix E: Table 2. Continuous Characteristics of Interviewed Members of the Birth to 20 Cohort as a whole and by Group.....	75
Appendix F: Table 3. Categorical Characteristics of Interviewed Members of Birth to 20 Cohort as a whole and by Group.....	76
Appendix G: Figure 1. Thematic Mapping of Factors that Affect Mother's Decision-Making.....	77

## I. Introduction

### *Problem and Justification*

Obesity is a growing issue globally and has been associated with non-communicable chronic diseases including hypertension, coronary heart disease, type 2 diabetes, and certain types of cancer (World Health Organization, 2002, 2011). However, obesity is not only a health issue for adults. Obesity in children, most often determined by a child's BMI-for-age, is a growing global health concern that is associated with many negative health outcomes (Karnik & Kanekar, 2012). For instance, childhood obesity has been associated with metabolic abnormalities, increased cholesterol, triglycerides, and glucose levels, cardiovascular complications, type 1 and type 2 diabetes, high blood pressure, and impaired social and economic success in adulthood (Kelishadi, 2007; Koplan, Liverman, & Kraak, 2005; J. J. Reilly et al., 2003). Additionally, childhood obesity has been strongly associated with obesity in adulthood (August et al., 2008; Lloyd, Langley-Evans, & McMullen, 2012; J. J. Reilly et al., 2003; Victora et al., 2008). In 2011, there were an estimated 43 million children under 5 years old (7% prevalence) in the world who were overweight (De Onis, Blössner, & Borghi, 2010). This is a 54% increase since 1990 when 28 million children in the world were considered overweight. This trend is expected to continue with an estimated 64 million children (9.9% prevalence) that will be overweight in the world by 2025 (Black et al., 2013).

In low- and middle-income countries (LMICs) such as South Africa, obesity is an increasingly important health issue, especially in children (World Health



Organization, 2002). Studies have shown that most overweight children under 5 years old, an estimated 32 million children in 2011, live in LMICs (Black et al., 2013). South Africa also has been experiencing a rapid nutrition transition, which has resulted in a shift to an energy-dense diet due to urbanization, low levels of physical activity, and a sedentary lifestyle (Joubert et al., 2007; Nelia P Steyn & Mchiza, 2014; Nelia P Steyn, Nel, Parker, Ayah, & Mbithe, 2012; Vorster, Venter, Wissing, & Margetts, 2005). This nutrition transition and the associated changes in behavior have been linked to the observed increase in overweight and obese adults and increased childhood obesity (Kahn, 2011; Popkin, Adair, & Ng, 2012; Schneider, Bradshaw, Steyn, Norman, & Laubscher, 2009). Childhood overweight/obesity is considered the major nutritional problem for South African children under 5 years old (Bosman, Herselman, Kruger, & Labadarios, 2011). This is significant because obesity is now considered a greater problem in South African children than malnutrition. Recent studies have shown a ranging prevalence of being either overweight or obese in South African children and adolescents between 7% and 13% with a significantly higher percentage of girls being either overweight or obese than boys (Black et al., 2013; Bosman et al., 2011; Jinabhai et al., 2007; Kimani-Murage et al., 2010; Labadarios, 2007; Shisana et al., 2013). Additionally the rates of being either overweight or obese in childhood are higher in urban areas than in rural areas (Black et al., 2013).

Many studies have examined the long-term health effects of obesity, especially trends of intergenerational obesity. For instance, maternal obesity can cause complications for both the mother and the fetus during pregnancy, delivery,

and postpartum periods (Tsoi, Shaikh, Robinson, & Teoh, 2010; Van Lieshout, Taylor, & Boyle, 2011). Furthermore, obese pregnant women are more likely to develop pre-eclampsia, gestational diabetes, and thromboembolism than pregnant women with a normal BMI (Tsoi et al., 2010). Being either overweight or obese during pregnancy increases the risk of childhood obesity, which continues into adolescence and adulthood (Catalano, 2003; McGuire, Dyson, & Renfrew, 2010). In South Africa, it was observed that children of obese mothers had higher BMI than non-obese mothers (Nel, Kruger, & Maunier, 2011). However, no studies in Africa have investigated how mothers maintain a normal BMI in this obesogenic environment and what influences their decision-making process regarding nutrition and physical activity. Previous research has indicated the need for this sort of research in sub-Saharan Africa (Davison & Birch, 2001; Kimani-Murage, Pettifor, Tollman, Klipstein-Grobusch, & Norris, 2011).

### *Theoretical Framework*

The Ecological Systems Theory, a sub-set of the Social Ecological Model, describes how an individual's outcomes are developed interactively within a certain context was the guiding theoretical framework for this qualitative study (Bronfenbrenner, 1986). This theory claims that the development of an individual's characteristics can only be explained with the consideration of the specific context that a person lives in (Bronfenbrenner, 1986). In 2001, Davison and Birch adapted this model to explain the factors that play into a child's weight status at the individual, familial, and community/societal levels (Davison & Birch, 2001). Specific

factors that influence the child's weight status include: personal factors such as age, gender, level of physical activity, and dietary intake; parents' and family characteristics such as child feeding practices, parent weight status, parent food preferences, parent dietary intake, parent activity patterns, and parent encouragement of child's activity; and community and societal characteristics such as accessibility of recreational facilities, accessibility of convenience foods and fast food restaurants, school physical education program, and neighborhood safety (Davison & Birch, 2001). These factors can be ascertained through interviewing a child's mother.

### *Study Objectives*

In view of the information presented here, we aimed to examine the individual, relationship, community, and societal-level factors that affect a mother's nutrition and physical activity decisions that affect both her and her child. To do this, we first determined where these mothers received health information and which source was most influential to them. Lastly, we investigated what behaviors and attitudes regarding nutrition and physical activity differentiate mothers with a non-overweight or obese child compared to a child who is at-risk of being overweight, overweight, or obese.

## II. Review of the Literature

Childhood obesity is a growing concern globally and is considered the leading health condition for children in South Africa. Many facets of childhood overweight and obesity, such as defining it, treating it, and the many etiological causes of it, make childhood overweight and obesity complex conditions. However, much research points to the mother and her influence on preventing and treating overweight or obesity in her child early. Research also indicates that a mother's own behaviors and attitudes can influence a child's weight status. Thus, this literature review first examines the basics of childhood overweight and obesity. Next, the literature review discusses how obesity presents itself in families and between generations before discussing the epidemiology of childhood obesity in a global sense and specifically in South Africa. The influences on a child's weight status and maternal decision-making are then considered based on individual, relationship, community, and society-level factors. Lastly, the nutritional context in South Africa is examined.

### *Defining and Measuring Overweight and Obesity in Children*

Obesity is defined as "a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired" (Garrow, 1988). The Centers for Disease Control and Prevention define overweight and obesity by a person's body mass index (BMI) range. A BMI is calculated by using a person's weight and height, and for most people, correlates to an amount of body fat (Centers for Disease Control and Prevention, 2012b). The terms 'overweight' and 'obesity'

refer to weights that are above what is considered healthy for a person's height with obesity being considered unhealthier and associated with worse outcomes than being overweight (Centers for Disease Control and Prevention, 2012b).

Before 2000, rates of childhood overweight and obesity were difficult to compare between different contexts because there was no universally accepted definition of childhood obesity. In 2000, Cole et al. determined values of BMI to define overweight among children using six large data sets drawn from population surveys internationally over three continents (Cole, Bellizzi, Flegal, & Dietz, 2000). Cole et al.'s reference population created a growth reference for children and adolescents aged 2-18 years that is applicable internationally. While this reference pooled data from six countries which avoids a single country being an international gold standard, the western population is over-represented and this reference population is sometimes considered inappropriate to use in non-western populations (Fu et al., 2003; J. Reilly, Dorosty, Emmett, & Team, 2000; Wickramasinghe et al., 2005; Zimmermann, Gübeli, Püntener, & Molinari, 2004).

In order to overcome the limitations of the Cole et al. reference population in an international setting the World Health Organization (WHO) developed a reference aimed to be the single internationally agreed-upon reference that carefully considered selection criteria, study design, sample size, measurements, and statistical modeling in its creation (Caroli, Wijnhoven, & Branca, 2007). In 2006, the WHO released growth standards for children aged 0 to 5 years to represent how children should and could grow when living in an appropriate environment (World Health Organization, 2006). The WHO Child Growth Standards included gender-

specific curves for weight-for-age, weight-for-height, height-for-age, and BMI-for-age (World Health Organization, 2006). These curves were clinically validated and confirmed that they properly determine the nutritional status of children up to five years old (Ebbeling, Pawlak, & Ludwig, 2002; Onyango et al., 2007). The WHO Child Growth Standard is the recommended method for assessing BMI in children worldwide from birth through five years, and has been used previously to assess the health of South African children (Bosman et al., 2011; Dinsdale, Ridler, & Ells, 2011; Kimani-Murage et al., 2010).

#### *Causes, Prevention, and Treatment of Childhood Obesity*

A child's bodyweight is regulated by many physiological mechanisms that help maintain a balance between energy intake and energy expenditure, and any factor that raises a person's energy intake or decreases his or her energy expenditure can lead to overweight or obesity in the long-term (Lustig, 2001). While there is believed to be a genetic predisposition to being overweight or obese, many genetically stable populations have been observed, thus indicating that there are other factors that contribute to childhood obesity (Ebbeling et al., 2002).

Environmental factors thought to contribute to childhood obesity include low levels of physical activity, a poor-quality diet, and familial factors (Ebbeling et al., 2002). Low levels of physical activity and a sedentary lifestyle in children may be due to a lack of physical activity in schools, a lack of a safe place to exercise, and increased television viewing and screen time (Bennett et al., 2007; LeBlanc et al., 2012; Robinson, 2001; U.S. Department of Health and Human Services, 2008;

Zimmerman & Bell, 2010). Diet content and factors that contribute to obesity are constantly changing (Ebbeling et al., 2002). However, energy dense diets, larger portion sizes, high amounts of fast food consumption and sugary drinks, and lack of breastfeeding can contribute to childhood overweight and obesity (Ebbeling et al., 2002; L Johnson, Mander, Jones, Emmett, & Jebb, 2007; Laura Johnson, Mander, Jones, Emmett, & Jebb, 2008; Larson, Story, & Nelson, 2009; McConahy, Smiciklas-Wright, Mitchell, & Picciano, 2004; Owen, Martin, Whincup, Smith, & Cook, 2005; Vartanian, Schwartz, & Brownell, 2007). Familial behaviors can also play a role in childhood obesity, such as eating out more frequently and eating more energy-dense meals and social support from parents encouraging physical activity (Ebbeling et al., 2002; Sallis, Prochaska, & Taylor, 2000; Zoumas-Morse, Rock, Sobo, & Neuhouser, 2001).

Prevention and treatment of obesity for adults and children alike involves eating less food and engaging in more physical activity (Ebbeling et al., 2002). With regard to childhood obesity, most efforts have utilized family-based or school-based approaches that focus on lifestyle interventions (physical activity and sedentary behavior), diet, behaviorally oriented treatment programs, drug interventions, and surgery (Barlow & Dietz, 1998; Doak, Visscher, Renders, & Seidell, 2006; Oude Luttikhuis et al., 2009).

