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Impact of Single Motherhood on Child Nutrition and Health in Kgatleng District, Botswana

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Walden University
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Abstract

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by

Franklin Mwamba

MD, University of Lubumbashi, 2003

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health Epidemiology

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Abstract

Malnutrition affects sub-Saharan African countries with increased stunting among under-5 children. The short- and long-term effects of this stunting include the potential for slow growth in early life, impaired health, and educational and economic disadvantages in adolescent and adult years. The purpose of this quantitative cross-sectional study was to analyze the relationship between single-mother families and the occurrence of malnutrition (stunting) among under-5 children in the Kgatleng district of Botswana. Bronfenbrenner's ecological model was applied to investigate factors that lead to stunting among these children. Primary data were collected from 196 mothers and their children who visited selected clinics in Kgatleng. Binary logistic regression was used to determine the most effective predictors of stunting in under-5 children and analyze contributing factors. Results showed a significant relationship between family structure (single-mother families, two-parent families) and stunting in the bivariate analysis. There was a statistically significant relationship between large family size (OR = 1.172; 95% CI = 0.012, 1.356; $p < 0.034$), mother's age at the birth of her first child (OR = 0.202; 95% CI = 0.063, 0.648; $p < 0.007$), mother's education level (OR = 0.199; 95% CI = 0.042, 0.943; $p < 0.042$), and stunting among under-5 children. The prevalence of stunting was estimated at 42.4% (n = 83). Findings also indicated increased odds of stunting among children aged 12-24 months. Overall, this study shows that single motherhood is not a unique determinant for stunting. Results promote social change by increasing awareness among health professionals to continually check linear growth of under-5 children to curb the deleterious effects and the social inequalities caused by stunting.

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Dedication

I dedicate this dissertation to my loving wife, Mbuyu Mukala Sylvie, for her unconditional love. Your comforting, unwavering support, and prayers went a long way to bring this work to light in spite of the difficult times we went through this process. This work is dedicated to my late father, Benjamin Mwamba Seya Mukulu, who would have loved to see this achievement. I salute his memory. All Praises be to God.

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Chapter 1: Introduction to the Study

Malnutrition impedes children from attaining their full physical and mental potential (Fentahun et al., 2016). Worldwide, it is estimated that about one quarter (26%) of children are stunted. Stunting, a subset of undernutrition, as opposed to wasting demonstrates a cumulative effect of chronic food deprivation and affects many developmental aspects and functions, morbidity, and mortality of the under-5 children including in their later life (Fentahun et al., 2016). In particular, developing countries share a significant burden of approximately 80% of the global undernutrition due to substandard and insanitary conditions as compared to developed countries (Fentahun et al., 2016). This is despite the global decline in the prevalence of undernutrition as per the 2015 Millennium Development Goals (MDG) report (Akombi, Agho, Hall, Wali, et al., 2017). Researchers who examined under-5 children and the impact of socioeconomic, demographic, and cultural factors associated with child malnutrition in sub-Saharan Africa demonstrated that causes of undernutrition were multisectoral rather than isolated to one individualized cause (Akombi, Agho, Hall, Merom, et al., 2017).

Of interest to this study is evidence that child malnutrition is a persistent problem in Botswana and that there are significant disparities in its prevalence both across and within districts (Nnyepi et al., 2010). Also of concern is the impact of single motherhood on increased risk of mortality for children brought up in one-parent household as compared to children raised in two-parent households (Ntoimo & Odimegwu, 2014) and the likelihood of worse health outcomes among children in settings where poverty is both cause and consequence of single motherhood (DeRose et al., 2017). In this study, I

analyzed the association between single motherhood and malnutrition (stunting) in the under-5 children in Kgatleng District, Botswana. In Botswana, many homes are dysfunctional and not stable; oftentimes, children are left with their mothers as sole caretakers. Thus, there is the potential for improving the nutritional status of under-5 children and for identifying holistic ways of dealing with malnutrition in Kgatleng District. Chapter 1 covers the study background, purpose, and the theoretical framework. Research questions and hypothesis, definition of terms, scope and delimitations, and limitations are also discussed.

Background

Stunting remains a public health problem of great significance in developing countries, and Botswana is no exception (Said-Mohamed et al., 2015). Health consequences related to malnutrition are various and include delayed development, increased susceptibility to diseases, a lower IQ, greater behavioral problems and deficient social skills (Kandala et al., 2011). In developing countries, researchers have shown a worse health outcome experienced by under-5 children living with single mothers and cohabiting households as compared to married mothers (Derose et al., 2017). Globally, there has been an appreciable decrease of cases of stunting among under-5 children. For instance, researchers noted a drop of about 16% of cases of stunting between 1990 and 2015, where the prevalence ranged between 40% and 24% respectively. However, sub-Saharan African countries still account for a large proportion of undernutrition cases as compared to the rest of the world (Acharya et al., 2018). According to the 2015 MDG report, sub-Saharan Africa accounts for one third of all world's undernourished children with about

39% stunted under-5 children (Akombi, Agho, Hall, Wali, et al., 2017). The authors suggested that undernutrition still remains a public health challenge of great concern in sub-Saharan Africa and a need exists to address undernutrition (stunting) in a more holistically manner including targeting the immediate, underlying and basic determinants of child undernutrition. Akombi, Agho, Hall, Wali et al. (2017) examined factors associated with stunting, wasting, and underweight in sub-Saharan Africa. The authors found that mother's education level, income, body mass index (BMI), and residence as well as child's birth weight, exposure to breastfeeding, and source of drinking water were factors in the development or absence of stunting, wasting, and undernutrition (Akombi, Agho, Hall, Wali et al., 2017). For example, Aguayo et al. (2016) found that for birthweight and feeding practices, women's nutrition status and household sanitation, and poverty were the most significant predictors of stunting and poor linear growth in children under 2 years of age. Darteh et al. (2014) found that being male and number of children in households played a significant role in the occurrence of stunting. Children in households with five to eight children were at 1.3 times greater risk of being stunted than were children in households with 1 to 4 children (Darteh et al., 2014).

Moreover, researchers found that mother's age was a significant predictor of stunting with children whose mothers were aged 35–44 years being more likely to be stunted (Darteh et al., 2014). As previously stated, stunting results from a prolonged food deprivation and can result in serious health complications; it is the best overall indicator of children's well-being and a precise reflection of social disparities (de Onis & Branca, 2016). Conditions such as food deprivation may be more prevalent in Botswana, where

women are the majority of the population and live in poverty with less access to and less control over economic resources and skilled training (Lesetedi, 2018). Researchers found that, relative to male-headed household, female-headed households in Botswana survive on the bottom incomes rank, and hence have the potential for poor health outcome of their under-5 children (Lesetedi, 2018). Researchers in both Western countries and in three sub-Saharan countries showed a link between single motherhood and poorer physical and mental health, and a higher risk of mortality for children born in single-mother household as compared to children raised in two-parent households (Ntoimo & Odimegwu, 2014). Raymo (2016) citing Hanson's work, noted that children living with single parents, as compared to children living with both biological parents, did not perform well in terms of economic, psychological, educational, and behavioral outcomes and that the differences were observed across racial and socioeconomic groups. Raymo also noted a moderating effect played by family or kin support that could reduce the effect of single parenthood on children outcome. To my knowledge, there are no studies in Kgatleng that have examined stunting of under-five children in single-mother families relative to children living with both parents. In this study, I will analyze the relationship between single-mother families and the occurrence of stunting in under-5 children. The findings from this study will enhance understanding of various factors leading to stunting and will help close a gap by increasing the knowledge of different stakeholders working at reducing malnutrition in under-5 children especially about the role played by single mothers.

Problem Statement

The impact of single motherhood on under-5 children increases the likelihood of stunting, a chronic form of undernutrition compared to children of married mothers in a union (Ntoimo & Odimegwu, 2014; Olamijuwon et al., 2017). This is of concern in sub-Saharan Africa, where single motherhood is a risk factor for children's nutritional status and chances of survival before the age of 5 (Clark & Hamplová, 2013; DeRose et al., 2017). In particular, in southern Africa, the risk of marasmus, a severe form of malnutrition is highest for children of single mothers (Olamijuwon et al., 2017).

Efforts made by many developing countries towards reducing the effects of malnutrition on under-5 children are acknowledged (Ramanujam & Richardson, 2018). However, notwithstanding some progress, stunting in Africa and particularly in southern Africa remains a persistent and prevalent concern despite economic growth, positive political action, social advances and national nutrition programs (Said-Mohamed et al., 2015). For instance, the most recent estimate of undernutrition showed that 160 million under-5 children in low- and middle-income countries suffer from stunting (Ricci et al., 2019). The prevalence of stunting among children in Africa is 35.6% for Africa as a whole, but higher at 39.6% in southern Africa (Food and Agriculture Organization of the United Nations [FAO], 2013).

Malnutrition, even though in decline, is still a problem in Botswana, a south African country, with prevalence of stunting among children at 31.4% as well as prevalence of micronutrient deficiencies classified as moderate to severe by the FAO (FAO, 2013). Ranging from severe nutrient insufficiencies to extreme obesity,

malnutrition is both undernutrition and overnutrition (Yadav et al., 2016). Of concern to this problem is the change in the Botswana family structure. Botswanan women have the burden of raising their children alone as marriages or cohabiting is on the decline (Dintwat, 2010). The traditional nuclear family or extended family has been replaced by a single head of household family and women now lead their families in up to 60% of households. This disruption of the nuclear family has played a negative role in children's health status and in the loss of empowerment by women (Dintwat, 2010). Researchers have documented the long-reaching consequences of early family disruption on health outcomes of their children, especially on adult height (Sheppard et al., 2015).

Liu et al. (2016) report that child survival has noticeably improved in the MDG period even though the targeted two-thirds reduction was not attained by most countries. As a result, the United Nations Children's Fund (UNICEF) made a priority call to all African countries, including Botswana, to reduce the under-5 mortality rates to 25 per 1000 live births or below by 2030 to keep up with the sustainable development goals in view of creating equity among under-5 children (Liu et al., 2016). In response to this call to action, with concern for the high prevalence of stunting among children and awareness of changes in family structure potentially disadvantaging women, the Botswana Ministry of Health, via the District heath management team of Kgatleng, encourages research on single motherhood and impact of malnutrition in under-5 children. Little is known about the impact of single motherhood in the Kgatleng district and about factors that impact the nutritional status of children living in single-mother households and those from households led by two parents (Ntoimo & Odimegwu, 2014). Contemporary researchers

have called for studies that could focus on family-based public health interventions, mostly those targeted at single-mother households (Ntoimo & Odimegwu, 2014) and proposed further studies that could investigate the relationship between single motherhood and the nutritional status of under-5 children, taking into account the timing of marital dissolution and restoration as well as biological relationships in each type of family structure. Thus, this study filled a gap in the research by focusing on single motherhood and its impact on children's nutrition and health in Kgatleng District as well as considering family structure and potential for health interventions all of interest to the Botswana Ministry of Health.

Purpose

The purpose of this quantitative study was to examine the relationship between single motherhood and the occurrence of malnutrition, mainly stunting among under-5 children in Kgatleng District, Botswana. In this study, the timing of marital dissolution and restoration as well as biological relationships in each family structure was studied in view of finding factors that lead to malnutrition in the under-5 children. Single mothers of interest were mothers whose current marital status was never married, widowed, divorced, and/or separated. *Married* included those who were engaged in union, whether married or living together in Kgatleng District (Ntoimo & Odimegwu, 2014).

As defined by the World Health Organization (WHO), *malnutrition* is categorized as *stunting* (i.e., low height for age), *wasting* (i.e., low weight for height) and *underweight* (i.e., low weight for age; Kandala et al., 2011). In this study, stunting was employed as an index of growth retardation to categorize the nutritional status of the

under-5 children. Because stunting is less sensitive to temporary food shortages, it is therefore accepted to be a more reliable indicator of malnutrition in under-5 children.

Research Questions and Hypotheses

Research Question 1: What is there the relationship between family structure (single-mother families, two-parent families) and the occurrence of stunting in under-5 children in Kgatleng District, Botswana after controlling for number of people living in the household, mother's age at birth of first child, mother's education level, income level, and birth order?

$H_0$1: There is no relationship between family structure (single-mother families, two-parent families) and the occurrence of stunting among under-5 children.

H_A1: There is a relationship between family structure (single-mother families, two-parent families) and the occurrence of stunting among under-5 children.

Research Question 2: What is the relationship between family type (nuclear family, extended family) and stunting in under-5 children in the Kgatleng district, Botswana after controlling for mother's age at birth of their first child, mother's employment, age at which babies should start eating solid foods in addition to breast milk or formula, child birth order, and number of people living in household?

$H_0$2: There is no relationship between family type (nuclear family, extended family) and stunting in under-5 children in the Kgatleng district, Botswana.

H_A2: There is relationship between family type (nuclear family, extended family) and stunting in under-5 children in the Kgatleng district, Botswana.

In this study, the independent variables were family structure (comprising single-mother families and two-parent families) and family type (nuclear family, extended family). Single motherhood, labelled as “single-mother families” was measured as a categorical variable and included never married, divorced/separated, and widowed, whereas two-parent families included currently married mothers, cohabiting or living together (Ntoimo & Odimegwu, 2014). Currently married was coded as 1; never married was coded as 2; cohabiting/living together was coded as 3; divorced/separated was coded as 4; and widowed was coded as 5 (see Ntoimo & Odimegwu, 2014). The dependent variable was the nutritional status of the selected under-5 children. In this case, stunting was measured as the proportion of children whose height-for-age was less than minus two standard deviations below the WHO height-for-age or length-for-age standard median. The values were categorized into two: those whose height-for-age was below minus 2 standard deviation was stunted were coded 1; others not stunted were coded 0 (Ntoimo & Odimegwu, 2014).

Theoretical Framework for the Study

To better understand and prevent the occurrence of stunting—the health outcome of interest, a holistic, multidisciplinary, and multilevel approach based on Bronfenbrenner’s ecological model was used (Bronfenbrenner, 1989; Ferguson et al., 2013). Bronfenbrenner (1989) argued that a person's (i.e., child’s) development is affected by everything in their surrounding environment. This idea is applicable to this study because under-5 children malnutrition (stunting) cannot be explained by one isolated factor but rather by jointly, inclusive factors working as a system emanating from

child, mother, family, and the community at large (Jones et al., 2003). For instance, parental monitoring has been considered as a vital parenting skill and has been found to be relevant to a variety of child and adolescent outcomes (Jones et al., 2003).

