Radboud University

The role men play on stunting in West African countries

Name: Daïfa Petronilia
University: Radboud University, Nijmegen
Date: 2 July 2021
Supervisor: Jana Vyrastekova
Course: Master's Thesis

The role men play on stunting in West African countries

Daïfa Petronilia, July 2021

Abstract

In 2020 alone, 144 million children under the age of 5 were stunted. Previous studies have regularly drawn attention to the role women play on child undernutrition but have not highlighted men's role on child undernutrition. Therefore, this study aimed to gain insight on the role men play on one form of child undernutrition, namely stunting in West African countries. This study has considered four men related variables, which are male-headed households, father's education and occupation, grandfather's co-residence, and polygamous culture. The data used in this study is obtained from the Demographic and Health Survey (DHS) and the World Governance Indicators (WGI). Data from the DHS database contains information on 58,845 children aged 6-59 months living in 12 West African countries covering the period of 1993-2020. To estimate relationships, bivariate analysis and multilevel logistics regression analyses were the methods applied. Results suggest that men do play a role on child undernutrition. Children whose father is highly educated and better-paid have lower odds of being stunted than other children. Moreover, children co-residing with their grandfathers have lower odds of being stunted. Finally, children in households led by males and children coming from polygamous households have a higher odds of being stunted.

***Keywords**: male-headed households, father, grandfather, polygamy, stunting*

Table of Contents

Introduction

An issue that persists in developing countries is undernutrition, especially among children under the age of five. Although several countries have been able to regulate and decrease the number of undernourished children, some still struggle to reduce child undernutrition. According to the World Health Organization (WHO) (2020a), in 2020, 144 million children under the age of five were stunted and 47 million under the age of five were wasted. Moreover, 45% of deaths of children under five years are directly or indirectly linked to undernutrition. Statistics clearly show that developing countries find it challenging to create and maintain a healthy environment and society. This could be because of the lack of resources, lack of available and accessible services or lack of good governance. This is a concern for developing countries because a healthy society will be less exposed to diseases and will perform better, contributing to both the country as the economy's growth and development in the long run. On top of that, with the current and devastating pandemic, it has become a bigger challenge for developing countries to reduce child undernutrition as things have worsened overall.

Studies often tend to put emphasis on the role women play on child undernutrition, considering the great influence women's education, Body Mass Index (BMI), height, and pregnancy status have on a child's nutritional status. But what about men? Do they not play an important role on a child's nutritional status? Previous studies suggest that men, their attitude, behavior, (nutritional) knowledge, nutritional status, contribution, support and guidance, involvement, and commitment impact a child's nutritional status (Sharma & Subramanyam, 2021; Kansiime, Atwine, Nuwamanya, & Bagenda, 2017; Ambikapathi, et al., 2021; Haywood, 2015; McEniry, Flórez, Pardo, Samper-Ternent, & Cano-Gutierrez, 2017). Still, there are not enough studies that focus on the role men play on child undernutrition. Therefore, this study has focused on the role men play on child undernutrition in West African countries. Previous scholars and researchers have used some of the variables considered in this study for research purposes in other countries such as Sub - Saharan Africa and individual developing countries, but not much research has been conducted on a group of West African countries specifically. Most current research on West African countries are individual, not collective.

"Child undernutrition refers broadly to the condition in which food intake is inadequate to meet a child's needs for physiological function, growth, and the capacity to respond to illness." (Wells, et al., 2019, p. 831) There are four sub-forms of undernutrition, namely stunting,

underweight, wasting[1] and deficiencies in vitamins and minerals (World Health Organization, 2020). Child undernutrition can have devastating (economic) consequences on a household level as well as a national level. Child undernutrition exposes children to serious diseases, contribute to child mortality and hinders the process of a proper development for the child. Hence, undernourished children are physically, emotionally, and mentally less productive concluding in the inability to perform well in school (Egata, Berhane, & Worku, 2014). This, of course, has both short term as well as long term economic and social consequences (Wali, Agho, & Renzaho, 2019).

In addition to this, the dangerous aspect of child undernutrition is that it is not a problem only during a child's childhood. It may carry on in their adulthood. Children who experience undernutrition during their childhood are more likely to suffer health issues, to have a negative impact on their cognitive and motor development, to have limited education and to be less productive at work, which in turn will provide explanation as to why they are trapped in poverty (Bredenkamp, Buisman, & Van de Poel, 2014).