It is important to identify and treat obesity in children early before health patterns are established. Older studies noted that interventions for very young children are necessary before a child's eating and physical activity habits are strongly established (Birch, 1999; Birch, Zimmerman, & Hind, 1980). More recent

research has also noted that eating and physical activity patterns persist strongly later in life indicating the need for obesity prevention and control measures in young children (Janz, Burns, & Levy, 2005; Mikkilä, Räsänen, Raitakari, Pietinen, & Viikari, 2005).

### *Health Consequences of Adult and Childhood Obesity*

Obesity has been associated with a myriad of negative health outcomes over a lifetime. Specifically, obesity has been associated with non-communicable chronic diseases including hypertension, coronary heart disease, type 2 diabetes, cancers (specifically endometrial, breast, and colon cancers), dyslipidemia, stroke, liver and gallbladder disease, sleep apnea, respiratory problems, osteoarthritis, and gynecological problems (abnormal menses and infertility (Centers for Disease Control and Prevention, 2012a; World Health Organization, 2002, 2011).

In addition to the aforementioned health consequences of obesity in adults, childhood obesity has also been associated with metabolic abnormalities, increased cholesterol, triglycerides, and glucose levels, cardiovascular complications, type 1 and type 2 diabetes, high blood pressure, and impaired social and economic success in adulthood (Kelishadi, 2007; Koplan et al., 2005; J. J. Reilly et al., 2003). Childhood obesity has also been strongly linked to becoming overweight and obese during adulthood (August et al., 2008; Curhan et al., 1996; Lloyd et al., 2012; J. J. Reilly et al., 2003; Victora et al., 2008).

### *Intergenerational Obesity*



Obesity can have a negative effect within the life cycle. For instance, overweight and obesity in women can be predictive of gestational diabetes during pregnancy, which can cause newborns to have excessive birth weight, which has been shown to be strongly associated with obesity in adulthood (August et al., 2008; Curhan et al., 1996; Institute of Medicine, 1990; Lloyd et al., 2012; J. J. Reilly et al., 2003; Victora et al., 2008). Maternal obesity can also cause complications for both the mother and the fetus during pregnancy, delivery, and postpartum periods (Tsoi et al., 2010; Van Lieshout et al., 2011). For instance, obese pregnant women are more likely to develop pre-eclampsia, gestational diabetes, and thromboembolism than pregnant women with a normal BMI (Tsoi et al., 2010). Furthermore, an overweight or obese mother during pregnancy increases the risk of childhood obesity, which can continue into adolescence and adulthood (Catalano, 2003; McGuire et al., 2010).

### *Global Obesity*

In 2000, the WHO and the International Obesity Task Force recognized excess body weight in both adults and children as “the most prevalent nutrition-related problem in western societies. Childhood obesity is rapidly emerging as a global epidemic” (World Health Organization, 2000). Since then, the global burden of childhood obesity has increased not only in its prevalence, but in its development at earlier ages and more frequent co-morbidities (Krassas & Tzotzas, 2004).

Childhood obesity is becoming an increasingly prevalent problem globally. A review of published papers between 1980 and 2005 found an increase in

overweight for 25 countries in school-aged children and 42 countries in pre-school-aged children (Wang & Lobstein, 2006). This study also found that obesity and overweight in children has increased more so in urbanized areas and in economically developed countries (Wang & Lobstein, 2006).

A study in 2010 estimated that there were 43 million children under five years old (7% prevalence) in the world who were overweight, with 35 million of them living in developing countries (De Onis et al., 2010). A 2012 study put the worldwide prevalence of overweight and obesity at 10% (Gupta, Goel, Shah, & Misra, 2012). These prevalence statistics show at least a 54% increase since 1990 when 28 million children worldwide were considered overweight (Black et al., 2013; De Onis et al., 2010). This rapidly increasing global trend will continue and estimated that 64 million children (9.9% prevalence) in the world will be overweight in 2025 (Black et al., 2013).

#### *Childhood Obesity Context in South Africa*

In 2010, the prevalence of childhood overweight and obesity in all of Africa was 8.5% and is expected to reach 12.7% by 2020 (De Onis et al., 2010). The WHO reported that obesity, specifically childhood obesity, has become increasingly important in Low- and Middle-Income Countries (LMIC) (World Health Organization, 2002). In 2011, it was reported that most overweight children under the age of five, estimated to be 32 million children, live in a LMIC (Black et al., 2013).

South Africa has been experiencing a nutrition transition where people shift to an energy-dense diet due to urbanization, low levels of physical activity, and a

sedentary lifestyle (Joubert et al., 2007; Popkin, 2003; Popkin et al., 2012; Nelia P Steyn & Mchiza, 2014; Nelia P Steyn et al., 2012; Vorster et al., 2005). Behavior changes associated with the nutrition transition in South Africa are associated with an increase in both overweight and obese adults and increased childhood obesity (Kahn, 2011; Popkin et al., 2012; Schneider et al., 2009).

Currently, childhood overweight and obesity is considered the major nutritional problem for children in South Africa under the age of five (Bosman et al., 2011). In fact, the 2012 South African National Health and Nutrition Examination Survey (SANHANES-1) found South African children were considered obese as early as two to five years old (Shisana et al., 2013). However, the prevalence of overweight and obesity in South African children ranges dependent on the study. Some studies have shown a prevalence of overweight and obesity in South African children and adolescents ranging between 7% and 10% with a significantly higher percentage of girls being overweight or obese than boys (Black et al., 2013; Bosman et al., 2011; Jinabhai et al., 2007; Kimani-Murage et al., 2010; Labadarios, 2007). However, the SANHANES-1 reported a higher prevalence of combined overweight and obesity in South African school-aged children at 13.4%. Additionally the rates of childhood overweight and obesity in South Africa are reported to be higher in urban areas than in rural areas due to the effects of urbanization (Black et al., 2013). Another study of South African families found that children of obese mothers had higher BMI than non-obese mothers (Nelia Patricia Steyn et al., 2011).

### *Influences on Children's Weight Status*

Previous research in the United States examined the rationale behind individual mothers' child feeding decisions and behaviors (Duncanson, Burrows, Holman, & Collins, 2013; Momin, Chung, & Olson, 2014). While these studies effectively investigated individual-level factors of a mother's health decisions regarding her child, other research indicates that relationships, the community, and society also play a role in mothers' health decisions.

Many previous studies that were conducted in various places around the world indicate that the family has the most influence on a child's health behaviors and attitudes (Pocock, Trivedi, Wills, Bunn, & Magnusson, 2010; Ventura & Birch, 2008). This extends to the relationships between children, parents, the broader family, and even the built environment of the home. Research indicates that professionals should focus on parental perceptions about healthy behaviors that can in turn prevent a child from becoming overweight or obese (Hesketh, Waters, Green, Salmon, & Williams, 2005; Pocock et al., 2010).

Mothers have been shown to be particularly important in determining the weight status of her child or children due to how much time they spend directly interacting with their children, which surpasses that of fathers (Garrett & Ruel, 2005). Research indicates that mothers help develop a child's eating behaviors and the child's overall health by parental role modeling and through the transmission of attitudes, beliefs, and values about nutrition and health (Arcan et al., 2007; Bante, Elliott, Harrod, & Haire-Joshu, 2008; Jabs et al., 2007; Kaplan, Kiernan, & James, 2006; Reynolds, Hinton, Shewchuk, & Hickey, 1999). Due to the aforementioned reasons on the mother's behavior, the mother's beliefs and attitudes about nutrition

and physical activity will be the focus of this research due to their implications on her child's weight status.

In addition to the intrapersonal and relationship-level factors mentioned previously, community and societal-level factors also have been shown to influence a child's weight status. Furthermore, Davison and Birch used an adapted Ecological Systems Theory model to describe the influences on a child's weight status characterized by the individual-level factors of a child, the relationship-level factors between the child and parents or other family members, and the community and societal-level factors (Davison & Birch, 2001). A quantitative study in the United States found that all levels of the Social Ecological Model significantly predicted a child's weight status (Ohri-Vachaspati et al., 2014). However, this type of research is absent within an African or South African context.

#### *Nutritional Context in Soweto, South Africa*

Past research examined the narratives that adolescent females in Soweto tell regarding their nutrition and physical activity habits. One study in which over half of the adolescent female participants were overweight or obese reported that locally prepared convenience foods, such as fat cakes (deep-fried dough balls), replaced breakfasts prepared at home (Sedibe et al., 2014). Participants also expressed that they would prefer to bring money to school and purchase lunch from tuck shops (small shops where junk foods and processed foods are sold) than bring a lunch from home (Sedibe et al., 2014). Reasons for wanting to purchase food (including kotas (a quarter loaf of white bread filled with processed meats, processed cheese,

and fried chips), fat cakes, and snacks) from tuck shops include price, convenience, and influence from peers (Sedibe et al., 2014). This study also found that these adolescent females participated in minimal amounts of physical activity due to a lack of facilities to exercise and perceived lack of safety in Soweto (Sedibe et al., 2014). Despite these seemingly unhealthy behaviors, participants knew that healthy eating and physical activity could benefit their health, and also knew the risks of obesity and other non-communicable diseases (Sedibe et al., 2014). While the participants of this study did not necessarily have children, it is clear that the nutritional behaviors established by a woman's adolescence would carry on into when she begins having children.

### *Literature Gap*

Much research from the United States has focused on the levels of the Social Ecological Model and its adaptation in the Ecological Systems Theory that influence maternal decision-making regarding health and child weight status. While it is clear that all theoretical levels play a role in influencing child weight status, the context in which they influence a mother specifically in Soweto, South Africa has never before been examined in this way. Furthermore, no studies in Soweto, South Africa have investigated the influences on maternal decision-making regarding nutrition and physical activity for herself and for her child or children. However, previous research has indicated the need for this type of research in sub-Saharan Africa (Davison & Birch, 2001; Kimani-Murage et al., 2011).

### *Conclusion and Study Objectives*

It is evident that childhood overweight and obesity are dire issues not only in South Africa, but also throughout the world. Due to the complicated nature of obesity development, prevention and establishing healthy nutritional and physical activity habits early in children's lives may be the best way to prevent childhood overweight and obesity. Previous studies have shown how influential a mother is in determining her child's nutritional and health attitudes and behaviors. While all levels of the Social Ecological Model and Ecological Systems Theory have been shown to be influential on a mother's decisions and on a child's weight status, no previous studies in South Africa have looked into how the individual, interpersonal, community, and societal-level factors work together to influence a mother's decision-making. Furthermore, no studies have examined where Soweto's mothers receive health information, or what behaviors and attitudes differentiate Soweto's mothers based on her child's BMI-for-age. Thus, this research aimed to answer the following research questions:

1. What are the individual, relationship, community, and societal-level factors that affect a mother's nutrition and physical activity that affect her and her child?
2. Where did mothers learn health-related information that affected her decision-making for herself and her child?
3. What behaviors and attitudes regarding nutrition and physical activity differentiate mothers with a non-overweight or obese child compared to an at-risk of being overweight, overweight, or obese child?