Bronfenbrenner's ecological systems theory (EST) is comprised of five different levels or aspects of the environment: the microsystem, mesosystem, exosystem, macrosystem, and chronosystem (Neal & Neal, 2013). The EST offers the best framework for this study as it considers individuals in ecological contexts (Neal & Neal, 2013). Bronfenbrenner's model for causes of malnutrition (stunting) in this study includes age, sex, and health of the under-5 children at the individual level, while at the microsystem level, causes of malnutrition (stunting) consist of immediate environments like nuclear and extended family, neighborhood, and access to health services (Bronfenbrenner, 1989; Ferguson et al., 2013). The mesosystem in this study is viewed as the relationship between under-5 children and their family for instance, whereas the exosystem of Bronfenbrenner's model is used to help understand the relationship between mother’s education level, marital status, and income level versus under-5 children and their health outcome (Bronfenbrenner, 1989; Ferguson et al., 2013). The sociocultural, economic, and political context is studied at the macrosystem level, and time of first marriage and time on first childbearing is examined at the chronosystem level (Bronfenbrenner, 1989; Ferguson et al., 2013).

Nature of the Study

The nature of this study was a descriptive, nonexperimental, quantitative approach. Quantitative research consists of the collection and analysis of numerical data,

which are typically rendered in the form of statistics (Denzin & Lincoln, 2005). Supporters of quantitative studies tend to prefer such types as descriptive (or survey), correlational, causal-comparative, and experimental research (Denzin & Lincoln, 2005). I used binary logistic regression analysis to study the association between single motherhood and the occurrence of malnutrition (stunting) among under-5 children in Kgatleng district by determining the predictor variables amongst variables selected (see Manjunath et al., 2014). The multivariate helped in the analysis of under-5 children's characteristics such as height-for-age and their relationship with single motherhood and other variables of interest (Manjunath et al., 2014).

This study used primary data collected from five clinics in Kgatleng District using child welfare clinics where mothers weigh their under-5 children on weekly basis. I obtained permission from the Botswana Ministry of Health prior to collection of any data. Under-5 cards (Under-5 welfare card containing child health Information) were utilized for confirmation of demographic data of selected children and their anthropometric measurements using standard techniques as per the WHO. Other pertinent information on dietary habits, parent and child-related socioeconomic status, and parent marital status was ascertained using structured interviews (see Hagos et al., 2017).

Definitions

Motherhood: In the African context, motherhood is a feminine natural ability and responsibility for women to bear their own children and to love, embrace, and cherish them. In numerous African societies, motherhood is culturally and religiously constructed (Chisale, 2018).

Single mother: A single mother is defined as a woman who has given birth to a living child, who either lived with a partner or was married before, widowed, or separated during the survey periods (Izugbara, 2016).

Ever-married woman: A woman who has been married at least once in their lives, although their current marital status may not be married (Izugbara, 2016).

Married women: Women who are engaged in union, whether married or living together in Kgatleng district (Ntoimo & Odimegwu, 2014).

Male- headed household: Household headship where the husband is present and active in decision-making (Mikalitsa, 2015).

De facto female-headed household: Household headship where the husband lives far from the household but keeps regular contact and continues to support the family including sending funds (Mikalitsa, 2015).

De jure female-headed household: A household where the woman stands as head of household because she is a widow, divorced, or separated (Mikalitsa, 2015).

Household: A unit composed of one or more persons "living together under the same roof" and "eating from the same pot" and or making common provision for food and other living arrangements (Central Statistics Office, 2011).

Nuclear family households: Families comprising the children, their mother and her spouse while extended family households include other adults who may be other spouses, relatives and/or nonrelatives (Akinyemi et al., 2016).

Body mass index (BMI): BMI is calculated from an individual's weight in kilograms divided by the square of height in meters. Childhood BMI is age-and sex-

specific (Centers for Disease Control and Prevention [CDC], 2015). I will use the BMI as proxy for the health nutritional status of the mothers.

Childhood healthy weight: Normal or healthy weight status is based on BMI between the 5^{th} and 85^{th} percentile on the CDC growth chart (CDC, 2015). Body mass index percentile is considered the best indicator to assess the size and growth patterns of individual children in the United Sates (CDC, 2015).

Linear growth retardation: Linear growth retardation (or linear growth faltering) is failure to reach one's linear growth potential. Linear growth retardation implies that (groups of) children are too short for their age but does not imply that they are stunted (Leroy & Frongillo, 2019).

Stunting: Is the proportion of children whose height is less than minus two standard deviations below the WHO's Child Growth Standards median for the same age and sex (de Onis & Branca, 2016; Leroy & Frongillo, 2019). Equally, children are categorized as severely stunted if their length/height is less than minus three standard deviations (−3 SDs) from the WHO Child Growth Standards median for the same age and sex (de Onis & Branca, 2016).

Income and household consumption: Index of household wealth, mother's occupation, education, and place of residence will be used as measures of economic resources (McGovern et al., 2017).

Kinship: Social connections that could influence children well-being (Ntshebe et al., 2019).

Under five card: It is a child clinic card, a key tool to assist health workers in providing integrated care to an individual child. It contains a chart needed to record and assess the growth of a child from birth up to 5 years of age (Banda et al., 2020).

Food insecurity: A state or a condition in which people experienced limited or uncertain physical and economic access to safe, sufficient, and nutritious food to meet their dietary needs or food preferences for a productive, healthy, and active life (Motbainor et al., 2015).

Exclusive breastfeeding: The infant has received only breastmilk from his or her mother or wet-nurse or expressed breast milk and no other liquids or solids, with the exception of drops or syrups consisting of vitamins, mineral supplements, or medicines (Binns & Lee, 2014).

Assumptions

The following assumptions guided the study: first, it was assumed that mothers or caretakers were able to give proper information when being interviewed/filling the questionnaire on their marital status, family structure, and their under-5 children characteristics. It was also assumed that the sample size from this study would be representative enough to draw conclusions that permit for generalization of results.

Scope and Delimitations

Scope

This quantitative study examined the relationship between single motherhood and the occurrence of malnutrition (stunting) in under-5 children in the Kgatleng district. Specifically, I studied the relationship between family structure (single-mother families,

two-parent families) and the occurrence of malnutrition (stunting). In addition, I explored the relationship between family type (nuclear family, extended family) and the occurrence of malnutrition (stunting). Primary data for this study were gathered from different clinics in the District using a questionnaire that was provided to mothers or caretakers who were willing to participate in the study. The sample size was adequate to respond to the research questions, findings from this study could be generalized to the entire Botswana population especially that they share the same characteristics.

Delimitations

This study was restricted to mothers aged 15 to 49 years and their under-5 children who had resided in Kgatleng District for the past 2 years before the inception of the study. Child's demographics characteristics and anthropometrics measures were included among data collected together with mother's characteristics and nutritional knowledge.

Limitations

The cross-sectional study design was ideal for this study because it is inexpensive, quick to execute, and helpful in examining the contextual effects on health. The design of the questionnaire was reviewed cautiously such that the language and sequence of questions were the same among all the participants (Aschengrau & Seage, 2014). However, this study had some limitations. First, the cross-sectional nature of this study could not determine cause and effect. Second, representativeness of population could not be guaranteed (Aschengrau & Seage, 2014). Third, I relied on an interpreter to conduct the face-to-face interviews, which could have led to information bias. In addition, the

children's mothers or caretakers self-reported information on various characteristics such as maternal income level, mother's education attainment, employment status, marital status, and breastfeeding practices which might have introduced response inaccuracy.

Significance

This study is of great importance in a country already affected by HIV/AIDS. The results of this study have the potential to inform policy makers and relevant stakeholders on factors that lead to malnutrition among under-5 children such that the authorities could develop and implement family-based public health interventions in order to curb the health outcome of interest among under-5 children in Kgatleng district specifically for single mothers. Malnutrition is a silent emergency (Yadav et al., 2016) and children are the nation's future, so identifying and understanding related factors that impact nutritional status of young children of single mothers was of fundamental importance as it could enhance normal child growth and development and lead to efforts to quicken economic development for the country as a whole (Yadav et al., 2016). Study results expanded knowledge on the determinant factors of stunting phenomena and the relationships in each family structure which could potentially bring social change in the Botswana community.

Because of its generational effects and consequences, results from this study have the potential to allow the policy makers and health workers in Kgatleng and Botswana to deepen their knowledge on undernutrition and most importantly to put preventive measures in place on how to decrease the occurrence of malnutrition (stunting) among under-5 children. This study promoted mothers' knowledge on undernutrition and

enhanced mothers understanding on under-5 children's nutrition as affected by household structure. At the national level, findings from this study would inform health policy makers' authorities on how to allocate funds and health workers in different health facilities to curb and treat malnutrition in under-5 children and help nurses and medical practitioners to manage malnutrition in a holistic manner.

Summary

Chapter 1 introduced the study topic and provided pertinent information to support research on the impact of single motherhood on stunting of under-5 children as compared to stunting of children of married mothers in a union. It included literature relevant to the study background, problem statement, and purpose, and it identified the theoretical framework, research questions, and study significance. Chapter 2 covers an in-depth literature review related to key variables, depicts the underlying and contributing causes of stunting, and ends with a summary and conclusion.

Chapter 2: Literature Review

Introduction

The purpose of this quantitative study was to examine the relationship between single motherhood and the occurrence of malnutrition, mainly stunting, among under-5 children in the Kgatleng District of Botswana. The impact of single motherhood on under-5 children increases the likelihood of stunting, a chronic form of undernutrition, when compared to children of married mothers in a union (Ntoimo & Odimegwu, 2014; Olamijuwon et al., 2017). In sub-Saharan Africa, malnutrition (stunting) in under-5 children is still a current and persistent problem (Mamman, 2016). The origin of stunting can be traced to long before even the child is born. Stunting prevents children from attaining their full physical and mental potential. A prolonged state of malnourishment among under-5 children leads to poor health and physical consequences such as delayed growth and development, increased susceptibility to diseases, a lower IQ, more behavioral problems, and deficiency in social skills (Kandala et al., 2011). As defined by the WHO, malnutrition is categorized as stunting (i.e., low height for age), wasting (i.e., low weight for height) and underweight (i.e., low weight for age; Kandala et al., 2011).

In Western countries, researchers have shown a link between single motherhood and poor physical/mental health, and a higher risk of mortality for under-5 children as compared to children raised in two-parent households (Ntoimo & Odimegwu, 2014). Compared to other countries in the world, children in sub-Saharan Africa still share elevated risk of dying before reaching age 5 (Akosile et al., 2017), and Botswana is no exception. This is alarming especially for developing countries where resources are

limited. Therefore, research is needed to find ways to curb mortality related to stunting in under-5 children. Chapter 2 covers the relevant literature on single motherhood and stunting in under-5 children, literature search strategy, review of the literature in terms of the key variables and concepts, and a discussion on the theoretical framework and summary and conclusion.

Literature Search Strategy

Various databases, including Embase, ProQuest, PubMed, CINHAL, MEDLINE, and Google scholar, were explored to search the literature. To complement this search, I used primary and secondary peer-reviewed articles, textbooks, and credible internet resources and websites. In this literature review, I included both seminal and current peer-reviewed articles from 1980 to 2019. However, the bulk of the literature was constituted by primary articles and secondary reviews published between 2014 and 2019. These sources were used to summarize the prevalence of stunting among under-5 children and to study the health consequences of single motherhood on these children in African as a whole and Botswana in particular. Key search terms were *single mothers, single motherhood, nutrition status, poor diet, poor nutrition, under nutrition, stunting, Africa,* and *Botswana*.

Theoretical Framework

The theoretical framework for this study was based on Bronfenbrenner's (1989) EST. Bronfenbrenner is among the renowned researchers who studied human development in terms of the surrounding environment and recognized its tremendous role in child development (Bronfenbrenner, 1989). For this study, the EST was the basis of a

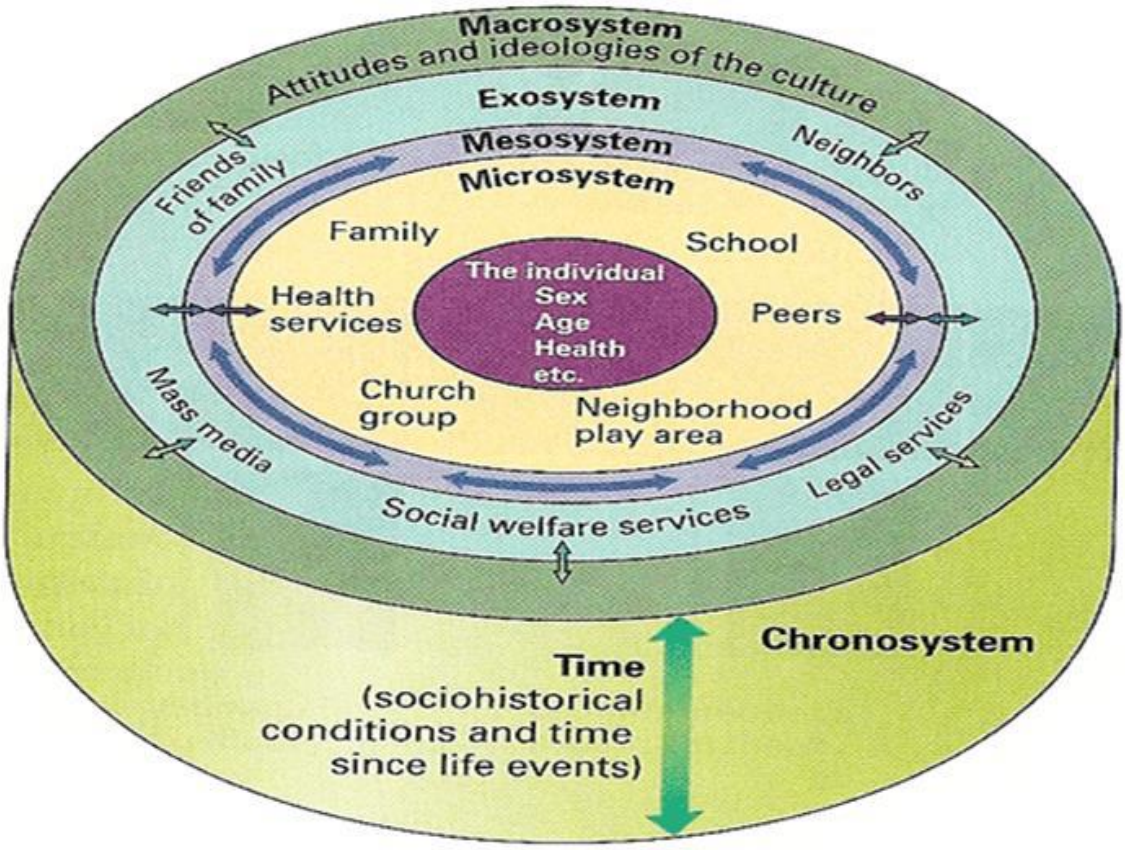
holistic, multidisciplinary, multilevel approach to better understand and prevent the occurrence of stunting in under-5 children, the health outcome of interest (Bronfenbrenner, 1989; Ferguson et al., 2013). In particular, I used the EST to study the health effect of single motherhood, taking into account the mother's social characteristics, the role played by the extended family, close surroundings environment, and time of marital status on the occurrence of stunting in under-5 children.