While the statistics mentioned in the first paragraph of the Introduction provide a more or less indication of the seriousness of the issue of child undernutrition, the main concern remains on how to reduce child undernutrition. The number of undernourished children has been decreasing over the past years, but this is happening at a slow pace. To date, in seven (7) sub-regions with high or very high prevalence of stunting, at least one (1) in every four (4) children is stunted (World Health Organization, 2020b) To come up with policies to reduce child undernutrition, countries must first identify the factors that play a crucial role in reducing child undernutrition.

One of the main factors expected to be associated with child undernutrition is economic growth. The theory behind this - as formulated by previous studies - is that income growth enables households to enjoy from more resources and therefore, making sure that household members consume the necessary calories needed to be nourished (Dreze & Sen, 1989). Moreover, it is also theorized that increases in GDP per capita enables increases in investments in nutrition, health, and sanitation. Hence, increased GDP per capita leads to increases in nutritional, health

[1] "Wasting refers to a child who is too thin for his or her height". (World Health Organization, 2020b, p. 2)

and sanitation investments, which in turn, reduces child undernutrition (Harttgen, Klasen, & Vollmer, 2013).

While Biadgilign, Shumetie and Yesigat (2016) and Soriano and Garrido (2016) suggest that economic growth does play an important role in reducing child undernutrition, Harttgen, Klasen and Vollmer (2013) and Subramanyam et al. (2011) argue that this relationship is rather small and weak, and in some cases, even not present. This means that other factors play a more influential role on child undernutrition than income growth. The other factors that influence child undernutrition are the socioeconomic status (SES) of households (Kang & Kim, 2019; Correia, et al., 2014), mother's nutritional status (Abuya, Ciera, & Kimani-Murage, 2012; Keats, 2018; Heath & Jayachandran, 2016; Gelu, Edris, Derso, & Abebe, 2018), area of residence (De Souza, 2017) and child characteristics (Harttgen, Klasen, & Vollmer, 2013; Boah, Azupogo, Amporfro, & Abada, 2019). While enough research has been conducted on these factors, the limited research on the role men play on child undernutrition was the main motivation behind this study.

The purpose of this study was to explore the role men play on child undernutrition in West African countries. Generally, when it comes to a child's nutritional status, attention is often drawn on women, since traditionally women are in charge of care related activities such as childcare (United Nations, 2011). Nevertheless, not only do women play an important role on a child's life, but men as well. Men play an important role in societies and in households. Men lead families, provide guidance and support, make major decisions concerning the household and the well-being of the family, and contribute economically at home (Fingleton-Smith, 2018; Engle, 1997). Previous studies in U.S. and Europe, confirmed that father's involvement in a household - from his presence to the income provided - adds value and contributes significantly to his children's intellectual, social, and emotional development and hence, improves the children's developmental and nutritional status (Engle, 1997). This is an indication that, besides women, men also matter and must therefore be taken into account.

The importance of this study was to shed light on the topic of the role men play and its consequences on child undernutrition. Considering the role men play in societies, households as well as, a child's nutritional status, in theory male-headed households with better educated men having a well-paid job and having the responsibility to provide for only one wife and the rest of his family, are less likely to have an undernourished child. Moreover, children co-

residing with their grandfathers may also be less likely to be undernourished (Ayogu, Afiaenyi, Madukwe, & Udenta, 2018; Tariq, Sajjad, Zakar, Zakar, & Fischer, 2018; Keino, Plasqui, Ettyang, & van den Borne, 2014; Senbanjo, Oshikoya, Odusanya, & Njokanma, 2011; Schrijner & Smits, 2018a).

Therefore, to determine the role men play on child undernutrition, the four men related variables that have been considered in this study are male-headed households, father's education and occupation, grandfather's co-residence, and polygamous culture. This study contributed highly to the knowledge on West African countries and their health related concerns especially, child undernutrition. Although some regions have experienced a decline in the number of undernourished children under five years, other regions such as Africa still did not manage to decrease the number of undernourished children under five years. This inability to decrease the number of undernourished children is enough to take this problem of child undernutrition seriously, especially because of the short run and long run consequences it has on the economy, the society, and the country as a whole.

The question that this research wanted to investigate was thus:

"What role do men play on child undernutrition in West African countries?"