### **III. Methodology**

#### *Study Description*

This qualitative research study used in-depth interviews and a semi-structured interview guide to assess how mothers with a normal BMI achieved this in a low-socioeconomic status, obesogenic environment in Soweto-Johannesburg, South Africa. We investigated what behaviors and attitudes regarding nutrition and physical activity differentiated mothers with a non-overweight or obese child compared to an at-risk of being overweight, overweight, or obese child. Interviews were conducted during the summer of 2014 at either Chris Hani Baragwanath Hospital in Soweto, South Africa or at participant's home in Soweto.

#### *Participants and Longitudinal Study Background*

This study was nested within Birth to Twenty (Bt20), a longitudinal birth cohort study of South African children living in Soweto-Johannesburg. For seven weeks in the Spring of 1990, singleton children born in the urban greater Johannesburg area were contacted for the initially termed Birth to 10 (Bt10) study (Richter, Norris, Pettifor, Yach, & Cameron, 2007). In total, 5,449 births took place during the seven-week period. Of these, 3,273 children were recruited into the longitudinal birth cohort (Richter et al., 2007). The aim of the Bt10 study was to follow urban children for 10 years and to investigate children's physical and social development in a rapidly changing social environment (Richter et al., 2007). However, the follow-up period extended to 20 years in 2000. The study currently follows children and families in the area of Johannesburg, Soweto, and the Gauteng



province. The enrolled cohort contained 3,273 children and their families, and more than 72% of whom had been followed for at least 17 years (Norris et al., 2008). The current study conducted for this thesis was nested within the Bt20 cohort and study participants were all members of the Bt20 cohort.

Variables collected for the Bt20 study were guided by literature and our theoretical model and included demographic, socioeconomic and household information; community, neighborhood and school environments; health and nutrition; childcare, supervision and monitoring; growth and physical activity; cognitive development and school performance; social and psychological adjustment; risk behaviors; and a range of physiological measures (Richter et al., 2007). Participants generally had to come in to Bt20 office once or twice each year (Richter et al., 2007).

The first Bt20 cohort member gave birth in October 2005 at the age of 14 (Richter et al., 2007). Three additional 14-year-old cohort members had children around this time (Richter et al., 2007). In South Africa, over a third of women have their first child by their 20<sup>th</sup> birthday (Richter et al., 2007). Children born to Bt20 cohort members are called 3G since they are the third generation of the cohort, with the first generation being pregnant mothers who were recruited in 1990 and the second generation being enrolled study participants.

### *Role of Positive Deviance in this Research*

This research was intended to be a positive deviance inquiry due to the novel approach of using all mothers whose BMIs were within the normal range and to

determine what differentiated those with a non-overweight or obese child (considered positive deviants) to those with an at risk, overweight, or obese child. Thus, the lens of positive deviance would help identify individuals who practiced an uncommon behavior that resulted in positive health outcomes for their children (Marsh, Schroeder, Dearden, Sternin, & Sternin, 2004). The identification of behaviors already practiced by some community members offers an affordable, acceptable, and sustainable solution to the problem being investigated (Marsh & Schroeder, 2002). In the past, positive deviance has been applied to newborn care, child nutrition, contraception rates, safe-sex practices, and educational outcomes (Ahrari et al., 2006; Dearden et al., 2002; Marsh et al., 2002; Sethi, Kashyap, Seth, & Agarwal, 2003). Thus, a positive deviance framework seemed appropriate based on the previous success of positive deviance inquiries, especially related to child nutrition practices. However, during the interview process, it was clear that this approach was not what was occurring due to the type of data that was being provided in interviews. Instead, the approach of purposive sampling based on group characteristics was deemed more appropriate to answer the research objectives.

#### *Eligibility Criteria and Participant Selection*

Participants for the current research study consisted of Bt20 cohort members who were 24 years old at the time of data collection. Additionally, participants all had a normal BMI between 18.5 kg/m<sup>2</sup> and 24.9 kg/m<sup>2</sup> at their most recent appointment where BMI data was collected. This appointment was usually within the last year. All participants were mothers who delivered their first child

after the age of 18 years old. The exclusion of women who had their first child before the age of 18 in order to exclude very young mothers who may have had their children for varying reasons.

Participants who met the aforementioned criteria were categorized into the following three groups based on the participant's first child's BMI-for-age and gender:

1. The first group was defined as mothers with a normal BMI whose 3G child had a normal BMI Z-score for the child's age and gender within  $-1 < Z < 1$ . The WHO considers this range of Z-scores to fall within the normal or healthy range of BMI for a child (World Health Organization, 2008).
2. The second group was defined as mothers with a normal BMI whose 3G child was at risk for becoming overweight indicated by a BMI Z-score for the child's age and gender within  $1.5 < Z < 2$ . The WHO considers this range of Z-scores for possibility of risk of becoming overweight with a trend towards  $Z=2$  indicating a definite risk (World Health Organization, 2008).
3. The third group was defined as mothers with a normal BMI whose 3G child was either overweight or obese indicated by a BMI Z-score for the child's age and gender at  $Z > 2$ . This group contains those that the WHO considers to be overweight (BMI Z-score  $> 2$ ) and obese BMI Z-score  $> 3$ ) (World Health Organization, 2008).

The WHO Child Growth Standard was used as the reference population for BMI-for-age and gender to calculate the Z-scores for children. The WHO Child Growth Standard is the recommended assessment of growth in infants and children

younger than 5 years old in developing countries and has been used previously to assess growth in South African children (Bosman et al., 2011; Kimani-Murage et al., 2010).

Out of the 3,273 total Bt20 cohort members, 251 had children without missing data as of June 2014. Of these 251 cohort members, 97, or 38%, were women who had a BMI between 18.5 kg/m<sup>2</sup> and 24.9 kg/m<sup>2</sup> at their most recent data collection visit. Of these 97 women, 56 women, or nearly 58%, had a 3G child with a BMI-for-age and gender that fell into one of the three groups outlined previously. Of these 56 women, 45 fell into group 1. Group 2 had eight eligible participants and group 3 had three eligible participants. Table 1 (Appendix A) shows the eligibility progression as outlined previously.

Because group 1 contained more participants than were intended to be interviewed, group 1 participants were selected using a random number generator. Randomly selected participants were called and recruited until the target number of participants was reached. Respondents were easily recruited, so there was no reason to suspect biased sampling. All eligible participants for groups 2 and 3 were contacted to participate.

### *Variables*

Before interviews began, participants were asked to complete a short demographic questionnaire. The purpose of the demographic questionnaire was to gain information on the participants that included date of birth, number of children, child or children's date of birth, children's gender, and child's birth weight.

Additionally, employment status, educational attainment, marital or relationship status were asked about both at the time of the interview and when she delivered her first child. The demographic questionnaire can be found in Appendix B.

Many participants were unable to recall their child's birth weight and mentioned their response was an approximation and stated that they were guessing at the weight, or chose not to provide one. For this variable only, data from the 3G study, being managed by the Bt20 research group, was supplemented to the demographic questionnaire.

A semi-structured interview guide was developed for use in this research project. All questions were open-ended. The interview guide included probing questions that could help direct the conversation, if necessary. The principal investigator created the interview guide and worked with many members of the Rollins School of Public Health at Emory University's staff to create a final interview guide. Members who the principal investigator worked with included both professors and staff who were experts in qualitative methodology, experts on the topics within the interview guide, and/or people with experience working with this or similar populations. Once the principal investigator was in South Africa, the interview guide was piloted in country using a focus group of Bt20 staff members. This focus group helped to ensure that the content of the interview was culturally appropriate and suited the Soweto-Johannesburg environment. Questions on the interview guide fell into one of the following categories: Introductory questions; current dietary habits and attitudes; personal dietary habits and attitudes while participant was growing up; dietary habits and attitudes during pregnancy; dietary

habits and attitudes while currently raising her child/children; intentions for future dietary habits; thoughts on healthy diet and healthy children; current physical activity habits and attitudes; personal exercise habits and attitudes while growing up; physical activity habits and attitudes during pregnancy; physical activity habits and attitudes while raising her child/children; intentions for future physical activity; thoughts on healthy physical activity and healthy children. This interview guide can be found in Appendix C.

All participants provided written informed consent to participate in the audio-recorded interview. These forms were adaptations of standard forms used by the University of the Witwatersrand and the Bt20 research group. Participants were also assured that their identifiable information, such as any names or locations, would be removed from the transcriptions and not traceable back to the participant. This all occurred before the demographic questionnaire was completed.

Ethics approval from the University of the Witwatersrand Committee for Research on Human Subjects (M140480) and IRB approval from Emory University were granted for this study (IRB00073602).

#### *Recruitment and Data Collection*

Selected cohort members were contacted via phone by a Bt20 staff member who had been working with the Bt20 research study for years and had considerable experience with this group, specifically recruiting them for past studies. She called the cohort member and asked if she was interested in participating in this research. Occasionally, a potential participant was unable to be reached, and instead, other

family members or neighbors were contacted to help reach the potential participant. If the cohort member agreed to participate, an interview time was scheduled. At this point, the participant was also given a unique identifying number, called the MIPAN (Maternal Influence on Physical Activity and Nutrition) ID number. The use of assigning an acronym to studies is standard protocol for research carried out within the Developmental Pathways for Health Research Unit at the University of the Witwatersrand. Interviews were conducted either at Chris Hani Baragwanath Hospital in Soweto or at the participant's home. All participants were English speaking to aid in the interview process, although a translator was present if deemed necessary. Recruiting only English speakers may have biased the sample to a more educated group of mothers. However, educational level was assessed through the demographic questionnaire to check for a potential bias.

Data were collected through individual semi-structured interviews that were tape-recorded using an app on a smartphone. Interviews were conducted in June and July of 2014. The principal investigator conducted all interviews with participants. If a participant could not express a certain phrase in English, she would say the phrase in another language, usually Zulu. Then, during transcription, a Bt20 staff member helped to translate the phrase into English.

Participants either completed the demographic questionnaire themselves or verbally with the interviewer. The first two interviewed participants were used to pilot test the interview guide. The interviewer listened to these recordings to assess the quality of information and the interview guide was modified to enhance the quality of information. These two pilot interviews were included in the final

analysis. Additional interviews were completed until saturation of data was achieved. All participants were reimbursed for their travel expenses.

#### *Quantitative Data Analysis*

Basic information on participants used for eligibility purposes were entered into a password-protected excel document on the principal investigator's personal computer. After data entry, another researcher checked the data against original eligibility documentation for accuracy of the entered information, and incorrect information was fixed to reflect the eligibility documentation.

Responses from the demographic questionnaire were entered into the same password protected excel document mentioned previously. This information was also checked to ensure that all self-reported data was accurately entered into the excel file. As previously discussed, information on 3G birth weight was supplemented using existing information from the 3G study. Data was analyzed using SPSS to provide descriptive statistics including means and frequencies of the collected data.

#### *Qualitative Data Analysis*

Interviews were transcribed verbatim either by the principal investigator or by a professional transcription service. All names, places, and identifying information were removed from the transcript. As soon as a transcript was completed, the audio recording was deleted. For transcripts that were completed by a professional transcription service, the principal investigator conducted quality



control measures to ensure the transcriptions were done correctly. This quality control consisted of the principal investigator listening to each interview with the completed transcription file open, and ensured that no sections were missing or inaccurately transcribed. The principal investigator corrected inaccuracies or inconsistencies so that the transcription was more accurate to the audio file.