Bronfenbrenner's EST is comprised of five different levels or aspects of the environment: the microsystem, mesosystem, exosystem, macrosystem, and chronosystem (Neal & Neal, 2013). The EST offers the best framework for this study as it considers individuals in ecological contexts (Neal & Neal, 2013). Bronfenbrenner's model for cause of stunting in this study included age, sex, and health of under-5 children at the individual level while at the microsystem level, causes of stunting consisted of immediate environments like nuclear and extended family, neighborhood, and access to health services (Bronfenbrenner, 1989; Ferguson et al., 2013).The mesosystem in this study was viewed as the relationship between the under-5 children and their family for instance, whereas the exosystem level of Bronfenbrenner's model was used to help understand the relationship between mother's education level, marital status, and income level versus under-five children and their health outcome (Bronfenbrenner, 1989; Ferguson et al., 2013).The sociocultural, economic, and political contexts were studied at the macrosystem level, whereas time of first marriage and time on first child bearing were examined at the chronosystem level (Bronfenbrenner, 1989; Ferguson et al., 2013).

The influence of Bronfenbrenner's EST is undeniable as a solution to under-5 child malnutrition, a disease that is multifaceted and difficult to handle with one approach and for which a solution to prevent and curb requires involvement of various stakeholders. Three main themes can be extracted from the ecological model by Bronfenbrenner. First, the embodiment of the individual child within the five layers of the EST comprising microsystem, exosystem, mesosystem, macrosystem, and chronosystem (Green-LaPierre et al., 2012). Second, for a child to reach their full potential, equilibrium has to be reached between the nested systems. There has to be bidirectional connections from the outer level (macrosystem) inward, and equally, from the inner level (microsystem) outward (Green-LaPierre et al., 2012). Third, the emphasis of Bronfenbrenner's EST is on the interdependencies of the system (Green-LaPierre et al., 2012); thus, a change in economic system of a nation could potentially have implications for children's education, health, and well-being.

Figure 1

Bronfenbrenner's Ecological Systems Theory.



Note. The ecological model shows the individual (i.e., child) of interest in the center circle and the influences they get from complex outer circles in a bidirectional manner. From "Ecological Systems Theory," by U. Bronfenbrenner, 1989, *Annals of Child Development*, *6*, pp. 187-249. (https://doi.org/10.1037/10518-046).

Literature Review Related to Key Variables

The key variables selected for review were fundamental to the understanding of stunting, its causes, and its risk factors. The focus of the literature review was on under-5 stunting in children living with single mothers in sub-Saharan Africa, with particular attention to Botswana. This review helped me to establish a framework for the biology of stunting and to identify underlying and contributing causes and risk factors that corroborate my problem statement and support my research questions. In addition to economic, social, and environmental conditions as underlying conditions to stunting, I reviewed literature related to family and child behaviors specific to food, nutrition, and health and the impact of family configurations and support systems as contributing factors to childhood stunting. The key determinants discussed in this review included parental education, access to healthcare system, and household wealth insofar as they promote childhood stunting.

Stunting

Stunting is a syndrome that is linked to poor nutrition and recurrent infections. These infections include parasitic infections, particularly malaria and intestinal helminths, and diarrhea, especially in conditions of poor sanitation and hygiene (Millward, 2017; Vonaesch et al., 2018). Identified as a cyclical process, growth faltering (i.e., stunting) often starts in utero, connects to maternal nutrition, to an intergenerational cycle of growth failure and conveys to generations through the mother (de Onis & Branca, 2016; Millward, 2017). This can be aggravated by the environment in which a child lives. Although the physiopathology of stunting is not well understood, authors

have theorized that pediatric environmental enteropathy (PEE), a chronic inflammation of the small intestine could play a major role (Vonaesch et al., 2018). They argued that PEE is closely linked to stunting and is characterized by the predominance of the inflammatory process dominated by villous atrophy, crypt hyperplasia, increased permeability, inflammatory cell infiltrate, and modest malabsorption caused by fecal bacteria ingested in large quantities by young children living in conditions of poor sanitation, and hygiene is crucial in the understanding of childhood stunting (Millward, 2017; Vonaesch et al., 2018). In their study Brown et al. (2015) concluded that PEE/stunting in the first two years of life was characterized by enteric infections caused by *Shigella* and enterotoxins.

Long-term consequences related to childhood stunting syndrome are varied and of massive severity. These include increased morbidity and mortality; reduced physical, neurodevelopmental, and economic capacity, and an elevated risk of metabolic disease into adulthood (de Onis & Branca, 2016). Researchers have documented poor school uptake among stunted children and a high risk of mortality and susceptibility to infections (Tariku et al., 2017). Stunting has important economic consequences for both sexes at the individual, household, and community level. Authors have shown an association between shorter adult stature and labor-market outcomes such as lower earnings and poorer productivity (de Onis & Branca, 2016). Increases in morbidity, mortality, and health expenditure and subsequent reductions in human capital investment, physical capital investment, and labor supply are all various pathways through which undernutrition could affect aggregate economic growth (McGovern et al., 2017). Ill health leads to reductions

in productivity and could negatively affect individuals' and society's economic growth, especially when a significant proportion of a country's population is affected by stunting (McGovern et al., 2017).

Underlying Causes of Stunting

The key study variables identified as underlying causes for stunting are discussed in terms of the study population's economic resources, social determinants of health, and environmental conditions.

Parental Employment

Parental employment status or the occupational standing of the household head has been associated with child's nutrition status (stunting). Rashad and Sharaf (2019) conducted a study to estimate the causal impact of women's work on child nutritional status as measured by the height-for-age score. The authors found a negative correlation between under-5 nutritional status and their mother's employment and reduced odds of stunting for children whose parents (households' heads) were farmers or self-employed relative to households headed by housewives. Rashad and Sharaf (2019) argued that it is because couples' income combined could procure better services than those gained by a single parent (mothers).

Parental Education

Parental education has been linked to childhood mortality through different pathways and is often associated with the socioeconomic status of the household. Frost et al. (2005) mentioned five pathways through which the linear relationship between parental education and mortality among under-five children occur: (a) socioeconomic

status, (b) health knowledge, (c) attitudes towards health care, (d) female autonomy, and (e) reproductive behaviors. These pathways operate at both individual and community levels. Mosley and Chen (1984), in their seminal work, observed a strong linear relationship between mother's educational achievement and reduction in infant and under-5 mortality in South Saharan African countries. Likewise, researchers found that high literacy levels among mothers in a given country of sub-Saharan Africa promoted the utilization of health care facilities and the lowering of risk for under-5 child mortality (Anyamele et al., 2017; McTavish et al., 2010). Nkurunziza et al. (2017) found that children whose mothers had no education were more likely to be stunted (cOR = 2.3; 95% CI: 1.7-3; $p < 0.001$) and severely stunted (cOR= 2.0; 95% CI: 1.3-2.9; $p < 0.001$) relative to those whose mothers who completed secondary school and above. Likewise, Acharya et al. (2018), in their analysis of determinants of childhood stunting in Democratic Republic of Congo, found a negative association between level of education and childhood stunting. Similarly, Birhanu et al. (2017) found an increased mortality rate for infants and under-5 children whose parents were illiterate as well as a strong association between stunting and parental education level. The number of stunted children was found to be four times higher among illiterate mothers as compared to those from educated mothers (Birhanu et al., 2017). Similarly, the likelihood of childhood stunting from illiterate fathers was eight times higher as compared to those children who had educated fathers (Birhanu et al., 2017). Even though the pathways are clearly understood, authors agree that parental education is a key determinant of childhood nutritional status as it plays a central role by empowering both women and men to offer

adequate childcare in terms of health, child feeding, and child education (Geberselassie et al., 2018).

Researchers noted a protective effect against stunting in children whose fathers completed secondary school as compared to children whose fathers completed primary school (Geberselassie et al., 2018). However, this protective effect might be missing in single mother households. Clark and Hamplová (2013) explored single motherhood and child mortality in sub-Saharan Africa and found that children born to never-married single mothers were significantly more likely to die before age five in six countries as compared with children whose parents were married (odds ratios range from 1.36 in Nigeria to 2.61 in Zimbabwe). In nine countries, they found children of formerly married mothers were at a significantly higher risk of dying (odds ratios range from 1.29 in Zambia to 1.75 in Kenya) relative to children having married parents (Clark & Hamplová, 2013). These findings are supported by Härkönen (2018) who found a universal growing negative educational gradient of single motherhood across countries. The negative educational gap promotes social inequality among single mothers and their children who live in a cycle of poverty, and experience health related risks, and poor educational achievement. Therefore, policy makers, public health organizations and country governments should empower single mothers with better education and environmental incentives to help ensure positive child health outcomes both at the community and individual levels (Frost et al., 2005).

Birth Interval

The relationship of birth interval and malnutrition has been linked to maternal education. The general consensus among researchers is that chronic malnutrition (stunting) is promoted by large sibling numbers and by later birth order. Researchers in sub-Saharan Africa found boys to be more affected by chronic malnutrition (stunting) as opposed to girls. For example, Guilbert and Marazyan (2018) found that among mothers who were single, first-born boys were more exposed to childhood mortality and not the first born girls' counterpart. They found that sister and not brother played a protective role towards lowering childhood mortality rate for second- born children. Similarly, Bukusuba et al. (2017) in their case control study among children aged six and 59 months in Uganda found that boys were significantly more likely to be stunted compared to girls (OR= 2.2, 95% CI: 1.1-4.2; $P < .05$).

Moreover, Kismul et al. (2018) found increased odds of childhood stunting for children born within a preceding birth interval less than 24 months. Equally, Liwin and Houle (2019) found the risk of dying more than five times higher among children aged 12–23 months in the interval of zero to 11 months between the index child and the succeeding while for a succeeding birth interval of 0–23 months the risk of dying among children aged 24–59 months increased by two-fold (Liwin & Houle, 2019).

Economic Resources and Living Conditions

Linked to education level of parents and opportunity for employment is the potential for improved household income which also plays a pivotal role in determining child health outcome. Household income is tied to parental education and child health

and impacts food intake through improved food purchasing power, quality of medication via its access and affordability, and household sanitation (Umar Farooq et al., 2019).

In their study in Cameroon and DRC, Ntoimo and Odimegwu (2014) found higher probabilities of childhood stunting in single mother households being significantly affected by economic resources and parental education. Moreover, Mikalitsa (2015) while examining the intra household allocation, household headship and nutrition of under-fives in western Kenya argued that better nutrition status of children was not always linked to high income in a household, but rather to who controls the income. The author found a linear association between improved childhood nutritional status in households and active participation of women in decision making (Mikalitsa, 2015). Households with uneducated parents were inclined to have low-income levels. These parents spent less on nutritional adequate foods and their children were more susceptible to growth failure due to lack of access to sufficient food of adequate quality as well as poor living conditions, lack of access to basic health care services and greater exposure to diseases (Mikalitsa, 2015; Ragasa et al., 2019). Thow et al. (2016) in their discourse on effect of remittances on diet and nutrition found that remittances could lead to household food security and underweight reduction even though remittances were found to play a little effect on chronic undernourishment.

In addition to the economic resources available to a household, where individuals in a household reside the effect of the environs are important considerations to stunting outcomes. In particular, is the recognized rural-urban inequality on childhood stunting and that malnutrition in under-five children has been variably distributed according to

geographic regions. Kismul et al. (2018) when analyzing the determinants of stunting in the Democratic Republic of Congo found a significant variability in the prevalence of stunting between rural and urban regions with rural areas having a larger percentage of children living with stunting than children living urban areas. In another study on environmental predictors of stunting among under-5 children in Somalia, authors found variation in stunting distribution spatially and temporally due to rains seasons and vegetation (Kinyoki et al., 2016). Similarly, Stifel et al. (2018) in keeping with previous findings showed that rural populations were characterized as having worse nutrition outcomes than those of urban populations. However, they demonstrated that the nutritional inequality that exists between rural-urban regions stems from differences in wealth, education, health, and non-road infrastructure services across rural and urban areas (Stifel et al., 2018). Thus, reduction of childhood stunting requires improvement of parental education, improvement of and access to healthy diets, and improvement of household's wealth as these are identified in the literature as the major predictors of stunting (Headey et al., 2017).

A component of the environment is water, but also relevant to hygiene and sanitation and a key nutrient for health is access to safe water in rural and urban communities. Childhood stunting has been negatively associated with poor access to safe water and to hygienic toilet (Kismul et al., 2018). While Freeman et al. (2014) estimated that fewer than one in five people globally wash their hands with soap after defecation, Bain et al. (2014) demonstrated the presence of disparities in access to safe water and sanitation between rural and urban communities with access to both water and sanitation

services in rural generally much lower than in urban areas, especially in low to middle income countries (LMIC; Bain et al., 2014). Cumming and Cairncross (2016) documented complex direct biological routes and many broader, less direct routes including the socioeconomic aspects such as accessibility and affordability of water supplies and sanitation facilities through which water supply, sanitation, and hygiene (WASH) could lead to stunting. Cumming et al. (2014) also had shown that over one-third of the world's population was deprived from domestic access to safe water and sanitation.