The remainder of this paper is structured as follows: Section 2 provides a theoretical framework. Section 3 describes the data used in the analysis. Section 4 presents the methodology. Section 5 and 6 discus the results. Section 7 provides recommendations and section 8 provides a conclusion of the study.

Theoretical framework

There are different factors that influence a child's nutritional status and one of them is men and their role as a family member. While the role women play on a child's nutritional status matters, men's role also matter. Men are not only crucial because they lead families, but also because of their (economic) contribution and engagement that lead to improvements in a child's nutritional status (Go, 2017). All in all - though not highlighted enough - men do play an important role in a child's life and nutritional status, especially because of their income earning power.

The determinants that capture men's role on child undernutrition have been limited to four, namely male-headed households, father's education and occupation, grandfather's co-residence and culture as proxied by polygamous households. Traditionally, a woman's role is to be a housewife and take care of the children, while the man has a job, which is his source of income that allows him to provide for his family. A man's role as a provider and his great decision-making power regarding most matters such as family welfare is a more or less indication that men are often the individuals that lead their families (Fingleton-Smith, 2018).

To be able to provide for his family, a man has to have an occupation. Having a decent and well-paid job (non-farm jobs) that allows one to cover the necessary expenses requires education. It is not that working in a farm is not a decent job, but rather that fathers working in farms generate insufficient income resulting in less investments in a child's nutritional status and thus, an undernourished child (Keino et al., 2014). A well-educated father not only has the chance to have a well-paid job, but also allows the father to gain knowledge on topics such as child and maternal health and family planning (Ambikapathi, et al., 2021). Furthermore, education affects personal characteristics like less present bias[2] behavior. Education minimizes the chance of making poor and short-term decisions, while encouraging future oriented decisions (Lavecchia, Liu, & Oreopoulos, 2015)

In addition to fathers, grandfathers also play a role on a child's life. In support of this, Tanskanen and Danielsbacka (2016) showed that grandfather's involvement improves a child's cognitive abilities. Moreover, Schrijner & Smits (2018b) also indicated that children living

[2] "Present bias is loosely defined as the propensity of overvaluing immediate rewards at the expense of futures ones." (Direr, 2020)

with their grandfathers are more likely to be in school. Grandfathers not only influence a child's development through school enrolment, but also through their nutritional status (Adachi & Urabe, 2021; McEniry, Flórez, Pardo, Samper-Ternent, & Cano-Gutierrez, 2017).

Lastly, culture as proxied by polygamy is considered. In West African countries especially, polygamy is a common cultural practice. Providing for one wife is already a struggle for men in developing countries considering the situation, let alone providing for multiple. Polygamy brings negative economic, social and educational constraints, mostly affecting the child (Al-Sharfi, Pfeffer, & Miller, 2016; Dissa, 2016). This means that in theory male-headed households, highly educated fathers, decent/ well-paid fathers, the co-residence of grandfathers and non-polygamous households are less likely to have an undernourished child. Although other variables could have been considered, the previous mentioned variables are the variables that are relevant for this study and that better capture the impact of the role men play on child undernutrition.

Male-headed households

The first determinant considered in this study that captures the role men play on child undernutrition was male-headed households. According to Gantner (2007), a social program implemented in Mexico with the goal to improve school enrollment, attendance, educational performance, health, and nutritional status of children in targeted households revealed that resources controlled by women are more likely to manifest greater improvements in child health and nutrition. Sethuraman, Lansdown and Sullivan (2006) found a positive and significant relationship between women empowerment and a child's nutritional status. This finding suggests that empowered, encouraged and autonomous women who are able to make certain or most decisions by themselves, could reduce the risk of having an undernourished child. Nonetheless, this is not only the case with empowered women, but also with empowered men with high gender-equitable attitudes (Sharma & Subramanyam, 2021).

In Western Kenya, children from female-headed households were less underweight compared to children from male-headed households (Onyango, Tucker, & Eisemon, 1994). On the other hand, studies conducted in Pakistan, Ethiopia, Nigeria and India found that female-headed households have more chances of having stunted and wasted children (Asif & Akbar, 2021; Ayogu, Afiaenyi, Madukwe, & Udenta, 2018; Haidar, Abate, Kogi-Makau, & Sorensen, 2005;

Liben, Abuhay, & Haile, 2016). This may be in support of the assumption that mothers who are alone are poorer because of limited or less income and thus, have less access to resources and nutritious food (Onyango, Tucker, & Eisemon, 1994; Workie, Mekonen, Fekadu, & Mekonen, 2020).