During the transcription process and after transcription and quality control were complete, a qualitative codebook was created. The codebook was modified as necessary during the transcription and analysis process. Interview transcripts were imported into the qualitative analysis software MaxQDA. Interviews were also coded for thematic analysis. Interviews were analyzed separately by group. The final codebook used for analysis can be found in Appendix D.

## IV. Results

### *Sample Characteristics*

As was mentioned earlier, participants completed a demographic questionnaire (Appendix B) before the interview began. Eleven participants from the 45 eligible in group 1 were randomly selected and interviewed. All eight eligible participants from group 2 and all three eligible participants from group 3 were also interviewed. Demographic information on all participants is presented in Table 2 (Appendix E), which contains continuous variables, and Table 3 (Appendix F), which contains categorical variables.

All participants were 24 years old at the time of the interview. The average age at which mothers gave birth to their 3G children, which was her first child, was 19.9 years (sd=1.4 years). The mean child's birth weight in kilograms was 2.9 kg (sd=0.4 kg). On average, the participants had a BMI of 22.2 kg/m<sup>2</sup> (sd=1.5 kg/m<sup>2</sup>), which is within the normal BMI range for adults. On average, 3G children were 3.7 years old at the time of interview (sd=1.3 years). The average BMI for 3G children was 17.4 kg/m<sup>2</sup> (sd=1.6 kg/m<sup>2</sup>) and the average Z-score of the child's BMI-for-age was 0.9 (sd=1.0). As can be seen in Table 2, the characteristics of the three groups were comparable to each other and to the overall group. On average, interviews lasted 37 minutes and 0 seconds (sd=19 minutes and 9 seconds).

Of the 22 women interviewed, 15 had one child at the time of the interview, and the remaining seven participants had two children at the time of the interview. Most participants had a female child (n=13). Many participants were unemployed at the time of the interview (n=13). The majority of participants had completed grade

12 and obtained a Matriculation Certificate (n=10) but educational attainment ranged from 10<sup>th</sup> grade being the highest level of school completed to completing a Bachelor's degree. Women indicated their relationship status at the time of interview as either married (n=1), not married but living together (n=6), not married and not living together but in a committed relationship (n=8), or single (n=7). One interesting difference between groups is that group 3 was the only group with more male 3G children than female 3G children. Also, group 3 was the only group to have more employed participants than unemployed women.

Participants also answered questions about the time at which they delivered their 3G children. The majority of women were unemployed when they delivered their first child (n=15). At the time of delivery her first child, three women had completed grade 10, 11 women had completed grade 11, 12 women had completed grade 12 or obtained a Matriculation Certificate, and one woman had obtained a certificate or diploma. Lastly, participants indicated their relationship status at the time she delivered her first child. Of the 22 participants, three reported they were not married but living together, 11 participants reported they were not married and not living together but in a committed relationship, and the remaining eight participants were single. Characteristics were similar between groups with the exception of relationship status at the time of delivery. Group 3 only had women who indicated they were single at the time of delivery of their first child.

### *Information Sources*

During interviews, participants indicated many sources from which they received information on nutrition and physical activity. The health information received pertained to both themselves and their children. These information sources are divided into four categories: Family members; people outside of the family; health-focused professionals or classes; and the media.

### *Family Members*

For the sake of this analysis, family members include blood relatives such as a participant's parents, siblings, and grandparents, and those not related by blood such as her partner/father of her child and his family.

Seventeen of the women stated that a matriarchal figure, such as a mother, grandmother, or aunt, provided information on nutrition and physical activity. This was consistent over all time periods that a participant discussed (growing up, pregnancy, and at the time of interview). Fifteen of the 22 participants discussed that their parents were still providing health information at the time of the interview because the participant and her child/children lived with at least one parent or grandparent. It is important to note that no women mentioned a patriarchal figure, like a father or grandfather, providing information on nutrition or physical activity.

Participants also noted that either the matriarch in the family generally did the grocery shopping and prepared meals for the household, or that one of the children completed these tasks as suggested by the matriarch. In other words,

regardless of who did the grocery shopping and the cooking, the matriarch in the family influenced the available food in the household.

Furthermore, when discussing specific nutritional and physical activity information provided by participants' mothers and grandmothers, the terms 'eat healthy' and 'eat less junk' were mentioned frequently. Most participants could not recall any specific nutritional information provided by their mothers or grandmothers. Nutrition seemed to be an abstract concept without specific nutritional guidelines. For instance, one 24-year-old mother of one said, "My mom would just say we must eat healthy. We must eat this and this and this, just say eat healthy food." (Participant 1-11, line 68).

While a participant was pregnant, their mother provided much nutritional and physical activity information. Many women considered their mother's guidance to be helpful and the seven of the 22 women followed their mother's advice over any other information source. Alternatively, four women discredited information from their mothers as old wives tales. For instance, one participant said that her mother told her that eating too many oranges or sugary drinks while pregnant would jaundice the baby, and another participant mentioned that eating junk food while pregnant would cause the baby to develop eczema.

Six women also discussed their partner or the father of her child as a source of nutritional and physical activity information. This was particularly seen as important during pregnancy. These participants indicated that their partner/the father of their child would encourage her to eat healthy food, exercise more frequently, and drop any bad habits that might have harmed the fetus. If the father

were still in the picture at the time of the interview, he also provided an opinion on the child's nutrition. This was discussed only once the child was old enough to eat solid foods.

### *People Outside of The Family*

Nine of the 22 interviewed women mentioned people outside of the family providing information on nutrition and physical activity. These people generally were either friends or co-workers of the participant. Generally, these sources already had a child and provided nutritional information for children based on their experience. Those who did not have children provided information based on social norms or what they had heard from others or based on their own nutritional knowledge.

### *Health-focused Professionals and Classes*

All 22 interviewed mothers discussed health-focused professionals and classes as sources from which they received information on nutrition and physical activity for both themselves and their children. This includes information received from a clinic and health personnel, the Bt20 study, and school or Life Orientation class in school.

Thirteen of the 22 participants stated that school or Life Orientation class was a place that they learned information about nutrition and physical activity while growing up. Food was readily available at school for participants to eat. While no one commented if the food they received at school was healthy or unhealthy, many

mothers indicated that the crèche their child or children attended had healthy foods. One mother noted that her child's crèche sent home information on exercising with children and had homework for the child that consisted of exercising with his or her parents.

All 22 interviewed mothers mentioned clinics, doctors, and nurses as a source of health information. Pamphlets were commonly cited as a way for healthcare settings to disseminate information on nutrition and physical activity. Participants brought up clinics and healthcare personnel most frequently when discussing pregnancy and early feeding practices for their 3G children. Participants mentioned that healthcare personnel discussed the health benefits of good nutrition and physical activity for the pregnant woman and for the fetus. However, the clinic and healthcare personnel were absent from the rest of the women's lives unless she or a close family member was chronically ill.

Four of the 22 participants cited Bt20 as a place they received health information. Interestingly, these participants only discussed Bt20 as a place where they received nutritional information but physical activity was not discussed. One 24 year-old mother of two noted that Bt20 was particularly influential to her because she knew they were interested in her life-long health and thus she adhered more to the information provided by Bt20.

### *The Media*

Out of the women studied, 15 mentioned at least one media source from which they learned about nutrition and physical activity. Specific media sources discussed included television programs, magazines, and the Internet.

Participants discussed television programs (n=13) and health-focused magazines (n=10) as sources of information for nutrition and physical activity. Sometimes, these mothers would seek out the information, such as in the case of watching a particular exercise program or buying a fitness magazine. Some mentioned that nutrition and exercise was discussed on a talk show that they regularly watched.

Eight of the 22 participants said that they looked to the Internet for health information. They were able to recall specific health information such as diet fads, tips for eating healthier, foods that seem healthy but truly are not healthy, and the benefits of healthy eating on the body. An important indication between different media sources is that the women sought out information on the Internet whereas information in magazines and on television programs was provided to the participant, although these women did have to turn on that specific television program or buy a certain magazine. However, the Internet may provide more influential information because a person must have an interest in a topic to seek out the specific information.

#### *Factors that Affect Decision-Making by Theory Level*

During interviews, mothers discussed factors that influenced their decision-making regarding health decisions for themselves and their children.. These factors



were organized thematically into individual, relationship, community, and societal-level factors (Figure 1, Appendix G).

### *Individual-Level Factors*

Mothers were asked how they made decisions on what to eat or what meals to cook for themselves and their families, which drove her beliefs about health. Most mothers (n=16) said they did not consider anything and prepare whatever is available or convenient. One 24 year-old mother of two said, "I don't really take much into consideration... I just do whatever is either quick enough to make" (Participant 1-09, line 18). When asked about how much food they eat, women simply claimed they eat when they feel hungry and stop eating as soon as they no longer feel hungry.

Only seven of the 22 women regularly exercised. These women noted that a gym was either easily accessible or was provided by their place of employment, or that they exercised in their own home. Those who did exercise mentioned that going to the gym with coworkers and friends was a prime source of motivation.

Of the 22 interviewed mothers, eight discussed a sense of self-responsibility for nutrition and physical activity decisions. These mothers indicated this by checking nutrition labels, seeking out information on health topics, and saying explicitly that people make their own nutrition decisions. This may indicate that these mothers were more curious and sought out information on health topics, or that they might have felt a sense of self-efficacy regarding nutrition and exercise. One 24 year-old mother of one said:

Exercising is good and, but I also think, let me be quite honest, people make their own choices. At the end of the day, I can only say so much about something and only the one with curious mind will actually go for it (Participant 1-06, line 482).

Throughout a mother's lifetime, there were shifts noted when she either ate more or less healthy, and when she exercised either more or less frequently. For instance, some mothers ate healthier while pregnant and others mentioned constantly craving and eating junk food and fast food. Similarly, some mothers decided to exercise if their body did not return to normal a few months post-delivery while others reverted back to the exercise habits they had before becoming pregnant. Every woman's experiences and shifts in behavior and attitudes were personal and there were no common patterns seen across women.

When mothers discussed breastfeeding their children, mothers knew they were supposed to breastfeed for at least six months. However, only half of the women (n=11) reported breastfeeding for at least three months with fewer (n=7) making it to or past the recommended six-month mark. Thirteen of the mothers discussed discomfort while breastfeeding, or that she or her child did not want to breastfeed. A few mothers cited needing to go back to work or school as reasons that they stopped breastfeeding. In lieu of breast milk, mothers chose to give babies formula. Some mothers gave their children porridge or maize meal as early as a few days old, although most were at least two months old when this first occurred. Mothers mentioned that they gave their child porridge or maize meal before the clinic-recommended six-month mark because the child was frequently crying which

participants believed was an indication that the child was hungry and that breast milk or formula was no longer sufficient for the child's diet.

During the interview, a mother was asked about perceptions of her own nutrition and physical activity throughout her lifetime. According to answers provided during the interviews, a mother's perception of herself generally shifted after she gave birth to her child. Some mothers mentioned that their bodies went back to normal on their own, and that they did not need to exercise to lose the weight. Several women claimed that the stress of being a new mother helped them to lose weight. Furthermore, mothers noted they did not have the time, money, or energy required to eat healthy and exercise with a newborn and that these changes happened naturally.