Aheto et al. (2015) in their study on determinants of malnutrition in Ghana found that absence of toilet facilities in households was associated with increased risk of malnutrition. Similarly, Haile et al. (2016) analyzed secondary data of the 2011 Ethiopian Demographic and Health Survey (EDHS) and found lack of a better-quality latrine to be associated with high probabilities of stunting from the community-level factors. Torlesse et al. (2016) found a prevalence of 28.4% and 6.7% for stunting and severe stunting, respectively among children in their study on determinants of stunting in Indonesia. After controlling for potential covariates, they found an association between household sanitary facility and household water treatment. They reported an increased adjusted odds of childhood stunting up to more than three times in households that drank unprocessed water if the household utilized a unimproved latrine (AOR = 3.47, 95 % CI: 1.73-7.28, $p < 0.001$) as compared to households that drank treated water and utilized unimproved latrine where the adjusted odds on child stunting was not significantly higher (AOR = 1.27, 95 % CI: 0.99-1.63, $p = 0.06$; Torlesse et al., 2016).

Health-seeking behavior hinges on the direct route between socio-economic position (SEP) and health outcomes (Benova et al., 2014). Various factors that influence health seeking behavior have been reported including socioeconomic and demographic characteristics, perceived need, accessibility, and service availability (Sarker et al., 2016). Uggla and Mace (2016) opined that parental investment in health-seeking behaviors was independently influenced by the association between maternal factors (age, health, and marital status) and child factors (birth order, health, sex, and age). The authors found higher odds of investment among children with lower birth order, older mothers and mothers with better health status. Similarly, scholars opined that higher maternal education and wealth, and better access to health services were associated with higher levels of health investment in children. The authors showed that monogamously married women had higher odds of investment than non-married women in all health-seeking behaviours (Uggla & Mace, 2016). Therefore, the Botswana Government policy makers should work in order to improve the primary health care system, promote early health seeking behavior, and support to the single mothers in terms of education and income resources so that these mothers could make sound decisions towards their under-5 children.

Contributing Causes of Stunting

Key study variables identified as contributing to stunting are specific to food and nutrition (food security, food diversity), health seeking practices (breastfeeding behaviors), family structure, and emotional care and family support systems.

Food insecurity and diversity: Food availability at the household level plays a crucial role in childhood health. Mechanisms through which food insecurity leads to stunting are inequality of food consumption in terms of quality, quantity, and continuity; and inadequacy of infant and child feeding which in turn leads to food consumption issues (FAO, 2017). In their study, Shinsugi et al. (2015) opined that stunting and severe stunting were associated with food insecurity. The authors found that moderately food insecure households were more likely to have stunted children as compared to food secure households (OR = 1.26; 95% BCI: 1.04–1.51). Moreover, children who lived in moderately food insecure households were more likely to be severely stunted than children living in food secure households (OR = 1.31; 95% BCI: 1.04–1.64; Shinsugi et al., 2015). While these findings are in accord with previous works, Hagos et al. (2017) noted that wealth played no role in the relationship between food insecurity and stunting.

The late introduction of additional foods, the use of nutrient-poor foods, or limited access to essential nutrients especially vitamin A, iron, and zinc were recognized as contributing to higher stunting risk in food-insecure households (Moradi et al., 2019). While some authors found that stunting was associated with household food insecurity, Motbainor et al. (2015) documented that food security was not the only criterion to determine childhood nutritional status, but rather other factors such as mother's knowledge of child nutrition and health care practices, maternal nutritional status, intrahousehold food allocation and utilization practices, and access to health services and healthy environmental conditions were to be taken into account.

Also of concern is food/dietary diversity to ensure an adequate and balanced diet for energy, growth and development. Food diversity is the number of varied foods or food groups consumed over a given reference period (Bukania et al., 2014). Researchers in Ghana have explored the relationship between dietary diversity and child health outcomes and found a general inclination of food diversification with increased child age (Frempong & Annim, 2017). They noted a significant relationship between food diversity in the health of children born to educated mothers (Frempong & Annim, 2017). Also, food diversity and number of meals the child ate per day were significantly associated with stunting ($\beta = 0.039$, $p < 0.01$) and underweight ($\beta = 0.035$, $p < 0.05$) respectively (Motbainor et al., 2015).

Food security and nutrition status of household members have been found to be dependent on culture and institutional frameworks in either male headed household or female headed household (Mikalitsa, 2015). Several authors found higher incidences of malnutrition and food poverty in the de jure female-headed households as compared to male headed households and de facto female headed households (Mikalitsa, 2015; Ragasa et al., 2019). Ragasa et al. (2019) examined whether providing agriculture and nutritional information to both mother and men had an impact on household food security. The authors found that the quantity and quality of household food availability was determined by agricultural production and income. Moreover, Ragasa et al. (2019) noted that in male-only and female-only headed household's food insecurity was on the high. Formal education and literacy levels and nutrition education appeared to lead to improved food security in households with sole male adults (headed by male) while food security in *de*

jure female headed households was driven by landholdings, livestock units (especially poultry) having other assets, planting tree and root crops, and nutrition-related information (Ragasa et al., 2019).

Breastfeeding

A source of nutrition for infants is of course breast milk. There are several benefits related to breastfeeding for both the infant and the mother. These include low cost, and immunological, psychological, social, economic, and environmental benefits (Patel et al., 2015). Researchers have documented reduction of childhood stunting for children who were optimally breastfed (Fikadu et al., 2014). The WHO endorses exclusive breastfeeding for a period of at least six months, and thereafter advocates for complementary solids feeding to be added to reduce risk of growth failure and undernutrition, and chronic diseases (Binns & Lee, 2014; Binns et al., 2016). In Botswana, breastfeeding is well-recognized and recommended practice among women; however, Ogwu et al. (2016) in their study on predictors of early breastfeeding cessation noted that among women living with HIV, breastfeeding continued to be rare and that short breastfeeding period and early weaning was the norm, putting under-5 children at risk of stunting. Akombi, Agho, Hall, Wali, et al. (2017) on the other hand, found an association between prolonged breastfeeding and the occurrence of stunting. This association was found to be aggravated among children from poor and uneducated household's parents who failed to diversify the nutrition of their under-5 children (Issaka et al., 2015). The characteristic negative growth trends observed in developing countries is mainly promoted by lack of complementary feeding.

In their study on the nutritional status of under-five children in western Nigeria among teenage mothers, Olodu et al. (2019) found a statistically significant relationship between breastfeeding initiation time and occurrence of stunting ($\chi^2 = 7.095$, $p = 0.008$). They reported that initiation of breastfeeding less than an hour post-delivery resulted in childhood stunting prevalence of about 18.6% while starting breastfeeding beyond an hour after delivery increased the odds of stunting (OR = 9.551, CI: 1.279–16.310; Monday et al., 2019).

Family Structure

Of importance to the current study is the impact of family structure and family configuration on the nutritional and health outcomes of under-five children. Family structure as a contributing factor for stunting is closely aligned with the underlying factor for stunting of economics and social determinants. Nkunzimana et al. (2016) while evaluating MDG achievements through under-5 child stunting in Rwanda and Burundi found that low socioeconomic status at the household level was associated with chronic malnutrition only in rural settings. Similarly, Akinyemi et al. (2016) found that poorer household wealth quintile and maternal occupation were associated with childhood mortality in rural settings. Akinyemi et al. (2016) explored the impact of family structure on the nutritional status and health of such children living in sub-Saharan Africa. They found that the percentage of children living in female-headed households (FHHs) ranged from 5.2% in Burkina Faso to 49.1% in Namibia while those living in extended family households ranged from 27.4% in Rwanda to 59.9% in Namibia. The authors found no significant higher childhood mortality for children living in FHHs in rural sub-Saharan

Africa. However, children in extended family households had a higher risk of child mortality in Burkina Faso (HR = 1.33, 95% CI: 1.04– 1.69) and Zambia (HR = 1.59, 95% CI: 1.02–2.49; Akinyemi et al., 2016). Clark et al. (2017) reported a link between single motherhood and poor health outcome such as stunting among under-5 children. In another study, Liwin and Houle (2019) found a 43% increased risk of under-5 mortality for children born to single mothers as compared to those born to married mothers. There has been documented inequality in childhood mortality distribution between rural and urban regions due to family structure. According to Katapa (2006) unfavorable childhood health outcomes in female headed households (FHH) were mainly caused by poor socioeconomic status of the female head. Using specific country survey data from 2010 to 2014, Akinyemi et al. (2016) determined the percentage of children living in FHHs in rural areas of sub-Saharan African countries ranged from 5.2% in Burkina Faso to 49.1% in Namibia while those living in extended family households ranged from 27.4% in Rwanda to 59.9% in Namibia (Akinyemi et al., 2016). Gupta et al. (2015) after adjusting for household characteristics found that household economic resources in FHH were the primary significant risk factor for infant death. Other researchers looked at differences in socio and economic characteristics of a household and found an associated variation in child health among single mother households; however, childhood mortality was not significantly related to female headed household (Akosile et al., 2017; Akinyemi et al., 2016). Lesetedi (2018) in accord with Kabeer (2015) reported that female heads of households presided over large households as compared to their male counterparts who were also believed to have relatively quick access to employment opportunities, condition

that place the FHH at an economic disadvantage associated with poverty. As such, children living in these households may have poor health outcomes as these women have fewer economic resources and would tend to depend on others for their living (Lesetedi, 2018).

Family Configuration/Union Disruption

Determinants of children's health in lower-income countries of interest to this study include parental care to their children, environmental conditions, living conditions, and parental resources (DeRose et al., 2017). The authors argued that better childhood health outcome was expected when parents are generous with attention and affection to their children. Accordingly, scholars have examined the relationship between family disruption and its effects on childhood development (DeRose et al., 2017). Sheppard et al. (2015) found early childhood familial disruption to be linked with shorter height for men while for women the relationship between father's death and height was found to be totally facilitated by earlier puberty.

Crosnoe et al. (2014) in their study in sub-Saharan Africa and the United States found that union disruption was linked to poor childhood outcomes based on the fact that children were taken care off by different people who could not spend valuable time to the welfare of the children. Compared to women from advanced backgrounds, DeRose et al. (2017) found that a negative relationship between single motherhood and children's health was more likely to ensue where poverty was both cause and consequence of single motherhood. Moreover, the authors argued that the association between divorce and child mortality was not dependent on whether the divorce occurred before or after the child's

death and that union instability was associated with childhood mortality risk (Crosnoe et al., 2014).

Emotional Care and Family Support Systems

Emotional care and family support systems are of importance to child rearing. In particular, kinship on the well-being children is of interest to this study. Kinship is defined as social connections that might influence children well-being. In the African culture, kinship support in its various forms is well recognized and expected from individuals of any given family. In the African family kinship is associated with strong ties and bonds of mutuality among extended members (Caldwell & Caldwell, 1987; Madhavan, 2010). Researchers found that family ties could go to the extent of favoring pooling of economic resources that would assist in the monitoring and supervision of under-5 children (Ntshebe et al., 2019). Likewise, Clark et al. (2017) in their study on issues of poverty and deprived ecological conditions (geographic proximity and employment) among single mothers found that support for single mothers was in high demand but that the active kin network of single mothers was quite small. They also observed variations in types of kinship and argued that the support offered as kinship is dependent on the local culture belief, employment status, geographic proximity, and age of the supporter (Clark et al., 2017). For instance, the authors revealed that up to 73.0% of coresidential kin provided no financial support while 50.8% provided no assistance with childcare. In addition, the authors found that 17.8% of those living in the vicinity, provided money or in-kind support while 8.0% supported with childcare in previous month (Clark et al., 2017). To add to these findings Kasper and Mulder (2015) revealed

the decline of African bonds for such support was due to growing urbanization, increased freedom of movement, and lack of resources. This suggests that if childhood stunting is to be reduced in the African region and particularly in Botswana where a majority of single women live in poverty, programs that aim at reducing poverty have to be promoted along with a culture to promote togetherness among extended members of families promoted both in rural and urban regions.

A mother's age may determine how much emotional care or support is needed by both the mother and the child to ensure adequate growth and development. Researchers have shown that mother's age at child's birth was a positive and significant determinant of children's height with delayed childbearing being linked to decreased chance of having stunted children (Keino et al., 2014). The authors found that mother's age above 20 years at the time of delivery was associated with 'less likelihood of childhood stunting. Wemakor et al. (2018) identified a young maternal age as a risk factor for child undernutrition in Tamale Metropolis, Ghana and reported that compared to children born from adult mothers those born from teenage mothers were eight times more likely to be stunted (AOR = 7.56; 95% CI: 4.20–13.63). Yu et al. (2016) investigated the differential effects of young maternal age on child growth and found that biological effects alone could not explain entirely the association between young maternal age and child growth. They found various pathways that lead to the association between young maternal age and child growth including epigenetic effects, difference related to socioeconomic status which accounted for majority of association, young ages.

Summary and Conclusion

Childhood stunting is a major public health problem in developing countries. In sub-Saharan African countries, the prevalence of stunting is still high and alarming and the impact of single motherhood on under-5 children increases the likelihood of stunting, a chronic form of undernutrition (Ntoimo & Odimegwu, 2014; Olamijuwon et al., 2017). In their study in sub-Saharan Africa, Ntoimo and Odimegwu (2014) showed that single motherhood was a risk factor for children's nutritional status and chances of survival before age 5 years. Moreover, Said-Mohamed et al. (2015) in their systematic review demonstrated that stunting in Africa and particularly in southern Africa was still a persistent and prevalent concern despite economic growth, positive political action, social advance, and national nutrition programs. Despite the paucity of research on single motherhood and its influence on childhood health in Kgatleng district, authors in other locations noted that variations in social characteristics among single mothers had an influence on childhood health (Akosile et al., 2017). Hence, to better analyze the occurrence of stunting, a multidisciplinary and holistic framework based on Bronfenbrenner's (1989) model was used. This review showed that stunting starts long before the child is born and its health and nutritional impacts are intergenerational (de Onis & Branca, 2016). Stunting is a result of many factors including socio economic status of parents as measured by parental education level, employment status, and income level. Through the literature, there was a clear evidence of spatial distribution of stunting according to geographic location of under-5 children (Hagos et al., 2017). In Chapter 3,

research questions, hypothesis, and the study design, data collection tools, and variables definitions are discussed.