Additionally, in Kenya and Malawi, children coming from *de facto* female-headed households[3] had a better nutritional status than *de jure* female-headed households[4] (Kennedy & Peters, 1992). This means that a female-headed household does not necessarily translate in a lower probability of a child being undernourished and it highlights that male-headed households also play an important role in child undernutrition.

Although research on male-headed households is limited, one study found that the odds of a child being stunted lowers by 3.1 percent in a male-headed household in comparison to female-headed households (Harttgen, Klasen, & Vollmer, 2013). Contrary to Harttgen, Klasen and Vollmer (2013), previous studies conducted in Indonesia, Ethiopia, Namibia and Mozambique found that sub-forms of undernutrition like stunting and wasting were more prevalent among male-headed households (Haile, Azage, Mola, & Rainey, 2016; Vaezghasemi, et al., 2014; Mtambo, Katoma, & Kazembe, 2016; Azzarri, Carletto, Davis, Nucifora, & Sohnesen, 2011).

Father's education and occupation

The second determinant considered was father's education and occupation. Previous studies have shown that one of the most important factors affecting the economy, the society, the behavior, and the attitude of individuals is education (Hasan, Ahmed, & Chowdhury, 2013). Of course! Education plays an important role on health and health related topics such as child undernutrition. Education allows individuals to educate themselves and gain more knowledge on e.g. properly taking care of a child, making use of health services, and applying family planning methods (Hasan, Ahmed, & Chowdhury, 2013).

[3] "De facto female-headed households are those where the self-declared male head is absent for at least 50 per cent of the time." (Kennedy & Peters, 1992, p. 681)

[4] "De jure female-headed households are those in which a woman is generally considered the legal and customary head of household." (Kennedy & Peters, 1992, p. 681)

Mother's nutritional status including her educational attainment is considered one of the most influential factors of child undernutrition (Harttgen, Klasen, & Vollmer, 2013). As one of the most important predictors of a child's nutritional status, previous studies suggest that more educated women reduce fertility and mortality rates, invest more in health and nutrition especially of their children, improve the child's health and thus have less undernourished children (Abuya, Ciera, & Kimani-Murage, 2012: Keats, 2018; Heath & Jayachandran, 2016; Gelu, Edris, Derso, & Abebe, 2018).

Even though mother's education plays an important role on a child's nutritional status, paternal education also seems to be a relevant factor influencing a child's nutritional status (Vollmer et al, 2017; Headey, 2014). In Mozambique and Pakistan, highly educated and literate fathers were more likely to have less stunted and underweight children compared to lower educated and illiterate fathers (Azzarri, Carletto, Davis, Nucifora, & Sohnesen, 2011; Mahmood, Abbas, Kumar, & Somrongthong, 2020; Tariq, Sajjad, Zakar, Zakar, & Fischer, 2018). In both countries, nevertheless, no relationship has been found between father's education and wasting.

Besides father's education, his occupation also plays an important role on child undernutrition. In Bangladesh, it has been found that father's occupation significantly contributes to a reduction in a form of child undernutrition, namely underweight (Hasan, Ahmed, & Chowdhury, 2013). Children whose fathers have a job on the farm are more likely to be stunted than children whose fathers have a non-farm job (Keino et al., 2014). Hence, the better educated a father is, the more knowledge he has, the better his occupational position and the better he is able to provide and take care of his child(ren).

Grandfather's co-residence

The third determinant considered was (maternal and paternal) grandfather. Again, considering the emphasis put on the role women play on a child's nutritional status, it would be expected that between the grandparents, grandmothers are the ones influencing a child's development more. In support of this, a study found that, principally maternal grandmothers, impact a child's survival positively. An explanation for this may be that grandmothers are already acquainted with the know-hows of having a child, and thus, serve as a helping hand to the mothers by doing household tasks or taking care of their grandchild (Sear & Mace, 2008).