Mothers were asked if she considered the food her child ate to be healthy. Mothers either said yes, or were unsure about how 'healthy' it is. However, these mothers were adamant that the food provides their child with adequate nutrition. For instance, when asked if a mother of two considered what her children ate to be healthy, she replied, "Not really really healthy, but I think they have enough nutrition" (Participant 1-09, line 119).

### *Relationship-Level Factors*

As was mentioned earlier, a woman's friends or co-workers influenced her health decisions. If a woman's friends wanted to go to the gym or run together, this could influence the mother to exercise more frequently. One mother of one said, "I hate [exercising] alone, that's the problem. I just hate doing it alone. I hardly have

people around so I just feel like, me alone jogging in the street, it's like I look crazy" (Participant 2-07, line 219). Similarly, a 24 year-old mother of one said that her boss recommended she not take her child to a fast food restaurant and recommended a healthier restaurant instead. Another mother of one explained how people outside of the family could be influential in both positive and negative ways:

At high school or university, you do try [to] eat healthy, and sometimes it's just like, "Ugh I just want to have my piece of chicken or something with my fried chips and my burger," and you're looking at your little salad and you're like, oh it's so not appetizing, and you think twice. So even just being in that environment, it really makes you feel so bad for eating healthy. But if you're around people who are health-conscious, then it's very good. So at work, people are actually health-conscious and it actually helps me to not revert to my old eating habits (Participant 2-05, line 46).

A woman's partner also influenced health decisions for herself and her child. The partner offered his opinion on a woman's health decisions while she was pregnant. Once the child was born, the partner continued to provide advice regarding the diet of the child. The partner also helped motivate the woman to exercise if he made a comment about her figure.

A participant's mother or other matriarchal figure, such as a grandmother, was particularly influential throughout the participant's lifetime. When discussing what they ate as children, participants indicated that a mother or grandmother usually did the grocery shopping and cooked meals. As these children grew older, they would commonly help prepare meals as well. A participant's mother regularly shared opinions on what the participant should or should not do while she was pregnant. Many times, the participant's mother or grandmother would also suggest

that the new mother feed her baby foods such as porridge or maize meal as a solution to incessant crying.

At the time of the interviews, 15 of the 22 mothers lived with their parents or grandparents. This living situation had implications on what the mother and her child or children could eat. Because the matriarch of the household decided what food to purchase and what meals to prepare, the matriarch's food opinions and desires were the most salient in determining what everyone in the household ate. Women mentioned a desire to move out and live in her own home so that she could determine what foods are served. One mother of two had done this about a week prior to the interview and noted:

I moved out of home. So the pressures of being a single mom, having to pay rent, two kids. It's actually just getting to me now, you know. 'Cause when you're home, your mother will provide food, everything's provided... And now that I've actually moved out of home, you know, I can control everything, you know. So what I've realized is that vegetables... it's delicious, the way I cook it (Participant 1-04, line 14, line 24).

The specific situation within the family also influenced how mothers made health decisions. Three of the 22 mothers noted they had a close family member who was a nurse or some other type of health professional. These women reported healthier nutritional and physical activity behaviors and attitudes when compared to other mothers. They also reported adhering strictly to the advice provided by these family members throughout their lifetime. Furthermore, seven mothers disclosed that either she or a family member was chronically ill. Because of these illnesses, the food in the house had to be healthier to aid in treatment. Due to healthier food in the house after someone fell ill, everyone in the household, including the participant, ate healthier.

A mother's relationship with her child also influenced how she made decisions about the child's health. Seven mothers reported that they did not always give their children food when it was requested. This was especially seen if the child asked for junk food or if the child had very recently eaten and does not need to eat again. Furthermore, four mothers mentioned that the relationship she had with her child motivated her to exercise. These mothers claimed they exercised with their children, such as going on runs or playing sports together.

### *Community-Level Factors*

Of the 22 interviewed women, 19 said that they participated in sports as children. The schools presented children the choice to participate in sports, so the opportunity was readily available to them. As children, these women commonly played netball, ran track and field or marathon, and did gymnastics.

As was previously discussed, participants stated that healthcare personnel were prominent in their lives when the woman was pregnant. However, a few months after a woman gave birth, the clinic and healthcare personnel were no longer influential in her life. A few participants discussed that they listened to a child's doctor regarding the health of the child, but that was solely when the mother had a preexisting concern about her child's health. One 24 year-old mother took her son to the clinic solely to check with doctors about how much he ate to determine if this behavior was abnormal for a child his age.

Of the 22 mothers, 14 reported that their children went to crèche or day care. Mothers revealed that they did not know what food was served at crèche or day

care, but they insisted that the food served was healthy. Mothers generally also perceived their children as particularly active, and 16 of them reported that their child was always running around at home and crèche or day care.

### *Societal-Level Factors*

To assess the greater Soweto society's perception of healthy food and physical activity, each mother was asked about her perception of healthy food and physical activity. All mentioned fruits and vegetables as healthy food items. Commonly, cereals, yogurt, and dairy products were also suggested as being healthy foods. Occasionally, a participant listed protein as a healthy food item. Using oil and eating sweets and 'takeaways' or fast food were commonly discussed as unhealthy foods. Of the 22 women, ten made a distinction between cooking styles, and grilled and boiled food were considered healthier than fried food or food prepared with a lot of oil. When eating out at restaurants was discussed, 14 women indicated that the food they eat out around once each month was unhealthy.

Of the 22 women interviewed, 19 of them explicitly stated that healthy eating is beneficial for any person. Around half of these women (n=9) also discussed physiological effects of healthy eating on the body such as for the immune system, the digestive system, and that it makes a person's skin clearer. Despite all of these positive effects of eating healthy, women said that healthy eating is difficult to maintain in their everyday lives. A few women also stated that healthy food was expensive (n=5) which was why they and their families could not eat healthy food more often.

When asked about what activities the women considered to be exercise, the most frequently mentioned activities were running, jogging, playing sports, walking, and going to the gym. Eighteen of the 22 mothers engaged in housework regularly, and 11 of them considered doing housework to be a healthy activity.

Thirteen mothers felt that exercise was needed to lose weight and to get in shape. Nine women explicitly stated that exercise was not important in their own lives because they felt healthy on the average day and were maintaining their weight. However, 16 participants said that exercise was necessary for all people, but that this lifestyle was difficult to maintain due to time and monetary constraints. Another woman said that if a person loses too much weight, others would think he or she is seriously ill. One 24 year-old mother of one discussed a common thought about exercise that prevented her from exercising regularly. She said:

I hear people saying when you exercise, you have to exercise throughout and you don't have to stop, 'cause once you stop, you gain more weight. And when I thought about that, I guess that's the thing that discouraged me and I ended up stopping (Participant 2-02, line 157).

A few women discussed the inability to stay healthy in Soweto. Soweto is known as an obesogenic environment, or an environment that promotes obesity due to factors in the area, which can include the prominence of calorie-dense food and reliance on motorized transportation. One 24 year-old mother of one discussed the effect that living in Soweto has on her diet:

I guess it's the environment you are around you know...when the people you are around are eating certain things then inevitably you also eat the same things they are eating so it has to do with the kind of foods they eat at home on a regular basis so you get demotivated about staying healthy and eating healthier... While there is healthy stuff that you can get which is like fruits and vegetables, there's a whole lot of fast food places, like people selling fries, a lot of deep fried stuff and that's become normal so that's the next best thing



you can get in like every corner so it's not really easy to stay healthy. (Participant 2-08, line 92, line 98).

Interviewed mothers frequently reported receiving advice on healthy eating and physical activity from various information sources as discussed earlier. The media and Life Orientation class were prominent throughout the Soweto society. When discussing the media, many women mentioned they sought out health information as indicated by watching certain television programs, buying health-focused magazines or searching for information on the Internet. However, information learned from these media sources were used for short-term health behaviors, such as a diet fad or to determine if she or a family member had the flu. The media sources did not have a long-lasting impact on health behaviors and attitudes.

When reflecting on school and Life Orientation class provided in school, many women noted the lessons learned did not impact them beyond basic information, such as fruits and vegetables are healthy. Two of the women could not remember one thing they had learned at school or Life Orientation class regarding nutrition and physical activity. One participant, who was a mother of one, explained her opinion behind this learning discrepancy:

As a young person, you really don't pay [attention], you just want to eat these things, you want to eat chips, you want to eat like just all these, all this salty food, your chips and fried chips and pizza and your burgers and everything that's just good but that's bad for your body. So we generally just don't pay attention, which is wrong in every essence, but is just because you're young and your body can still manage that and because you're active and because you know you can shed of the kilos and all of those things. So you only start to realize it as you grow older when you stop being active and all that fat you've been packing up it starts catching up with your body eventually (Participant 2-05, line 68).

Often, participants mentioned a discrepancy when the information she was provided from her doctors and other health personnel did not match with information received from her mother. This was specifically seen when a participant was breastfeeding and when she was deciding on early feeding practices for her child. For instance, a doctor would tell a participant not to provide the infant anything besides breast milk or formula for six months. Alternatively, a participant's mother who would constantly hear the child cry would encourage her daughter to feed the child porridge or maize meal. This happened as early as 10 days after birth, but most frequently happened when the child was two or three months old. Participants varied on which information they listened to and sometimes felt they had to keep their actions a secret as to not upset anyone.

#### *Unique Qualities of Group 1*

Interviewed participants in group 1 were mothers with a normal BMI and her 3G child had a normal BMI-for-age (n=11). The following describes the unique behaviors and influential factors that mothers in group 1 reported during their interviews.

When discussing food that participants ate out, group 1 participants were concerned with the fact that you cannot see how the food is prepared at restaurants. Due to the food eaten out was considered unhealthy. One 24 year-old mother of one noted that "you don't see whatever they are using and, the chemicals like, when you're in a hurry, you can't do anything [else]" (Participant 1-07, line 52).

Less than one-half of the mothers in group 1 (five of the 11) discussed a sense of self-responsibility for nutrition and physical activity decisions. As was said earlier, mothers indicated this behavior by checking nutrition labels, seeking out information on health topics, and saying explicitly that people make their own nutrition decisions. The presence of self-responsibility is higher in group 1 in comparison to the other two groups. This may indicate that these mothers are more curious and seek out information on health topics, or that they might feel a sense of self-efficacy.

All but one mother in group 1 (n=10) reported breastfeeding her 3G child for at least three months with only six making it to or past the recommended six-month mark. These breastfeeding behaviors were by far the most prominent in group 1 with only one additional mother from group 2 making it to or past the six-month recommendation.

As was mentioned, there was a discrepancy between the information received from health professionals and information received from a matriarchal figure, specifically a participant's mother. Women in group 1 more frequently adhered to advice from doctors/health personnel (n=5) as compared to her mother (n=1). Three of the women in group 1 reported that both information sources influenced her health decisions, and the remaining two participants said neither one influenced her decisions.

### *Unique Qualities of Group 2*

The women in group 2 were mothers who had a normal BMI and her 3G child had a BMI-for-age that was at risk of being overweight (n=8). The following describes the unique behaviors and influential factors that mothers in group 2 discussed during interviews.

When discussing food eaten out at restaurants, group 2 mothers focused on the food being full of fat and oils whereas group 1 participants mentioned the inability to see the food being prepared. Furthermore, six of the eight women in group 2 reported eating out at least once per month, which was more prominent than in any other group. Four of these six women reported eating out between two and five times each month.