Chapter 3: Research Method

Introduction

The aim of this study was to examine the relationship between single motherhood and the occurrence of malnutrition, mainly stunting among under-5 children in the Kgatleng District, Botswana. Key study variables identified as underlying causes for stunting were examined in terms of the study population and included economic resources, social determinants of health, and environmental conditions. Also examined were contributing variables to stunting that are specific to food and nutrition (food security and food diversity), health seeking practices (breastfeeding behaviors), family structure, and emotional care and family support systems. Knowledge of these variables in the selected population helped inform policy makers and relevant stakeholders on factors that lead to malnutrition among under-five children in Kgatleng district and expand knowledge on biological relationships in each family structure and potentially bring change in the Botswana community. The chapter covers the research design and its rationale, a discussion on the population of interest and sampling procedures.

Research Design and Rationale

This was an analytical observational cross-sectional study, with stunting as the outcome of interest. The main exposure of interest was single motherhood versus father/mother parenthood. The demographic characteristics (age, education level, marital status), parental income level, and mother's age at birth of the child, breastfeeding, and birth order, parents' employment status, and health seeking behavior are covariates. Unlike in case-control or cohort studies, in a cross-sectional study, the investigator

measures the outcome, stunting in this instance, and the exposures in the study participants at the same time (Setia, 2016). I selected participants based on the inclusion and exclusion criteria set for the study (see Setia, 2016). In addition to the ability to measure prevalence, cross-sectional studies offer the advantage of being relatively inexpensive, have low or no attrition. Furthermore, the participation rate in cross-sectional designs is usually higher due to the shorter time commitment (Salazar et al., 2015). The statistical inquiry was used to examine the relationships between the independent variables and the outcome of interest, stunting. I collected primary data at one point in time in five clinics of the Kgatleng District. Selected participants were administered a structured questionnaire comprised of mothers' sociodemographic characteristics (age, education level, marital status), dietary factors and mother's health seeking behavior and practice (breastfeeding), mother's nutrional knowledge, and child factors (age, birth order, health, and sex). Further, food insecurity and diversity were assessed based on the terms of quality, quantity, and continuity of food. In addition, family structure (female headed household, male headed household, and extended families), family configuration (time of marital dissolution), and family support system were analyzed in relation to stunting among under-5 children.

Methodology

Population and Geographic Areas

The study population was constituted of under-5 children and their mothers living in the Kgatleng district for at least 6 months prior to the commencement of the study. The mothers were aged 15 to 49 years and were willing to participate in the study. All women

above 49 years and below 15 years were excluded from the study. Any child or mother who did not reside in the Kgatleng district for the above-specified period was excluded from the study. According to the Botswanan population and housing census 2011, Kgatleng district had a population of 91660 individuals (males: 44565; females: 47095); infants (0-1 year) were estimated at 4.9%, whereas the under-5 (0-4 years) population were estimated at 11.9%, and the average literacy rate was 86.5% (males 83%, females 89.7%; Statistics Botswana, 2015).

Sampling and Sampling Procedures

Optimum sample size is a crucial component of any research because sample size helps determine the cost and the duration of a study and because adequate sample size helps ensure ethical and valid scientific results (Pourhoseingholi et al., 2013). To determine the correct sample size and to ensure accuracy and validity of the statistical tests that was conducted, I considered the following assumptions: power was estimated at 85%, confidence interval estimated at 95% (Burkholder, 2012; Salazar et al., 2015; Yadav et al., 2016). The prevalence of stunting was considered as 25.9% (Central Statistics Office & UNICEF, 2009). The design effect of 2 and 10% of non-response rate was considered (Yadav et al., 2016). Importantly, I used G-power3 to help in the determination of sample size (Faul et al., 2009). Power analysis was conducted as follows [Power = 0.85] and [R1 other X = 0.04], using two probabilities [Two probabilities] Pr(Y=1|X=1) and H_0 = 0.6; then the minimum sample size was equal to 103. Taking into account the design effect of 2% and a nonresponse rate of 10%, the maximum sample was equal to 185 children.

Procedures for Recruitment, Participation, and Data Collection

Mothers were randomly selected at the clinics with every third mother and their children included. The survey questionnaire was administered to the mother and questions asked about demographics and dietary information to assess the children's nutrition status (stunting), household demographics and socioeconomic characteristics, and the dietary diversity of the child. A mother provided written consent for both herself and her child (children) prior to enrolling in the study. Data from both mothers and children were safely kept in a lockable cabinet designed for that purpose in my office for the duration of the study and 3 months after data have been analyzed and published. To avoid missing data and to allow for completeness of collected data, questionnaires were reviewed with the mothers at the end of each day session. Under-five cards were utilized for confirmation of demographic data of selected children followed by anthropometric assessment using standard methods as described in the training manual of WHO Growth Standards (Yadav et al., 2016) for the duration of the data collection until required sample size was reached.

Instrumentation

A validated structured questionnaire was distributed to the mothers whose children were selected to assess their sociodemographic characteristics such as age, marital status, mother's education attainment, economic status, and mother's age at birth of the child, mother's nutritional knowledge, and child birth order, parents' employment status, and mother's health seeking behavior. The questionnaire was first written in English and then translated in Setswana, the local language, and then back translated in

English to maintain uniformity of the questionnaires (Badake et al., 2014). In addition, the questionnaire included information on household profiles like age, sex, education level, and occupation of household members, household size and marital status of the household heads. The questionnaire was piloted with public health peers and pre-tested to check its readability, functionality, and completeness; this enabled me to check for flow of the questionnaire prior to inception of the study in the selected clinics in Kgatleng district.

Standard methods as described in training manual of WHO Growth Standards were employed to assess the anthropometric measures of height and weight, (Yadav et al., 2016) and age of the under–5 child was ascertained using the under-five card. Height of the under-5 children was measured using a calibrated gauging board. For children who could not stand, a recumbent position was used to measure height of the children. Any child above 24 months and who could stand erect, height measurement was done on standup position against calibrated height gauging board and the measurement was taken to the adjacent 0.1 cm (Badake et al., 2014). As described in by Zeray et al. (2019), the assessment of the under-5 child's height was done using a length-measuring device with a fixed headboard and a moveable footboard perpendicular to the surface on which the child was lying. A fixed measuring tape marked in millimeters was attached to the surface with the zero ends at the edge of the headboard. During the measurement, children were placed and maintained in a straight position by holding their head with crown against the headboard (Zeray et al., 2019). To measure weight, the under-5

children were placed in the center of calibrated weighing device and the reading taken to the adjacent 0.5 g.

Validity of an instrument deals with the degree to which the scale gauges what it is intended to measure, the accuracy of results while reliability deals with the precision of the results, the degree of reproducibility of the results, if repeated measurements are done (Taherdoost, 2016; Salazar et al., 2015). There are four types of validity namely criterion validity, face validity, content validity, and construct validity (Salazar et al., 2015). Internal validity refers to credibility, legitimacy of results (Taherdoost, 2016). To achieve this goal, I adapted and made minor modifications to a validated questionnaire by other experts that has consistently and accurately assessed the nutritional status in the under-5 children. The adopted questionnaire covered all the constructs of interest and the gauge for height measurement was standardized in all the clinics to ensure stability and repeatability of results, and good interpretation of scores thereafter (Taherdoost, 2016).

Data Collection Procedure and Quality

The data were collected using a structured questionnaire by interviewing the mothers of the child after taking an informed written consent (see Yadav et al., 2016). For quality assurance, in addition to a pre-test that was distributed to other peers, I adhered to the importance of confidentiality, capacity to listen, and how to accurately collect and report the data. I directly supervised different sites and maintained the integrity of collected data during the entire study period (see Abera et al., 2018).

Operationalization

Operational Definition

In this study, single motherhood (single-mother families) of interest were mothers whose current marital status was never married, widowed, divorced and separated. Married mothers included those who were engaged in union, whether married or living together in Kgatleng district (Ntoimo & Odimegwu, 2014).

Independent Variables

The independent variables were family structure (single-mother families and two-parent families) and family type (nuclear family and extended family). Single motherhood, labelled as single-mother families were measured as a categorical variable and included never married, divorced/separated, and widowed while two parent families included currently married mothers, cohabiting or living together (Ntoimo & Odimegwu, 2014). Currently married were coded as 1; never married coded as 2; cohabiting/living together coded as 3; divorced/separated as coded as 4; and widowed coded as 5 (Ntoimo & Odimegwu, 2014).

Dependent Variable

In this study, the dependent variable was the nutritional status (stunting) of selected under-5 children.

Operational Definition

Stunting was measured as the proportion of children whose height-for-age was less than minus two standard deviations below the WHO height-for-age or length-for-age standard median. Stunting was measured as a binary variable, and values were

categorized into two: those whose height for-age is below -2sd will be stunted, coded 1; others not stunted coded 0 (see Ntoimo & Odimegwu, 2014; Rengma et al., 2016).

Covariates

As previously stated, the independent variables of interest were family structure (single-mother families and two parent families) and family type (nuclear family and extended family). The relationship between single motherhood and the occurrence of stunting in the under-5 children could be confounded by other factors. In this study, mother's education level, parental income level, and mother's age at birth of the child, breastfeeding, and birth order, parents' employment status, and health seeking behavior were covariates.

Mother's education level was defined as any formal education undertaken prior the inception of the study and was classified as primary school or none coded 1, secondary school level coded 2, and higher coded 3 (see Acharya et al., 2018).

Parental income level was defined as monthly earning in Pula (Botswana currency) such that any monthly earning equal or less than $134 USD was coded 1, earning between $135-334USD coded 2, earning between $335-667 coded 3. Any monthly earning above $ 667 USD was be coded 4 (see Uggla & Mace, 2016).

Age of the mother at birth of the child was measured as an ordinal variable coded 1 for mothers aged 15-19 years, coded 2 for those aged 20-24 years, coded 3 for those aged 25-29 years, coded 4 for mothers aged 30-34 years, coded 5 mothers aged 35-39, and those aged 40- 49 years will be coded 6.

Birth order was treated as a continuous variable and described whether the child was the first, second born, and so on at time of the survey (Uggla & Mace, 2016). Number of siblings was described how many siblings the child has in the household and was coded 0 for having one to two siblings, coded 1 for having three siblings, and coded 2 for having four or above siblings. Household size included the number of members present in the household at the time of the survey and was coded 0 for household having less or equal to four members, code 1 for households having five to six members, and coded 2 for households having seven members. In addition, breastfeeding was treated as a binary variable and was responded to as yes for mothers who breastfed for six months or no response for mothers who breastfed less than six months (Olodu et al., 2019).

Mother's employment status was coded 0 for employed mothers while unemployed/housewife mothers were coded 1 (Ntoimo & Odimegwu, 2014; Rengma et al., 2016). Nutritional knowledge was assessed to check if the mother does not know about malnutrition (stunting) which will be coded 0 and otherwise as 1, Gender of the household head as a proxy for maternal empowerment was coded 0 when the male was the head of the household and 1 when the mother was the household head (Umar Farooq et al., 2019). In addition, attitude for health seeking behavior was assessed by asking whether the mother did not visit medical expert attention for prenatal care and was coded 0, otherwise 1 (Umar Farooq et al., 2019).

For family structure: gender of the under-5 child was categorized as a nominal, categorical variable with a male coded as 1 and female coded as 2 (Nkunzimana et al., 2016). In addition, children's age was regarded as an interval variable ranging from 0 to

59 months. Thus, children whose age ranges between 0-11 was coded 1, those between 12 and 23 was be coded 2, those between 24 and 35 coded 3, between 36 and 47 coded 4, and between 48 and 59 months coded 5 (Uggla & Mace, 2016). Kinship support was measured as a categorical variable with yes or no response. Single mothers receiving support from their kin will be coded 1 and those no receiving support from their relatives coded 2.

Data Analysis Plan

The Statistical Package for the Social Sciences (SPSS) version 25 was used for data analysis (SPSS Software, 2018). After aligning the data in descending order, data cleaning was undertaken for data cleaning and for removing errors from the dataset using the same software. For each variable, frequency distribution was checked for ranging variability. Descriptive statistical analysis was conducted for the analysis of the demographic data in terms of mean and standard deviation (Rengma et al., 2016). Cross tabulations with Pearson Chi Square (χ^2) tests were performed to establish the association between single motherhood and stunting (Habaasa, 2015). In addition, Chi Square test was used to test for difference between proportions of under-five stunting (Manjunath et al., 2014). A binary logistic regression was fitted to analyze factors that contribute to stunting in under-5 children and to deal with the many covariates and confounders (Pourhoseingholi et al., 2011). The binary logistic regression analysis helped in the analysis of under-five children characteristics such as weight for age and their relationship with other variables of interest. To determine predictor variables amongst variables considered in binary logistic regression (BLR) analysis, a stepwise multiple

logistic regression analysis (forward conditional model) analysis was undertaken (Rengma et al., 2016). The association and differences were interpreted as either statistically significant or not statistically significant at $p < 0.05$ (Manjunath et al., 2014).

To measure the association between the dependent variable and other covariates, the odds ratio of various covariates such as mother's age at birth of the child, breastfeeding, household size, parents' occupation, and health seeking behavior was measured. For the regression logistic model, each model was constructed based on the goodness of fit test and model coefficients tests. Thus, the Hosmer–Lemeshow goodness-of-fit and Omnibus tests of model coefficients was used to test for the model fitness (Egata et al., 2014). The Hosmer–Lemeshow goodness-of-fit test is an important test in analyzing whether there was any collinearity or interactions. To check for homogeneity of variance, the Levee's test of equality of variance was be used.

Research Questions and Hypotheses

Research Question 1: Is there a relationship between family structure (single-mother families, two parent families) and the occurrence of stunting in under-5 children in the Kgatleng District, Botswana after controlling for number of people living in the household, mother's age at birth of first child, mother's education level, income level, and birth order.

$H_0$1: There is no relationship between family structure (single-mother families, two parent families) and the occurrence of stunting among under-5 children.

H_A1: There is a relationship between family structure (single-mother families, two parent families), and the occurrence of stunting among children under-5 children.

DV: Malnutrition (stunting) - dichotomous

Groups: Single families versus two parent families

Test: Binary logistic regression

Research Question 2: Is there a relationship between family type (nuclear family, extended family) and stunting in under-5 children in the Kgatleng District, Botswana after controlling for mother's age at birth of their first child, mother's employment, age at which babies should start eating solid foods in addition to breast milk or formula, child birth order, and number of people living in household.

$H_0$2: There is no relationship between family type (nuclear family, extended family) and stunting in under-5 children in the Kgatleng District, Botswana.

H_A2: There is relationship between family type (nuclear family, extended family) and stunting in under-5 children in the Kgatleng District, Botswana.

DV: Malnutrition (stunting) - dichotomous

Groups: Nuclear family versus Extended family

Test: Binary logistic regression

Threats to Validity

Observational studies often are challenged by validity issues; there are numerous factors that could affect the study process and the findings of a research, one of them being systematic errors (Taherdoost, 2016). The author argued that it is easy for a researcher to assess reliability of an instrument and not its validity (Taherdoost, 2016). Thus, it was imperative that the selected instrument in this study measures what it was intended to measure (Abera et al., 2018). The key question in assessing internal validity

is whether observed changes can be attributed to the exposure and not to other possible causes. The internal validity of a study may be compromised by not having a control group or by having a control group that is not comparable to the exposed group in measurable or unmeasurable ways (Carlson & Morrison, 2009).

Threat to External Validity

External validity is the ability to generalize study results to a more universal population. External validity is the degree to which the conclusions in a study would hold for other persons in other places and at other times. As such, internal validity is a prerequisite for external validity. That is, the study must demonstrate that the "exposure" in the study is the cause of variation in the outcome before one can generalize that the exposure more universally causes the outcome (Carlson & Morrison, 2009). Therefore, it was imperative to understand whether findings from this study could be extended to the whole country of Botswana considering that the population was similar in many aspects and whether results could be generalized to other settings.

Threat to Internal Validity

Internal validity is the extent to which study results are correct and the associations detected are actually caused by exposure (Shamliyan et al., 2012). I ensured that data quality was maintained both during the collection and analysis stages. Confounding variables of the relationship between single motherhood and the occurrence was be dealt with.

Ethical Procedure

In this quantitative, observational, nonexperimental study I collected primary data. Permission was sought from the head of the District health management team to explain the study purpose to each selected clinic prior to the inception of the study and a written consent was sought from all the mothers/caretakers who were willing to participate in the study. Participants' personally identifiable information was stored in a locked cabinet and in a password protected computer for confidentiality reasons, hence, no major ethical issues could be expected. Participants who consented for the study were de-identified and encoded in alphabetical manner to protect their anonymity. Written consent was sought from the participants; mothers consented for their children. Prior to the inception of the study, data collection, and analysis, permission was received from Walden University Institutional Review Board (IRB; approval number: 01-30-20-0504573) and the Botswana Ministry of Health IRB (approval number: HPDME 13/18/1) to have access to local clinics and participants.

Summary

This quantitative study used primary data from 5 clinics in Kgatleng District. A cross-sectional design was employed, and a minimum sample size was determined using G*power tool. To analyze the research questions bivariate analysis was used to determine the frequency and means of different variables. The binary logistic regression and the Chi Square (χ^2) tests were used to assess the association between single motherhood, mother's educational level, parental income level and stunting. In addition, Chi Square test was used to test for difference between proportions of under-five stunting. In

addition, the multivariate analysis helped in the analysis of under-five children characteristics such as height for age and their relationship with other variables of interest. To determine predictor variables amongst variables considered in bivariate logistic regression analysis, a stepwise logistic regression analysis (forward conditional model) was undertaken. In the following Chapter 4, study findings are discussed.

Chapter 4: Results

Introduction

The purpose of this quantitative, cross-sectional study was to examine the relationship between single motherhood and the occurrence of stunting among under-5 children in the Kgatleng district of Botswana. Single mothers of interest were mothers whose current marital status was never married, widowed, divorced and/or separated. Mother's age, employment status, income level, level of education, number of people living in the household, the household head, family type, and child's gender were considered probable predictors for our outcome of interest (stunting). The independent variables in this study were family structure (single-mother families and two-parent families), family type (nuclear family, extended family), and the dependent variable was stunting. Primary data were collected at one point in time in various clinic locations of the Kgatleng district. The participants were comprised of mothers aged 15 to 49 years and their under-5 children residing in Kgatleng District, Botswana. To better model the binary regression analysis as proposed in the previous chapter, I slightly modified research questions by including control variables. Thus, research questions (RQ) and associated null hypotheses were the following:

RQ1: What is the relationship between family structure (single-mother families, two parent families) and the occurrence of stunting in under-5 children in the Kgatleng District, Botswana after controlling for number of people living in the household, mother's age at birth of first child, mother's education level, income level, and birth order?

$H_0$1: There is no relationship between family structure (single-mother families, two parent families) and the occurrence of stunting among under-5 children.

H_A1: There is a relationship between family structure (single-mother families, two parent families), and the occurrence of stunting among under-5 children.

RQ2: What is the relationship between family type (nuclear family, extended family) and stunting in under-5 children in the Kgatleng district, Botswana after controlling for mother's age at birth of their first child, mother's employment, age at which babies should start eating solid foods in addition to breast milk or formula, child birth order, and number of people living in household.

$H_0$2: There is no relationship between family type (nuclear family, extended family) and stunting in under-5 children in the Kgatleng district, Botswana.

H_A2: There is relationship between family type (nuclear family, extended family) and stunting in under-5 children in the Kgatleng district, Botswana.

In this chapter, I briefly review data collection and present descriptive statistics, and describe findings from univariate, bivariate, and multivariate analyses conducted to test hypotheses associated with each RQ. Finally, I summarize answers to the RQs based on the statistical findings.

Data Collection

Parents who took their under-5 children for weighing at the child welfare clinics were recruited for this study. Of these, 196 respondent's parents were interviewed in two waves, the first in March 2020 and the second in September 2020 due to the difficulties related to the COVID-19 pandemic as under-5 children were not permitted to visit clinics

or hospital premises. In the first wave, four sites were covered and a total of 146 respondents were interviewed. Data collection for the second wave started early September 2020 after the lifting of the lockdown and a total of 50 respondents were interviewed at the last site. Interviews were self-administered, in person, and face to face at all the sites. Interviews lasted at most 25 minutes and were conducted in both English and Setswana, the local language. Data accuracy and completeness were checked at each site prior to ending the interview with the respondent caretaker/mother. As described in Chapter 3, the majority of parents that came for welfare clinics were willing to participate in the study; out of 220 mothers who were approached, 196 decided to participate in the survey. Apart from the lockdown that delayed the recruitment process, no major challenge was encountered.

Results

Descriptive Statistics

As shown in Table 1, the majority of parents who took their under-5 children to the clinic were mothers who made up 86.7% (*n* = 170) of the sample while fathers constituted 4.1% (*n* = 8). Of note for mothers, 68.9% (*n* = 135) were never married, 15.8% (*n* = 31) were married, and 14.8% (*n* = 29) were cohabiting or living together. Single mother households were also the leading family structure type (see Table 2). The mean age of the mothers was 29.8 years; the majority attended secondary school 76.0% (*n* = 149) without necessarily graduating, whereas 17.9% (*n* = 35) of mothers completed college (see Table 1). The under-5 children of the parents interviewed were evenly divided based on gender with 50% (*n* = 98) male and 50% (*n* = 98) female (see Table 1.)

Of these children, just over one third lived in households headed by the biological father (34.7%), one third lived in biological mother (32.7%) headed households, and one third (32.7%) in households headed by others (grandparents, uncle, aunt, other relative, not related member; (see Table 1).

With regard to stunting, height-for-age anthropometric measurements of the under-5 children in the study population was compared with the WHO standard growth curve (Uwiringiyimana et al., 2019). The majority of under-5 children, 59.2% (n = 116), were of normal height, whereas 42.3% (n = 83) were stunted, among whom 27.6% (n = 54) were moderately stunted and 14.8% (n = 29) severely stunted. Further examination of the descriptive data potentially related to child growth and development showed that 35.2% (n = 69) of mothers exclusively breastfed their under-5 children for a period ranging between 6 months and 1 year, whereas 31.1% (n = 61) of mothers breastfed for more than one year (see Table 1).

Also relevant to the sample and children's stunting status are living location and economic status. Four fifths (80.1%; n = 157) of the respondents resided in Mochudi, which is considered a peri-urban area, as compared to about one fifth (19.9%; n = 39) of the respondents who lived in Artesia, a rural zone of the Kgatleng district (see Table 1). Overall, respondents in both locations reported having free access to a broad range of health services. Most of the parents interviewed were from the lowest economic quantile corresponding to $134 and less per month (see Table 1).

Table 1

Descriptive Characteristics of the Sample

Categorical and numerical variables	Response	*n*	%	*M*	*SD*	Range
Under-five nutritional Status	Normal	116	59.2			
	Stunted	83	42.3			
Stunting classification	Moderate	54	27.6			
	Severe	29	14.8			
Mother's marital Status	Currently married	31	15.8			
	Never married	135	68.9			
	Cohabiting/living together	29	14.8			
	Divorced/separated/ widowed	1	.5			
Residence area	Mochudi	157	80.1			
	Artesia	39	19.9			
Relationship with child you care for	Mother	170	86.7			
	Father	8	4.1			
	Grandparent	9	4.6			
	Others	9	4.6			
Mother's educational level	No education and primary	12	6.1			
	Secondary	149	76.0			
	Higher	35	17.9			
Mother's employment status	Employed	68	34.7			
	Unemployed	128	65.3			
Mother's age at birth of first child	15-19	77	39.3			
	20-24	78	39.8			
	25-29	31	15.8			
	30-34	7	3.6			
	35-39	3	1.5			
Mother's pregnancy status	Yes	17	8.7			
	No	177	90.3			
	Don't know	2	1.0			
Kinship support	Yes	60	30.6			
	No	13.6	69.4			

Categorical and numerical variables	Response	*n*	%	*M*	*SD*	Range
Type of kinship support	Monetary	42	21.4			
	Non-monetary	14	7.1			
	Not receiving any support	140	71.4			
Household head	Father	68	34.7			
	Mother	64	34.7			
	Others	64	32.7			
Family type	Nuclear family	76	38.8			
	Extended family	120	61.2			
Child's gender	Male	98	50			
	Female	98	50			
Number of persons living in the household	2	2	1.0	6.49	2.5	2-15
	3	12	6.1			
	4	36	18.4			
	5	29	14.8			
	6	29	14.8			
	7	26	13.3			
	8	23	11.7			
	9	15	7.7			
	10	14	7.1			
	11	2	1.0			
	12	4	2.0			
	14	1	0.5			
	15	3	1.5			
Number of children	1	68	34.7	2.34	1.4	1-6
	2	59	30.1			
	3	31	15.8			
	4	17	8.7			
	5	14	7.1			
	6	7	3.6			
Duration of breastfeeding	Less than 6 months	30	15.3			
	6 months to 1 year	69	35.2			
	More than 1 year	61	31.1			
	Never breastfed	36	18.4			
Mother's monthly income level	$ 134 and less	119	60.7			
	$ 135-334	28	14.3			
	$ 335-667	23	11.7			
	More than $667	26	13.3			

Table 2

Mother's Marital Status

Status	*n*	%
Single mother	136	69.4
Two-parent family	60	30.6
Total	196	100.0

Table 3

Feeding Pattern of Under-5 Children

Pattern	*n*	%
Feeding practices		
Less than 3 meals (Inadequate feeding)	4	2.0
3 meals only (Inadequate feeding)	39	19.9
3 to four meals	92	46.9
5 or more small meals (Adequate feeding)	60	30.6
Breast feeding		
Yes	159	81.1
No	37	18.9
Bottle feeding		
Yes	37	81.1
No	157	18.9

Assumptions

The outcomes for this study for both research questions were binary dichotomous. The binary logistic regression was fit for the analysis of the models. There was no multicollinearity among the independent variables with the highest correlation test between independent variables ranging between + .033 to – 0.209.

Bivariate Statistics

For the research question "What is the relationship between family structure (single-mother families, two parent-families) and the occurrence of stunting in under-5 children in the Kgatleng District, Botswana?" the alternative hypothesis assumed that there would be an association between family structure (single-mother families, two parent families) and the occurrence of stunting among under-5 children. In this section, results for the baseline binary logistic are presented to decide if family structure (single-mother families, two parent families; $N = 196$) have a statistically significant association with the occurrence of stunting among under-5 children in Kgatleng District. The alpha level for the final model was set at $\alpha = 0.05$ to determine the significance.

I examined the bivariate model showing the relationship between family structure and stunting. The possible predictor was family structure including single-mother families and two parent families. The pseudo R^2 values show approximately how much variation in the outcome is explained by the model. The Nagelkerke R^2 suggested that the model explained approximately 2.8% of the variation of under-5 stunting in the model. From the results in Table 5 it appears that stunting was negatively significantly predicted by single mother families. The Exp (*B*) and direction of the beta values informed me of the negative association between single mother families and stunting. The Hosmer-Lemeshow Goodness-of-fit test was conducted to estimate if the model adequately fit the data. The results showed $x^2(0) = 0.00$, $p = 0.046$. Additionally, the [-2 log Likelihood= 262.985] and the [Nagelkerke R squared = 0.28]. The predictor variable family structure (single-mother families) in the logistic regression analysis was found to contribute to the

model. The unstandardized beta weight for the constant was B= [-.651], SE= [.326], Wald = [3.982], $p < 0.05$. The estimated odds ratio favored a decrease of nearly [92%]. [Exp (B) = [1.918], 95% CI (1.012 - 3.637) for every increase in single mother. Children living in a single mother headed household were at higher risk of stunting compared to their counterparts with both parents. Based on the results of the baseline logistic analysis, the null hypothesis of no association between family structure and stunting was rejected.