Participants in group 2 indicated that a person is responsible for his or her own health, but this was communicated less frequently than in group 1. Specifically, three of the eight group 2 mothers discussed self-responsibility for health as compared to five of the 11 group 1 mothers. This may indicate that these women did feel a curiosity about health or feel a sense of self-efficacy regarding health, but it was less prominent in group 2 women than in group 1 women.

Group 2 participants reported breastfeeding far less frequently than mothers in group 1. Only one of the eight mothers in group 2 breastfed her child for at least three months, and this mother did breastfeed for at least six months. With regard to her child, one mother in group 2 claimed that her child ate a lot of food and that her child was constantly asking for more food or snacks. In comparison, no group 1 mothers reported this behavior in their children.

Only two of the eight group 2 mothers reported they did not always provide food to their children when they asked, especially if it was junk food. This is less frequent than was reported by group 1 mothers (five of 11 reported this behavior). Furthermore, one mother in group 2 mentioned that her child ate a lot of food and her child was constantly asking for more food. In comparison, no group 1 mothers reported this behavior.

The same discrepancy was noted between information received from a participant's mother and the doctors/health personnel regarding breastfeeding and early feeding practices. However, among group 2 participants, more women preferred the advice from her mother rather than recommendations from the doctors or health personnel (n=4). Two group 2 mothers said they listened to the doctors and other health professionals over other sources of information, and the remaining two said they felt both sources were influential.

### *Unique Qualities of Group 3*

Participants in group 3 were mothers with a normal BMI and her 3G child had an overweight BMI-for-age (n=3). The following describes the unique behaviors and influential factors that mothers in group 3 discussed during interviews.

Interestingly, two of the three participants in group 3 regularly exercised because their jobs provide gym access. One mother claimed that she only began exercising due to the access to the gym provided by her job.

No mothers from group 3 reported behaviors that indicate a self-responsibility for health, nor did they discuss it during their interviews. This may

indicate that these women were not curious about health-related topics, or they did not feel a sense of control over their health. It also may indicate that these mothers felt they were provided enough health information regularly from various sources, such as from family and peers, and did not feel the necessity to supplement their knowledge, or that they were content with what they knew on health-related topics.

Group 3 mothers breastfed less frequently than mothers in groups 1 and 2. In fact, no group 3 mothers breastfed their children for more than two weeks. Instead, these mothers provided their infants with formula.

All group 3 participants described their children as 'always asking for food' or that their child 'loves food.' This was much more prominent than was reported by mothers in group 1 or 2. Mothers also said that they provided their children food when they asked, and none of the three mothers claimed they modified what her child ate depending on if the request was junk.

The discrepancy was still present concerning advice provided by participant's mothers and doctors/health personnel regarding early nutritional practices. Interestingly, two of the three group 3 participants indicated a clear preference for their mother's advice over the advice from doctors. One 24 year-old mother of two recalled that her son started eating when he was 10 days old due to advice from her mother:

Yes, so my mom told me... the baby must start eating [when he gets home], must eat so the baby can grow and can sleep. Because the reason a baby cry is most the time, maybe he's hungry... So my mother tell me, 'Ah don't tell me about the doctors what they're saying, tell me about you, how's it six months without eating, just drinking formula?' I said, 'But it's what they told us, said that the baby should start eating at the age of six months. You should just give the baby formula or breastfeed the baby.' That's it. But they didn't die, no; they're old now (Participant 3-01, line 120).

The last group 3 participant reported that she did not heed advice from either her mother or from her doctors and instead followed her cravings and what she felt like doing.

## V. Discussion

### *Summary of and Implications of Findings*

Individual, relationship, community and societal-level factors were all found to influence a mother's decision making regarding health for herself and her child within the context of Soweto, South Africa.

Results of this research indicated a disconnect between how Soweto's mothers perceived the individual roles of nutrition as compared to physical activity. In general, interviewed mothers viewed eating healthy as something necessary for the physiological effects including benefits for the immune system, the digestive system, and to make a person's skin clear. In contrast, exercising was seen as necessary for losing weight, for getting in shape, and for toning the body. Thus, many women felt that they did not need to exercise if they were happy with their bodies. What was absent from these interviews was a discussion of how nutrition and physical activity can and do work together to help a person control their weight, help a person be physiologically healthy, and contribute to a person's overall health. This has implications for the health decisions that a mother makes for herself and the beliefs and values she will pass on to her child or children. Future interventions should focus on the integration of nutrition and physical activity and how both contribute to a person's health so that this disconnect is not as common. By teaching this to mothers, they will pass on this belief and knowledge to their children, which could result in a healthier upcoming generation.

Information sources from which mothers learned about nutrition and physical activity for both themselves and their children included health-focused



professionals and classes, family members, people outside of the family, and media sources. Furthermore, seeking out information from media sources was also seen with behaviors indicating self-responsibility due to the curiosity needed to seek out health information. This indicates that Soweto's mothers receive health information from all levels of influence within the model (Figure 1, Appendix G).

Participants reported they were particularly influenced by a matriarchal figure in their lives, usually a participant's mother, and doctors and other health professionals. As a child's weight status category increased, the child's mother was more influenced by her mother than the clinics or doctors. These findings indicate that interventions focused on a mother's health behaviors and attitudes cannot focus solely on the mother. Instead, future interventions need to consider formal health education settings, such as in the clinic of a doctor's office, and informal health education services including family, friends, co-workers, the general community, and society as a whole.

Furthermore, while interviewed mothers mentioned lessons learned in school, such as in Life Orientation class, these lessons did not have a lasting impact into adulthood. The Life Orientation curriculum used at the time the study was conducted was created in 2003. A previous study indicated that there was a prominent belief that Life Orientation is ineffective and a waste of time for students (Jacobs, 2011). Thus, the Life Orientation curriculum may need to be evaluated and redesigned to be more effective at impacting short-term and long-term health outcomes at the societal level.

A total of eight of the 22 interviewed women discussed how a person is responsible for his or her own health, or indicated that she performed behaviors indicating a self-responsibility for health such as research on the internet or checking nutrition labels. Alternatively, 16 of these 22 women also claimed they considered nothing when making nutritional decisions for herself and her family. Nine women also said they felt exercise was not needed for them personally. These behaviors indicate that there was a general lack of self-efficacy with regard to nutrition and physical activity, which could be why they did not consider health when making nutritional decisions, or why they believed exercise was not necessary in their lives. It also cannot only influence their child's weight status, but also what nutritional behaviors and values they pass along to their children. Future interventions may want to focus on intrapersonal factors such as increasing nutritional and physical activity knowledge and self-efficacy in Soweto's mothers. Effective interventions of this type can have a lasting intergenerational effect and improve the health of mothers and their children.

A difference was noticed in breastfeeding rates and durations between groups. Ten of the 11 mothers in group 1 breastfed their 3G child for at least three months, and six of them breastfed their 3G child for at least six months. In comparison, one mother in group 2 breastfed for at least six months, and no women from group 3 breastfed longer than two weeks, if at all. Previous research has shown that breastfeeding and delay of introducing complementary foods is protective against a child becoming obese later in life (Owen et al., 2005). The findings of this research may indicate that signs of obesity, influenced by a lack of breastfeeding,

may be seen earlier than previous research has indicated. Furthermore, there is a need to increase breastfeeding rates for at least six months in Soweto's mothers. An intervention that can successfully increase breastfeeding rates could contribute to lowering the burden of childhood obesity in Soweto.

### *Limitations*

There are a few limitations to consider with this research. Mothers who were interviewed for this study self-reported their behavior over a lifetime. Self-reported data is subject to a perceived stigma of the subject matter or bias due to wanting to report a certain outcome to please the interviewer. Additionally, women were asked about their experiences over a lifetime and thus their reporting is subject to recall bias.

Another limitation is that the principal investigator who conducted all interviews was a Caucasian female who was not an insider in the Soweto-Johannesburg community. This may have caused interviewed mothers to feel uncomfortable and not disclose accurate or sensitive information. However, the principal investigator spent much time before and during the interview building rapport with the mothers being interviewed. In fact, many mothers disclosed personal information including family issues, personal or familial health issues, or other personal information. This indicates that these women were comfortable talking and reporting accurate information to the principal investigator. Furthermore, the principal investigator did not feel that being an outsider to the Soweto-Johannesburg community hurt the quality of information reported. In fact,

the participants took the time to explain cultural and societal factors discussed more thoroughly because the interviewer was an outsider.

A last limitation is that the findings of this research may not be generalizable as the study was conducted within the Bt20 longitudinal cohort and only interviewed members of this cohort.

### *Future Research Directions*

This research used a sample of mothers with a normal BMI. While their habits were well documented in this research, there was no comparison group (i.e. mothers with an overweight or obese BMI). Thus, future research should examine the differences in behaviors, attitudes, and influential factors that mothers with a normal BMI have in comparison to mothers with an overweight or obese BMI. This would be particularly interesting in an obesogenic environment, such as Soweto,

Future research should examine how to help women maintain healthier behaviors when they naturally occur in women's lives. Furthermore, some women indicated that their healthier behaviors and attitudes were sustained long-term when either she or a family member were ill, or if she had a close family member who was a nurse or other health professional. Future research may want to further examine the role that either an ill family member or a family member who is also a health professional plays in women's lives and their health decisions.

There are many lessons from this research that future interventions can utilize. For instance, this research indicates a necessity for an increase in self-efficacy of Soweto's mothers regarding nutrition and physical activity. Furthermore,

any lessons on nutrition and physical activity should make sure to integrate the benefits of nutrition and physical activity and teach that they complement each other and both contribute to an individual's overall health. The positive effects of this type of lesson would be twofold: 1) The lessons would combat the belief that healthy eating is only necessary for positive physiological effects and that physical activity is needed for losing weight and getting in shape, and 2) The lessons would increase a person's self-efficacy and ability to eat healthier and exercise more regularly.

Furthermore, this research highlights the importance of the family and the community for a mother's health decisions for herself and her child or children. Thus, effective interventions in this area should at least have a familial component, and preferably also have a component to impact the greater community. It can be expected that interventions that focus on multiple levels (individual, familial, and community levels) would be most effective at having positive effects at health outcomes. Research may also want to be done at how to make the Life Orientation curriculum more effective and able to produce long-term and sustainable health outcomes.

## VI. References

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## VII. Appendices

### Appendix A: Table 1. Progression of Eligibility Criteria

	<b>No.</b>
3G children with complete data	251
Mother with BMI between 18.5 kg/m <sup>2</sup> and 24.9 kg/m <sup>2</sup>	97
Eligible to participate	56
Group 1	45
Group 2	8
Group 3	3

## Appendix B: Demographic Questionnaire

Participant ID# MIPAN: \_\_\_\_\_

Interview Date and Time: \_\_\_\_\_

Interviewer's Name: \_\_\_\_\_

### 1. Current Age

- What is your date of birth? \_\_\_\_\_ Age: \_\_\_\_\_

### 2. Child Information

- How many children do you have? \_\_\_\_\_
- Please write in your child's/children's date of birth and gender:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### 3. Current Occupation Status

- Do you currently have a job? **Yes** **No**

### 4. Highest Level of Education

- Have you successfully completed grade 12 (passed matric, obtained matric certificate?) **Yes** **No**
- **If No:** What is your highest grade successfully completed?