Analysis of Research Questions and Hypothesis

Research Question 1

Table 4

Logistic Regression Results of Impact of Family Structure (Single Mother Families, two Parents Families) and Stunting after Controlling for Covariates

					95% C.I.	
Independent variables	B	Wald	Sig.	OR	Lower	Upper
Marital status [a]	-.143	.070	.791	.867	.302	2.490
Family type [b]	.272	.245	.620	1.331	.447	3.855
How many people live in the household?	.159	4.513	.034	1.172	1.012	1.356
Mother's age at birth of her first gave birth?		8.720	.069			
Mother's age at birth of her first gave birth?	-.076	.048	.827	.926	.467	1.836
Mother's age at birth of her first gave birth?	-1.600	7.229	.007	.202	.063	.648
Mother's age at birth of her first gave birth?	.485	.329	.566	1.623	.310	8.501
Mother's age at birth of her first gave birth?	21.56	.000	.999	.000	.000	.
Level of _education new		5.021	.081			
Level_of education new [c]	-1.614	4.137	.042	.199	042	.943
Level_of education_new [d]	-1.110	1.571	.210	.329	.058	1.870
Constant	.057	.004	.948	1.059		

[a] Index value is two parents.

[b] Index value is nuclear family.

[c] Index value is primary and none.

[d] Index value is secondary school.

Logistic Regression Results for Research Question 1

A binary logistic regression analysis was conducted to examine the null hypothesis that there is no relationship between family structure (single-mother families, two parent families), and the occurrence of stunting among under-5 children after controlling for covariates. The covariates, number of people living in the household, mother's age at the birth of her first child, mother's level of education, and family type were included in this model. The Hosmer and Lemeshow test suggested that the model was a good fit as $p = > 0.5$. The addition of covariates to the main predictor improved the model. The possible predictors were mother's age at birth of first child, number of people in the household, family type, and mother's level of education. The results showed $x^2(8) = 3.661$, $p > 0.05$. Additionally, the [-2 log Likelihood= 237.237] and the [Nagelkerke R squared = 0.19] explained 19% of the variance in stunting. Based on the model, family structure was not significant ($p > 0.05$), however, the predictor variables age of the mother at birth of her first child, number of people in the household, and mother's level of education in the logistic regression analysis were found to contribute to the model. The unstandardized beta for number of people in the household was B= [.159], SE= [.075], Wald = [4.513], $p < 0.05$. The estimated odds ratio favored an increase of nearly [17%] [Exp (B) = [1.171], 95% CI (1.012 - 1.356) for every increase in number of persons in the household. The variable mother's age at the birth of first child in the logistic regression model was significant for mothers aged 20-24 as compared to mothers aged 30 and above with the Exp (*B*) and direction of the beta values positive. Further, the unstandardized beta for mother's age was B= [-1.602], SE= [.595], Wald = [.048], $p < 0.05$. The

estimated odds ratio favored a decrease of nearly [20%] [Exp (B) = [.202], 95% CI (0.063 – 0.648) for every increase in mother's age at the birth of their first child. The variable, mother's education level, was found to be negatively significant for mothers who completed primary level or had no education as compared to those who had high education. The unstandardized beta for mother's education level was B= [-1.614], SE= [.794], Wald = [0.42], $p < 0.05$. The estimated odds ratio favored a decrease of nearly [20%] [Exp (B) = [0.199], 95% CI (.042 - .943) for every year increase in education.

Research Question 2

What is the relationship between family type (nuclear family, extended family) and stunting in under age-5 children in the Kgatleng district, Botswana after controlling for mother's age at birth of their first child, mother's employment, age at which babies should start eating solid foods in addition to breast milk or formula, child birth order, and number of people living in a household. A binary logistic regression analysis was conducted to examine the null hypothesis that there is no relationship between family type (nuclear family, extended families) and the occurrence of stunting among under-5 children after controlling for covariates. The model of binary logistic regression fit well within this question as our outcome of interest is dichotomous. The Hosmer-Lemeshow Goodness-of-fit test was conducted to estimate if the model adequately fit the data. The results showed $\chi^2(8) = 9.278$, $p > 0.05$. The model explained approximately 20% of variance in stunting (Nagelkerke R2) in the model. The covariates were added to the model and were significant for number of people living in the household, for age at which babies should start eating solid foods in addition to breast milk or formula, for mother's

age when she first gave birth, number of children, and child birth order. As seen in Table 5 below, the results of the binary logistic regression were significant, $\chi^2(1, 196) = 4.366$, $p = 0.033$ for number of people living in the household, for mother's age when she first gave birth $\chi^2(1, 196) = 4.248$, $p = 0$ .039, for age at which babies should start eating solid foods in addition to breast milk or formula, $\chi^2(1, 196) = 3.933$, $p = 0.047$,number of children $\chi^2(1, 196) = 4.366$, $p = 0.037$, and for child birth order $X^2(1, 196) = 4.589$, $p =$ .032. The unstandardized beta for number of people in the household was B= [.171], SE= [.080], Wald = [4.566], $p < 0.05$. The estimated odds ratio favored an increase of nearly [19%] [Exp (B) = [1.187], 95% CI (1.014 - 1.388) for every increase in number of person in the household. The unstandardized beta for mother's age when she first gave birth was B= [-.471], SE= [.229], Wald = [4.589], $p < 0.05$. The estimated odds ratio favored a decrease of nearly [19%] [Exp (B) = [.624], 95% CI (.399 - .977) for every increase in maternal age. The unstandardized beta for number of children was B= [-.387], SE= .185], Wald = [4.366], $p < 0.05$. The estimated odds ratio favored a decrease of nearly [32%] [Exp (B) = [.679], 95% CI (.473 - .976) for every increase in number of persons in the household. In other words, stunting is negatively affected by number of children by a factor of .679. The unstandardized beta for child birth order was B= [1.033], SE= [.482], Wald = [4.589], $p < 0.05$. For every increase in the child birth interval, the odds of stunting increase by a factor of 2.809. The unstandardized beta for introduction of complementary foods was B= [2.110], SE= [1.064], Wald = [3.933], $p < 0.05$. The increase of age at which solid foods were introduced in babies feeding in addition to breast milk or formula increased the odds of stunting by a factor of 8.247.

Table 5

Logistic Regression Results of Impact of Family Type (Nuclear Families, Extended Families) and Stunting after Controlling for Covariates

Variables in the Equation		B	S.E.	Wald	df	Sig.	OR	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	What was your age when you first gave birth?	-.471	.229	4.248	1	.039	.624	.399	.977
	How many children do you have?	-.387	.185	4.366	1	.037	.679	.473	.976
	How many people live in the household?	.171	.080	4.566	1	.033	1.187	1.014	1.388
	Birth order	1.033	.482	4.589	1	.032	2.809	1.092	7.226
	At what age should babies start eating solid foods in addition to breast milk or formula?	2.110	1.064	3.933	1	.047	8.247	1.025	66.354
	What is your average monthly income?	.266	.180	2.194	1	.139	1.305	.918	1.856
	What is your employment status?	.507	.408	1.547	1	.214	1.660	.747	3.690
	What would you consider your family type?(1)	-.411	.400	1.056	1	.304	.663	.303	1.452
	Constant	-6.638	2.405	7.616	1	.006	.001		

a. Variable(s) entered on step 1: 11. What would you consider your family type?

Summary

This cross-sectional study included two research questions and fitted a binary logistic regression for analysis of data to predict the outcome. Bivariate models (even though unstable as per H-L results) for the two RQs revealed a statistically significant relationship between family structure (single mother families, two parent families) and stunting in under five children in the Kgatleng district, Botswana for RQ1 and family type (nuclear family, extended family) and stunting in under age five children in the Kgatleng district, Botswana for RQ2. However, the null hypothesis for research questions 1 and 2 in the improved models that included covariates was not rejected. Nevertheless, number of people in the household, age at which a baby should start eating solid foods in addition to breast milk or formula, mother's age at the birth of her first child, and mother's education level were found to be significant. Chapter 5 interprets, and discusses the findings described in this chapter in line with the literature. Chapter 5 also includes the study limitations, future recommendations, and implications for social change.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The objective of this nonexperimental, cross-sectional research study was to investigate the health impact of single motherhood on the occurrence of stunting in Kgatleng District, Botswana. Mothers and under-5 children's characteristics factors were examined. This quantitative study used primary data collected in five clinics in the Kgatleng district and included a sample of 196 mothers bringing their under-5 children for welfare clinics. I used SPSS (Version 25) to analyze the data. In RQ 1, I sought to analyze whether there was a relationship between family structure (single-mother families, two parent families) and the occurrence of stunting in under-5 children in the Kgatleng District, Botswana, after controlling for number of people living in the household, mother's age at birth of first child, mother's education level, and family type. In RQ2, I examined whether there was a relationship between family type (nuclear family, extended family) and stunting in under-5 children in the Kgatleng District, Botswana, after controlling for mother's age at birth of their first child, mother's employment status, age at which babies should start eating solid foods in addition to breast milk or formula, child birth order, mother's income level, and number of people living in household.

The main findings for RQ1 supported the hypothesis that there is a relationship between family structure (single-mother families, extended families) and stunting for the bivariate model. However, after the introduction of covariates number of people living in the household, mother's age at birth of first child, mother's education level, the model

was no longer significant. For RQ2, the key finding held the hypothesis that there is no relationship between family type (nuclear family, extended family) and stunting in under-5 children in the Kgatleng District, Botswana when controlling for mother's age at birth of their first child, mother's employment status, mother's income level, age at which babies should start eating solid foods in addition to breast milk or formula, child birth order, number of people living in the household. The model was not significant and in each case of the improved models, the null hypothesis was not rejected.

Interpretation of the Findings

The determinant factors of stunting identified in this study were male gender for the child, number of people living in the household, age of the mother at birth of their first child, age at which solid foods are introduced, and child birth order. The association between family structure (single mother family and two-parent families) and stunting was statistically significant. Children living with their mother alone were at higher risk of stunting compared to their counterparts living with both parents. Similar studies conducted in Rwanda showed an increase likelihood of stunting for under-5 children in single mothers' homes. This resonates with Finlay et al. (2016) who showed a negative effect of single mothers on stunting. Contrarily, Vandeginste (2014) showed in Burundi and Nigeria that children from single mothers' homes were less likely to be stunted. This is in line with findings in the improved model for RQ1 for this study. The mixed findings could be explained by the fact that there is variety of risk factors leading to stunting and that single motherhood may not be the sole pathway to stunting. In the adjusted model, after controlling for covariates, the association between family structure (single mother

family and two parent families) and stunting was not significant. The effect of single mothers on stunting could then be influenced by other factors, such as mother's age at birth of her first child, household wealth, child birth order, maternal education level, and child gender. In this study, teenage and adolescent mothers were a risk factor to stunting. As shown in Table 1, 42.3% (n = 83) of under-5 children experienced stunting. Previous researchers in sub-Saharan Africa reported similar trends (Birhanu et al., 2017; Mengesha et al., 2020). Results for gender association with stunting revealed that boys were more stunted than girls. This is in line with previous studies that revealed increased likelihood of stunting among boys; hypothesizing the role played by environmental stress, researchers showed that boys were more predisposed to experience chronic undernutrition than their female counterparts (Asfaw et al., 2015). Table 1 showed that stunting was higher among under-5 children in the age group 12-23 months. Children in the age group 6-11 months, 24-35 months, 36-47 months, and 48-59 months were also likely to experience stunting. This is consistent with previous work and researchers who reported long-term and cumulative effects of stunting with the increased age of under-5 children (Dewey & Huffman, 2009; Geberselassie et al., 2018; Maleta et al., 2003). In their seminal study on timing of growth faltering in rural Malawi, Maleta et al. (2003) found that height faltering among under-5 children was 10.5 cm lower than those of the reference population and that height faltering had diverse origins and determinants.

The time of initiation of complementary feeding was statistically significant with regard to stunting. In this study, the majority of under-5 children was breastfed up to one year and was found to be stunted. This is in agreement with previous studies conducted in

Ethiopia that showed increased likelihood of stunting for children who received complementary feeding before 6 months and for more than 12 months (Akombi, Agho, Hall, Wali, et al. 2017; Ayaya et al., 2004). Akombi, Agho, Hall, Wali, et al. (2017) in their systematic review conducted in sub-Saharan Africa on stunting, wasting, and underweight emphasized the importance of timing of introducing complementary feeding, the good quality of feeding, and the right frequency at which feedings have to be administered for better childhood development. The authors showed that extended duration of breastfeeding with poor complementary feeding practices inclines a child to growth failure due to inadequate nutrients intake needed to fuel their developing brains and bodies (Akombi, Agho, Hall, Wali, et al., 2017).

For RQ2, I hypothesized that there is a relationship between family type (nuclear family, extended family) and stunting in under-5 children in Kgatleng District, Botswana. As expected, the results of the bivariate analysis demonstrated a statistically significant relationship with children living in extended families having higher likelihood of stunting as compared to those living in nuclear family. This is in line with previous studies that report worse health outcome with increased odds of stunting for under-5 children living with single mothers or mothers who are not currently living with their partners (Dewana et al., 2017). However, the analysis of the improved model showed no statistically significant relationship between family type and stunting. A possible explanation is that, in Botswana, the majority of single mothers in rural and urban settings were unemployed and co-resided with a grandmother (Mokomane et al., 2006). In agreement with the hypothesis of co-residence, findings from recent studies in sub-Saharan Africa showed a

lesser likelihood of stunting for children living with a grandmother (who is aged between 50 and 75 years) in the household as compared to those not living with their grandmother (Schrijner & Smits, 2018). The authors found that the presence of a grandmother played a moderating effect in rearing their grandchildren (Schrijner & Smits, 2018). Conversely, they found no association between co-residence with a grandfather and child stunting (Schrijner & Smits, 2018).

The current study findings indicated a statistically significant relationship between large family size and stunting. Researchers have reported various factors that could be incriminated in this regard, such as scarcity of resources for household consumption; in particular, they mentioned lack of food that could lead to stunted growth (Schrijner & Smits, 2018). This corroborates findings by Habyarimana et al. (2016) that children born in a large family size had a higher risk of stunting. They showed an increased likelihood of stunting among under-5 children born to mothers who had more than three children (Habyarimana et al., 2016). On the contrary, few studies reported increased likelihood for underweight for children born to a mother who gave birth to more than four (Asfaw et al., 2015).

Maternal education and mother's age at birth of their first child are associated with either improving or worsening of child health outcomes. This study showed that mothers with no education or with only primary school attainment were significantly negatively associated with their child's stunting. This is in line with studies conducted across sub-Saharan Africa reporting a positive relationship between mother's education and healthier under-5 children (Akombi, Agho, Hall, Merom, et al., 2017). Previous

studies also found the percentages of stunted children to be the least among households with a higher wealth index, more maternal education, urban residence, female child, birth interval ≥ 48 months, fewer children ever born and singleton birth (Yaya et al., 2020). In this study, adolescent and teenage mothers were more likely to have stunted children. This is in accord with Nguyen et al.'s (2019) findings that teenage mothers, compared to adult mothers, negatively affect maternal and child outcomes. They found that children born to adolescent mothers were at risk of being undernourished through various mechanisms such as poor maternal nutritional status and many more (Nguyen et al., 2019). In this study birth order was positively associated with stunting. These results were in line with previous findings that support the notion of inverse relationship between the length of the preceding birth interval and the proportion of children who were stunted (Asfaw et al., 2015). The authors argued that the longer the interval, the less likely it is that the child will be stunted (Asfaw et al., 2015).

Limitations of the Study

This study generated significant determinant factors for stunting in under-5 children in Kgatleng District, Botswana. However, the study had some limitations. First, causality could not be established due to the cross-sectional nature of the data. Data were collected at one point in time to determine stunting in under-5 children. Secondly, the accuracy of the mother's responses could not be verified. All under-5 children included in the current study had their under-5 welfare cards where their demographics were documented. However, the children's mothers or caretakers self-reported information on various characteristics such as maternal income level, mother's education attainment,

employment status, marital status, and breastfeeding practices, which might have introduced response inaccuracy. Third, this study did not include parental/child's current and past health illness, such as HIV, diarrhea, or malaria, that could influence the outcome of interest. Also, the current study did not measure the height for caretakers and did not assess mothers' nutritional status as this measure could influence and determine factors leading to the child health outcome of interest.

Recommendations

To my knowledge, there have not been any studies conducted in Botswana to determine the relationship between single-mother families and stunting using primary data. Studies on stunting in sub-Saharan Africa largely focused on stunting, underweight, and wasting without putting particular attention on single mothers and their implications on stunting. The results for this research will offer a useful foundation for future researchers to view the pertinence of the health impact played by family structure and family type on stunting among under-5 children. This study showed that stunting affects mostly under-5 children aged 12-24 months. At the exosystem level of Bronfenbrenner's ecological model, the current study found that mothers with no education or those with primary attainment were associated with stunting in their under-5 children, whereas at chronosystem level, this study showed that time/age of the mother on first childbearing was also associated with stunting. Wodon et al. (2016) reported that earlier primary educational attainment had the capacity to influence when, why, and how a woman marries. In the context of sub-Saharan Africa, they argued that pursuing and completing

secondary schooling was repeatedly, in part, disturbed by early marriage (Wodon et al., 2016).

I therefore encourage public health officials at local, regional, and national level to focus on educating teenage and adolescent mothers and emphasize the importance of caring practices for their children and the need for these young mothers to defer the time of child bearing. Further, the Botswana Ministry of Health and Wellness should sensitize and focus on educating health workers on undernutrition phenomena and its consequences on under-5 children, specifically on stunting. Future researchers on this topic are also encouraged to conduct longitudinal studies that include single mothers' and two-parent households with children aged 0 to 59 months taking into account the cultural belief of the populations and environment in which they live to depict the true relationship between family structure and stunting in the country such that findings are not either overstated or understated. Further, to achieve the WHO's global nutrition target by 2025, policy makers are advised to formulate multi-strategy community-based approach laws that promote equality and reduce poverty by supporting young single mothers with cash transfer strategies and entrepreneurship opportunities in the fight against undernutrition, hence, reducing inequalities in child health outcome.

Implications for Social Change

Reducing and preventive the burden of stunting is a very cost-effective strategy for sub-Saharan Africa, specifically for an emerging country like Botswana. These strategies should aim at promoting a healthier society with better health outcome for under-5 children in view of promoting productivity and improve national economies. In

2012 the WHO declared stunting a global target and called for a 40% reduction of stunting by 2025 (WHO, 2015). UNICEF et al. (2015) estimated globally about 159 million of under-5 children who were stunted and Africa shared the big proportion of more than one third of children. The bivariate findings in the current study revealed a negative association between single mother families and stunting while the effect of single mother families on stunting in the multivariate analysis did not reveal a significant association. Results from this study have implications for social change in that single motherhood is not the unique determinant for stunting and that household structure (family structure) might play a buffer role in alleviating the severity of child health outcome. For instance, Schrijner and Smits (2018) showed a positive association between the co-residence of grandmothers who were in their middle ages and the reduction of children's stunting in sub-Saharan Africa. Finlay et al. (2016) in their study on stunting risk of orphans by caregiver and living arrangement in low-income and middle-income countries found that orphan status in general could not intensify the risk of malnutrition and that head of household as well as whether the surviving parent lives with the child could play a protective role.

The current study added knowledge on the family structure, family type in the Kgatleng District and mainly supports education and social awareness of the mothers and caretakers in view of combatting stunting that affects under-5 children in Botswana. Continued efforts by local government, public health officials in conjunction with other non-governmental organizations to curb the prevalence of stunting are well recommended. My findings from the current study point to a need for a longitudinal

study using a mixed method methodology to help determine the most efficient course of action to decrease under-5 stunting in the Kgatleng District, Botswana.

Conclusion

The purpose of this cross-sectional, nonexperimental study was to examine the health impact of single motherhood on the occurrence of stunting in Kgatleng District, Botswana. Two research questions were modeled to better examine the hypothesis under investigations. The study's findings showed that single motherhood increases the likelihood of under-5 stunting to some extent in a bivariate model. However, the outcome was not statistically significant in improved models that controlled for covariates, showing that single motherhood should not be considered as a sole pathway to under-5 children stunting. Stunting is still a serious public health issue in sub-Saharan Africa and a major threat to the development of the under-5 children. Thus, further longitudinal studies that would include other predictors are recommended to help depict various routes that lead to undernutrition. Determinant factors for this study were age of the mother at birth of her first child, age at which complementary food is introduced, child birth order, number of people living in the household were predictors of stunting.

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Appendix: Questionnaire

Questionnaire on household structure, demographics, employment, health, and wellness for mothers and their under-five children

Respondent Identification			Coding
IRT1	District		
IRT2	Village		
IRT2	Ward		
Interviewer Identity			
IP1	Name of the Interviewer		
IP2	Date of interview	☐☐ ☐☐ ☐☐☐☐	
IP3	Time of interview	Time started :	Time ended:
Consent, Interview Language			
CI1	Interview Language	English------- 1 Setswana---- 2	

	(English or Setswana)		
CI2	Consent has been obtained (written).	Yes ---1 No--- 2 **If no, end the interview**	
Status	Name	Date	Signature
Interviewer		☐☐ ☐☐ ☐☐☐☐	
Data entry			

CORE: Mother Characteristics and Child Breastfeeding			
I am going to ask you demographics questions and questions' pertaining to your child's eating habits. There is no right or wrong answer. Please let me know if you need me to clarify any of my questions. Feel free to ask any question you may have.			
Questions		**Response** (Tick the corresponding answer)	**Code**
1	What is your age? *Probe if necessary*: What is your birth date?	_ _ / _ _ /_ _ _ _ day month year	M1
2	What is your address?	District _____ Village _____ Ward _____ Other _____	M2
3	What is your relationship with the child you are caring for?	Mother 1 □ Father 2 □ Grandparent 3□ Other 4 □ explain: _____ If the answer is Father (2) go to M3a	M3
	Are you still together with the mother of the child?	Yes 1 □ No 2 □	M3a
	What is your marital status?	Currently married 1 □ Never married 2 □	

4		Cohabiting 3 □ Separated/Divorced 4 □ Widowed 5 □	M4
5	What was your age when you first gave birth?	18 to 22 1 □ 23 to 27 2 □ 28 to 32 3 □ 33 to 37 4 □ 38 to 45 5 □	M5
6	Are you currently Pregnant? *For pregnant women: ask if* *this is her first pregnancy*	Yes 1 □ No 2 □ First pregnancy □ Not First Pregnancy □	M6
7	How many children do you have?	Fill in the blank space _____	M7
8	How many people live in the household	Include the number on the space below _____ □	M8
9	What is your average monthly income?	< $134 USD 1 □ $135-200USD 2 □ $201-334USD 3 □ $335-667 USD 4 □ >$667 5 □	M9
10	Who is the household head?	Mother 1 □ Father 2 □ Other 3 □	M10

11	What would you consider your household type?	Nuclear Family 1 □ Extended Family 2 □ Other 3 □	M11
12	What is your employment status?	Employed 1 □ Unemployed 2 □ *If the answer is employed go to M13*	M12
13	Where are your employed	Government employee 1 □ Private sector employee 2 □ Police or Military 3 □ Trading or entrepreneur 4 □ Farmer (land owner) 5 □ Farm worker 6 □ Other 7 □	M13
14	Have you ever attended school?	Yes 1 □ No 2 □ *If yes skip to M14a*:	M14
	What is the highest level of school you attended?	None 1 □ Primary school 2 □ Secondary school 3 □ Completed some college 4 □ College graduate 5 □	M14 a
15	Do you have access to health services	Yes 1 □ No 2 □	M15
16	Does your child have siblings	Yes 1 □ No 2 □ If the answer is yes go to M16a	M16
	How many siblings does your child have	*Give the number in the space provided below* _____	M16a
	What is the age of the other siblings	< 2 years 1 □ 2 years 2 □	M16b

		≥ 3 years 3 □ 4 and above 4 □	
17	Birth Order	First 1 □ Second 2 □ Third 3 □ Fourth 4 □ Firth or higher 5 □	M17
18	Do you receive any additional household support?	Yes 1 □ No 2 □ If yes proceed to question M18a	M18
19	Can you specify the type of support?	Monetary form(money) 1 □ Non-monetary (goods and services) 2 □	M18a

CORE: Breastfeeding

I am going to ask you some questions about breastfeeding. Please let me know if you need me to clarify any of my questions. Feel free to ask any question you may have.

Questions		**Response**	**Code**
20	Was your child (*Child's code*) breastfed immediately after birth?	Yes ----1 □ No------2 □ *If no, go to B 3*	B1
21	For how long was your child breastfed?	Less than six months 1 □ Six months to 1 year 2 □ Greater than 1 year 3 □	B2

22	If not breastfed, what did you provide the child with in the first 6 months	*Feel free to provide your answer here*:	B3
23	When you are not home or cannot feed the child yourself, who does it?	Father 1 □ Grandmother 2 □ Other children 3 □ Other 4 □ Don't know/no answer 5 □	B4
CORE: Diet			
The next questions ask about the meals you feed your child daily.			
Questions		**Response**	**Code**
24	How many meals does your child eat daily?	Less than 3 meals 1 □ 3 meals 2 □ 3 to 4 meals 3 □ 5 meals or more 4 □	D1
25	If your child has less than 3 meals daily, why is it so?	Lack of food in the household 1 □ Lack of resources 2 □ Others 3 □	D2
		Mabele/Maize meal/Rice/Samp/Pasta/Potatoes/Brea	

26	Give an example of a meal that you gave to your child in the past 24 hours *If the meal contains all the categories, tell the mother to choose a corresponding answer/answers as necessary*	d/Breakfast cereal/Tsabana/Malutu 1 □ Beef/Chicken/eggs/Fish/Beans/Phane/Milk/Peanut Butter 2 □ Vegetables (cabbage/rape/spinach/butternut) 3 □ Fruits/Fruit Juice 4 □	D3
27	In the past seven days, how often did you give your child any of the following foods? (Mabele/Maize meal/Rice/Samp/Pasta/Potatoes/Bread/Breakfast cereal)	1-3 times 1 □ 4-5 times 2 □ 6 or more 3 □ Never 4 □	D4
28	In the past seven days, how often did you feed your child protein rich foods? (Beef/Chicken/Eggs/Fish/Beans/Phane/Milk/Peanut Butter)	1-3 times 1 □ 4-5 times 2 □ 6 or more 3 □ Never 4 □	D5
		1-3 times 1 □	

29	In the past seven days, how often did you give your child fruits and vegetables?	4-5 times 2 □ 6 or more 3 □ Never 4 □	D6
30	Do you supervise your child's feeding?	Yes 1 □ No 2 □	D7

CORE: Mother's nutritional Knowledge			
I am going to ask you some questions about your knowledge about nutrition. Please let me know if you need me to clarify any of my questions. Feel free to ask any question you may have.			
Questions		**Response**	**Code**
31	What are the benefits of breastfeeding in the first six months of life? *Ask the participant to choose all responses that apply*	He/she grows healthily 1 □ Protection from diarrhoea and other infection 2 □ Protection against obesity and chronic diseases in adulthood 3 □ Protection against other diseases 4 Other 5 □ Don't know 6 □	K1
32	When should a mother start	Immediately after birth 1 □	

	breastfeeding their new born infant?	More than 2 hours 2 □ Don't know/no answer 3 □	 K2
33	At what age should babies start eating solid foods in addition to breastmilk or formula	H At birth 1 □ At Six months and above 2 □ Don't know 3 □	 K3

Questionnaire continued

Core: Child's Demographic and Anthropometric (Height and Weight) Measures			Code
34	What is your child' age? *Probe if necessary*: On what day and in which month and year was child born? Does he/she have an under-five card with the birth date recorded? *If yes, record the date of birth as documented in the under-five card*	_ _ _ _ / _ _ / _ _ year month day	C1
35	What is your child's gender	Male 1 □ Female 2 □	C2

CORE: Core: Child's Demographic and Anthropometric (Height and Weight) measures

Continued.

Questions		Response	Code
36	Height/length	In Centimeters (cm) ⌊__⌋⌊__⌋.⌊__⌋	C3 C4
37	Weight *If too large for scale, code 666.6*	In Kilograms (kg) ⌊__⌋⌊__⌋.⌊__⌋	C5