Grade 5 or lower	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11

- **If Yes:** Is grade 12 your highest level of education? **Yes** **No**
- **If No:** What is your highest level of education?

Certificate/Diploma	Bachelors' Deg.	Honor's Degree	Master's Degree	Doctorate

### 5. Marital Status

- What is your current marital status?

Marital Status	Tick one
Single	
Not married and not living together, but in a committed relationship/partnership	
Not married but living together	
Married (including traditional or customary)	
Divorced or separated	
Widow/widower	

### 6. Mother's Age at Delivery

- How old were you when you delivered your first child? \_\_\_\_\_

### 7. First Child's Birth Weight

- How much did your first child weigh at birth? \_\_\_\_\_

### 8. Occupation Status at Delivery

- When you delivered your first child, did you have a job? **Yes** **No**

### 9. Level of Education at Delivery

- When you delivered your first child, had you successfully completed grade 12 (passed matric, obtained matric certificate?) **Yes** **No**
- **If No:** What grade had you successfully completed when you delivered your first child?

Grade 5 or lower	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11

- **If Yes:** Was grade 12 your highest level of education when you delivered your first child? **Yes** **No**
- **If No:** What was your highest level of education when you delivered your first child?

Certificate/Diploma	Bachelors' Deg.	Honor's Degree	Master's Degree	Doctorate

### 10. Marital Status at Delivery

- What was your marital status when you delivered your first child?

<b>Marital Status</b>	<b>Tick one</b>
Single	
Not married and not living together, but in a committed relationship/partnership	
Not married but living together	
Married (including traditional or customary)	
Divorced or separated	
Widow/widower	



## Appendix C: Interview Guide

### Interview Guide for Participants

#### **Introductory Questions**

Thank you so much for coming in to speak with me today! My name is Marcie Kirschner, and I am a guest researcher working with the Birth to Twenty research group this summer. This study is being conducted to help understand what influences a mother's behavior, attitudes, and the decision making process regarding nutrition and exercise for both mother and her child. This information will eventually be published to help our understanding in public health. The questions I would like to ask you focus on what you and your child eat and do for exercise in the past, present, and goals for the future. I am very interested in your experiences and want you to feel comfortable speaking with me. This interview is voluntary and confidential, and everything that we discuss will not be shared with anyone who is not directly related to this project. Let's review this information sheet...

When we first contacted you, it was mentioned that this interview would be recorded. This is so that I can better remember everything you say today. If you are okay with this interview being recorded, could you please sign the audio recording consent form?

Throughout the interview, I may take notes on this paper, but that is only to remind myself of things to ask you later so that I do not interrupt you.

Do you have any questions for me? Great. Let's get started by filling out this demographic questionnaire...

1. Please tell me about yourself.
  - Probes:* -Please tell me about your child.
  - Please tell me about your household.

#### **Current dietary habits and attitudes**

2. Let's now talk about what you eat. What meals do you eat on an average day?
  - Probes:* -What factors do you think about when deciding how to eat and what to eat? (*Affordability, access, culture, time to prepare food, number of people in household*)
  - Where do you get your information on healthy food and healthy eating?
  - Do you consider the foods you eat healthy? Why or why not?
  - How do you feel about healthy eating now? Is it important in your life?
3. Please tell me about how meals are currently prepared in your household.

*Probes:* -Does your family have a routine involving meals? If so, please describe this routine. (*Cooking together, helping out, eating together, washing up*)

-Is there consistently enough food to eat?

-Do you and your family eat most meals at home, or do you eat out? If so, where and how often?

-Do you think that the food you eat out at restaurants is healthy? Why or why not?

### **Personal dietary habits and attitudes while participant was growing up**

4. Let's talk about what you ate while you were growing up. Please tell me about how meals were prepared in your household before you turned 18 years old.

*Probes:* -Did your family have a routine involving meals? If so, please describe this routine. (*Cooking together, helping out, eating together, washing up*)

-Where did you get your information on healthy eating and healthy food when you were a child?

-In what ways did your family discuss healthy eating with you as a child?

-Did you and your family eat most meals at home, or did you eat out?

5. While growing up, did your family ever experience a time when there wasn't enough food to eat? If so, please tell me about a time this happened.

*Probes:* -What caused there to not be enough food for you and your family?

-What did your family do about food during this time?

### **Dietary habits and attitudes during pregnancy**

6. What changes did you notice in what you ate when you became pregnant?

*Probes:* -What did you think about when you were deciding what to eat while you were pregnant?

-How did your attitude towards healthy eating change once you became pregnant?

-Did you have any healthy or unhealthy recurrent cravings while pregnant? Please tell me about them.

7. Did anyone talk to you about what you should eat while you were pregnant? If so, what did they tell you?

*Probes:* Were there any people who gave you advice on what you should eat while pregnant that you did not take?

-How else did you know what you should eat while you were pregnant?

8. In what ways did your neighborhood influence your food choices while you were pregnant? (*Food advertisements, people around you*)

*Probes:* -In what ways did your culture influence your food choices while you were pregnant?

### **Dietary habits and attitudes while currently raising her child**

9. What changes did you notice in what you ate after you had your child?  
*Probes:* -What did you consider when deciding what to eat after you had your child? (*Affordability, access, culture, time to prepare food, number of people in household*)  
 -How did your attitude towards healthy eating change once you had your child?
10. Once your child was born, did you breastfeed him/her? If so, for how long did you breastfeed? If not, why did you choose not to breastfeed?  
*Probes:* -At what point did you introduce anything besides breast milk to your infant? What prompted you to do so?  
 -At what point did you introduce solid foods to your infant? What prompted you to do so?
11. What does your child currently eat on an average day?  
*Probes:* -Why do you feed your child these food items?  
 -Do you feel that what your child's eats is healthy? Why or why not?  
 -Does your child express that he/she likes or dislikes the food items?
12. Does anyone talk to you now about what you and your child should eat? If so, what do they say?  
*Probes:* -In what ways do these people influence you?  
 -Are there people who give you advice on what you and your child should eat that you do not take?
13. How do you know what you should eat and how much you should eat?  
*Probes:* -How do you know what your child should eat and how much your child should eat?

### **Intentions for future dietary habits**

14. Now I would like to talk about your intentions for what you plan for both you and your child to eat in the future. Are there any changes you would like to make to what you eat in the future?  
*Probes:* -What kind of foods do you imagine your child will eat as he/she grows up?  
 -In what ways do you plan to discuss food and nutrition with your child?  
 -What topics do you plan to discuss with your child about food and nutrition?

### **Thoughts on healthy diet and healthy children**

15. What do you think of when you think of healthy eating and healthy food?  
*Probes:* -Can you please list healthy foods for me? Do you believe you and your child eat these foods frequently enough?

-What do you think a healthy child eats?

### **Current physical activity habits and attitudes**

16. Now let's change topics and discuss exercise. What are your activity patterns over a typical day or week?

*Probes: -(If participant does not exercise) Do you remember the last time you exercised? Please tell me about it.*

-What do you think is the difference between healthy activity and exercise?

-Do you do housework on an average day? If so, please tell me about it.

-Do you consider housework to be a healthy activity?

-Do you walk for transportation? If so, how far do you walk? Do you do this regularly?

-What factors do you consider when deciding how and when to exercise?  
(*Time, access, safety*)

-How do you feel about exercise now? Why do you feel this way?

-Are you satisfied with your current exercise habits? Why or why not?

### **Personal exercise habits and attitudes while growing up**

17. Let's talk about exercise while you were growing up. Did you participate in sports, school-related, or extra-curricular physical activity before you turned 18? If so, please tell me about it.

*Probes: -How did you feel about exercise as a child? Why did you feel this way?*

-What changes did you see in your physical activity levels as you grew up?

Did you take up any new sports or join a gym?

### **Physical activity habits and attitudes during pregnancy**

18. What changes did you notice in how you exercised when you became pregnant?

*Probes: -What did you consider when deciding how and when to exercise?  
(Time, access, safety)*

-How did your exercise change when you became pregnant?

-How did your attitude towards exercise change once you became pregnant?

19. Did anyone talk to you about exercising while you were pregnant? If so, what did they tell you?

*Probes: -Were there any people who gave you advice about exercising while pregnant that you did not take?*

-How else did you know how you should exercise while you were pregnant?

20. In what ways did your neighborhood influence how you exercised while you were pregnant? (*Community gym, friends who exercised*)

*Probes: -In what ways did your culture influence how you exercised while you were pregnant?*

### **Physical activity habits and attitudes while raising her child**

21. What changes did you notice in how you exercised after you had your child?

*Probes:* -What factors did you consider when deciding how and when to exercise after you had your child? (*Time, access, safety*)

-How did your attitude towards exercise change after you had your child?

22. Does your child engage in exercise? If so, what does your child do?

*Probes:* -Does your child tell you if he/she enjoys exercising?

23. Does anyone talk to you about exercise in children? If so, what do they say?

*Probes:* -Are there any people who give you advice about how you and your child should exercise that you do not take?

24. How do you know how much you should exercise?

*Probes:* -How do you know how much your child should exercise?

### **Intentions for future physical activity**

25. Now I would like to talk to you about your future exercise intentions for both you and your child. Are there any changes you would like to see in your exercise in the future?

*Probes:* -What kind of exercise do you imagine your child will participate in as he/she grows up?

-In what ways do you plan to discuss exercise with your child?

-What topics do you plan to discuss with your child about exercise?

### **Thoughts on healthy physical activity and healthy children**

26. When I say exercise, what do you think of?

*Probes:* -Can you please list activities you consider to be exercise? Do you and your child do this frequently enough?

-How often do you believe an adult should exercise to be healthy?

-How often do you believe a child should exercise to be healthy?

Thank you so much for all of your time! The stories you told and the information you provided were extremely helpful and I greatly appreciate it.

## Appendix D: Code Tree and Codebook used for Analysis

### Code Tree

- 1. Information sources on nutrition and physical activity**
  - 1.1. Family Members
  - 1.2. Health-focused professionals/classes
  - 1.3. Media
  - 1.4. People outside of the family
- 2. Health Behaviors**
  - 2.1. Participant's response to advice
  - 2.2. Self-responsibility for exercise and diet of self and family
  - 2.3. Positive shifts in healthy eating or exercise
  - 2.4. Negative shifts in healthy eating or exercise
  - 2.5. Breastfeeding/early feeding habits
  - 2.6. Participant's diet and exercise habits
  - 2.7. Child's diet and exercise habits
  - 2.8. Healthy-unhealthy dichotomy
  - 2.9. Child healthy-unhealthy dichotomy
- 3. Health Attitudes**
  - 3.1. Things considered/Motivators
  - 3.2. Reasons for specific breastfeeding and early feeding practices
  - 3.3. Participant's perception of healthy food and/or exercise
  - 3.4. Child or family's perception of healthy food and/or exercise
  - 3.5. Change for better in future
  - 3.6. Satisfied with current habits
- 4. Important Quote**

### Codebook

Code	Description
<b>1. Information sources on nutrition and physical activity</b>	
1.1 Family Members	Information on nutrition, physical activity and/or breastfeeding was sought out or provided by a family member. This family member can be related both by blood such as the participant's parents, siblings, or grandparents, and those not related by blood, such as her partner/father of the child/children, and family of the child's/children's father.
1.2 Health-focused professionals and/or classes	Information on nutrition, physical activity, and/or breastfeeding was sought out or provided in school, Life Orientation class, in the clinic or by other health personnel, and/or the Birth to 20 study.
1.3 Media	Information on nutrition and/or physical activity was sought out or provided through the Internet, television, magazines, and/or newspapers.

1.4 People outside of the family	Information on nutrition and/or physical activity was sought out or provided by the participant's friends, co-workers, or other people outside of the participant's family.
<b>2. Health Behaviors</b>	
2.1 Participant's response to advice	<p>The participant either took or did not take provided advice from the information source.</p> <p>Taking the advice indicates the participant found the information helpful and useful to her life and thus listened to the information.</p> <p>Not taking the advice indicates the participant did not find the information helpful and useful to her life and thus did not listen, or the participant didn't want to listen to the advice.</p>
2.2 Self-responsibility for exercise and diet of self and family	The participant sought out information or took initiative to keep herself and her family healthy, such as making own meals, going grocery shopping, checking nutrition labels, self-research, rarely/never eating meals out.
2.3 Positive shifts in healthy eating or exercise	A positive shift to healthier eating or more frequent exercise. Due to having more money, having more time, gym access with a job, gym membership, becoming pregnant, wanting to lose weight, etc.
2.4 Negative shifts in healthy eating or exercise	A negative shift to less healthy eating or less frequent exercise. Due to stopping sports after high school, no longer living with a family member who made healthy meals, lack of money, lack of gym access, becoming pregnant, etc.
2.5 Breastfeeding/early feeding habits	When a participant discusses her history with breastfeeding her child or children, and the child/children's early eating habits.
2.6 Participant's diet and exercise habits	A participant's report of her own diet and exercise habits at any point in her life.
2.7 Child's diet and exercise habits	A participant's report of her child's diet and/or exercise habits.
2.8 Healthy-unhealthy dichotomy	When a participant claims she is healthy, but does not think she eats indicated healthy food items/does not exercise enough. This code will be used when at the beginning of the interview, a mother claims she eats healthy/exercises enough, but when listing healthy food/activities, she notes these are not done frequently enough.
2.9 Child healthy-	When a participant claims her child is healthy, but

unhealthy dichotomy	does not think the child eats indicated healthy food items/does not exercise enough. This code will be used when at the beginning of the interview, a mother claims her child eats healthy/exercises enough, but when listing healthy food/activities, she notes her child does not do these frequently enough.
<b>3. Health Attitudes</b>	
3.1 Things considered/Motivators	<p>The participant discusses things she considers when deciding what to cook, what to purchase at the grocery store, how/when to exercise. Can include that she does not consider anything when making health decisions and/or eats whatever she wants to eat or is craving at the time.</p> <p>Includes reasons for eating healthy and/or exercising, and reasons for not eating healthy and/or exercising.</p> <p>Reasons for eating healthy and/or exercising can include weight loss, being healthy, feeling better when eating healthy, being toned, needing to walk for transportation, bonding between mother and child, link between race and health, easy access to a gym, etc.</p> <p>Reasons for not eating healthy and/or exercising can include time, money, bland food, doesn't feel like healthy eating or exercise is necessary for them personally, laziness, dislikes exercise, dislikes healthy eating, eating fast food is a special occasion once/month, link between race and health, no access to a gym, etc.</p>
3.2 Reasons for specific breastfeeding and early feeding practices	Reasons for her breastfeeding choices, such as the participant did or did not want to breastfeed, the participant's child did not want to breastfeed, positive or negative perceptions for other reasons. Also includes reasons for early feeding choices for her child/children.
3.3 Participant's perception of healthy food and/or exercise	When a participant mentions her perception of healthy food and/or exercise that she felt at any point in her life. Includes listing of healthy foods and exercise activities, feeling better/worse when eating healthy and/or exercising, seeing positive results in self or others, noting it is not necessary for her personally, being healthy is expensive, etc.
3.4 Child or family's	Includes any time her child or family members



perception of healthy food and/or exercise	(partner, parents, in-laws, other) has mentioned their perception of healthy food, not just information on healthy food.
3.5 Change for better in future	A participant noted she wants herself and/or her family to eat healthier and/or exercise more in the future.
3.6 Satisfied with current habits	A participant noted she is happy with her and/or her family's current diet and exercise habits and they do not need to change in the future.
<b>4. Important Quote</b>	

**Appendix E: Table 2. Continuous Characteristics of Interviewed Members of the Birth to 20 Cohort as a whole and by Group**

**Table 2. Continuous Characteristics of Interviewed Members of Birth to 20 Cohort as a whole and by Group**

	All Participants (n=22)		Group 1 Participants (n=11)		Group 2 Participants (n=8)		Group 3 Participants (n=3)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Interview length (minutes:seconds)	37:00	19:09	38:43	23:26	37:55	16:35	28:15	2:56
Mother's age at delivery of 3G child (years)	19.9	1.4	19.9	1.5	20.1	1.5	19.3	1.5
3G child's birth weight (kg)	2.9	0.4	2.8	0.4	3.0	0.5	3.2	0.2
Mother's BMI (kg/m <sup>2</sup> )	22.2	1.5	22.0	1.9	22.1	1.3	22.7	0.8
3G child's age at time of interview (years)	3.7	1.3	3.6	1.2	3.6	1.6	4.6	1.3
3G child's BMI (kg/m <sup>2</sup> )	17.4	1.6	15.9	0.7	18.5	0.8	19.4	0.7
3G child's Z-score based on BMI-for-age	0.9	1.0	0.0	0.3	1.8	0.2	2.2	0.1

### Appendix F: Table 3. Categorical Characteristics of Interviewed Members of Birth to 20 Cohort as a whole and by Group.

**Table 3. Categorical Characteristics of Interviewed Members of Birth to 20 Cohort as a whole and by Group**

	All Participants (n=22)	Group 1 Participants (n=11)	Group 2 Participants (n=8)	Group 3 Participants (n=3)
	No.	No.	No.	No.
Number of children				
1	15	6	7	2
2	7	5	1	1
3G child's gender				
Female	13	7	5	1
Male	9	4	3	2
Employed at time of interview				
Yes	9	4	3	2
No	13	7	5	1
Highest completed level of education at interview				
Grade 10	3	2	0	1
Grade 11	5	1	3	1
Grade 12/Obtained Matric Certificate	10	6	4	0
Certificate/Diploma	3	2	0	1
Bachelor's Degree	1	0	1	0
Marital status at interview				
Married (including traditional or customary)	1	1	0	0
Not married but living together	6	3	1	2
Not married and not living together, but in a committed relationship/partnership	8	5	2	1
Single	7	2	5	0
Employed at time of delivery				
Yes	7	4	2	1
No	15	7	6	2
Highest completed level of education at delivery				
Grade 10	3	2	0	1
Grade 11	11	1	3	1
Grade 12/Obtained Matric Certificate	12	8	5	0
Certificate/Diploma	1	0	0	1
Marital status at delivery				
Not married but living together	3	2	1	0
Not married and not living together, but in a committed relationship/partnership	11	6	5	0
Single	8	3	2	3

## Appendix G: Figure 1. Thematic Mapping of Factors that Affect Mother's Decision-Making

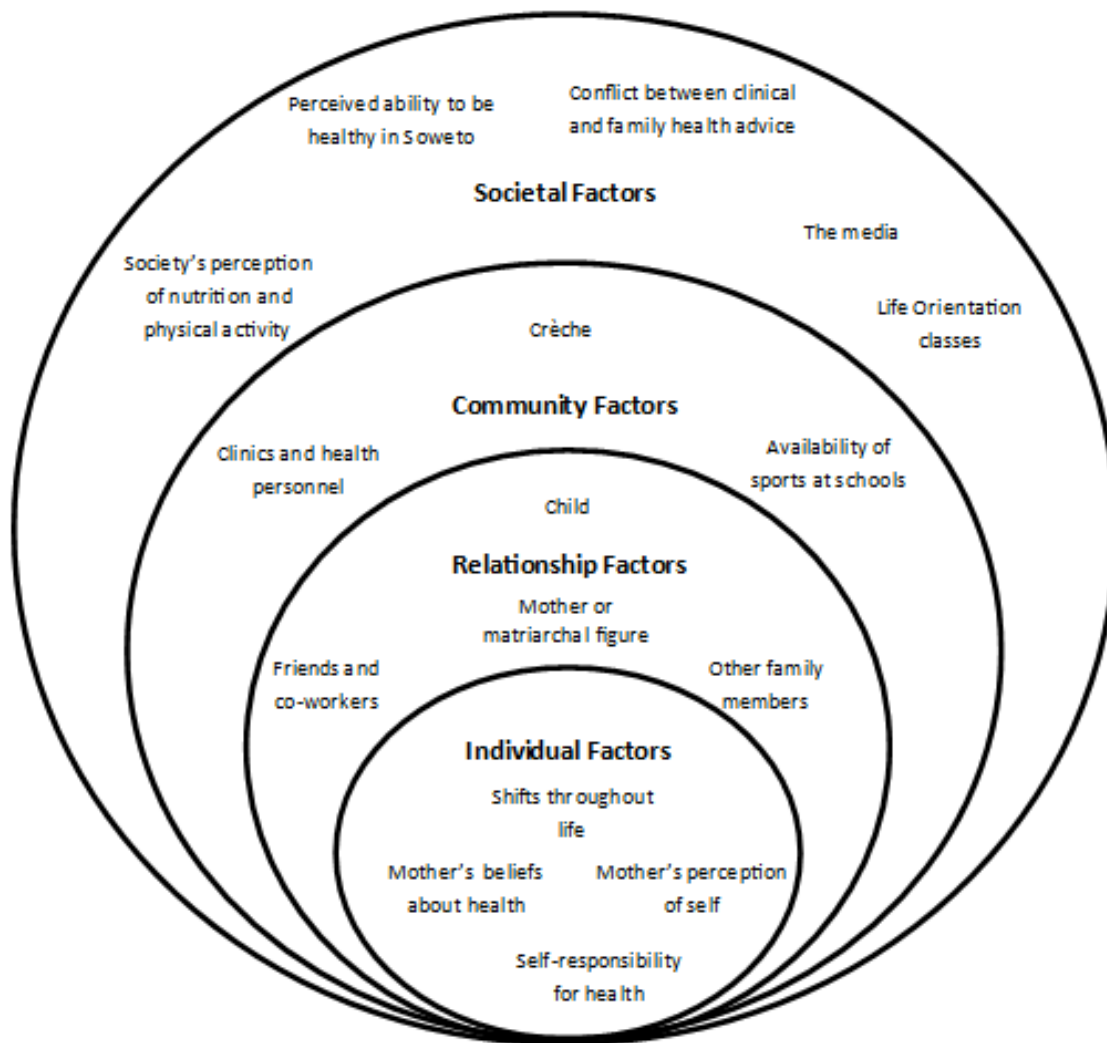


Figure 1. Thematic Mapping of Factors that Affect Mother's Decision-Making