In a matrilineal society in Malawi however, it has been found that child mortality rates are higher when maternal grandmothers and aunts are present. Both maternal as paternal grandfathers on the other hand, have no or little influence on child survival (Sear, 2008). This may be explained by the role perceived by society of grandparents. In Latin American countries, for example, it is grandmothers who traditionally have the task of taking care of the child and ensuring a proper education and prosperous well-being. The role of grandfathers is often to teach children how to survive and work-related tricks for the future (Suomalainen, 2017). Thus, grandfathers are less involved in taking care of the child.

Although a majority of research examine the relationship between grandfathers and child survival, there is some research on the relationship between child undernutrition and grandfathers. In Malawi, an association has been found between stunting and grandfathers. Children living with their grandfathers are more likely to be stunted. This is because of cultural beliefs and customs. In Malawian culture hierarchy matters. This means that in households with grandfathers, highly positioned individuals - namely the senior males - eat first, as children occupy a lower position. Therefore, nutritious foods may finish before the child gets a chance to be fed, translating into lower intake of nutritious food and thus, contributing to an undernourished child (Adachi & Urabe, 2021).

Furthermore, a case in Colombia found a positive relationship between grandfathers with a different form of malnutrition, which is obesity. An obese grandfather has a higher probability of having an obese grandchild. Additionally, there is a strong association between grandfather's height and child stunting (McEniry et al., 2017). This is an indication of generational transmission. Lastly, a study has been conducted in Sub-Saharan Africa to examine the relationship between stunting and households co-residing with grandfathers. Despite the fact that no significant relationship has been found, results indicate that co-residence of a grandfather is associated with less stunting of girls, in poor households and in polygamous households (Schrijner & Smits, 2018a).

Polygamous culture

The fourth and last determinant considered was culture. Formal institutions play a vital role in a country and this is not different for child undernutrition. High quality institutions contribute considerably to reducing child undernutrition, especially stunting (Biadgilign, et al., 2019;

Smith & Haddad, 2015). Not only do formal institutions influence a child's nutritional status, but also informal institutions, namely culture, habits, beliefs, behavior, and customs. Cultural beliefs[5] of both female individuals as male individuals affect a child's nutritional status.

De Souza (2017) found an association between culture and child malnutrition in Yemen. The number of malnourished children in Yemen keeps increasing because of cultural beliefs and taboos among Yemeni women. Yemeni women believe that breast milk produced during the first period post-partum is not clean due to its colour differences and therefore, feed the child water and sugar instead of breast milk. In Ethiopia, it has also been found that food taboos linked to religion and cultural prohibition prevent women from consuming nutritional food, and thus, affecting the child's development and nutritional status (Tela, Gebremariam, & Beyene, 2020).

Besides female cultural beliefs, male cultural beliefs adopted by men - maybe because it is expected from the society - also influence a child's nutritional status. Research in Malawi showed that some of the factors that prohibit men from taking care of their children are gender constriction and norms. According to the Malawi men interviewed, women are mostly the ones responsible for taking care of the children, because when a man takes this responsibility, they are considered weak as it threatens their masculinity. When a man personally takes care of the child, he may be teased by community members. In addition to this, women are also judged negatively if they allow men to take care of the children, since 'it is women's job to do this' (Kerr et al., 2016).

Another culture related topic that involves men is polygamy. Polygamy is expected to have a negative impact on a child's nutritional status. The more people there are in the house, the more division of the available food and the less food will be consumed by the children (Mshida, Kassim, Mpolya, & Kimanya, 2018). In line with this statement, a study in Nigeria found that children from polygamous households are more likely to be stunted (Senbanjo et al., 2011). Unfortunately, this finding is not equivalent in all countries. In Sub Saharan Africa, polygamous practices worsened and increased the risk of a child under five years to be

[5] "Cultural beliefs are a set of behavioral patterns related to thoughts, manners and actions, which members of society have shared and passed on to succeeding generations." (Shahin, Kennedy, & Stupans, 2019, p. 1020)

underweight and/ or wasted, but this relationship was not significant (Anjorin, et al., 2020). In Ethiopia, the relationship was also found insignificant (Ersino et al.,2018).

Critical reflection on literature

Women empowerment has shown to be an important factor in different areas like politics and economics and this is no different when it comes to a child's nutritional status. Studies have found a positive relationship between women empowerment and a child's nutritional status (Sethuraman, Lansdown & Sullivan, 2006; Sharma & Subramanyam, 2021), which may indeed suggest that resources controlled by women are more likely to manifest greater improvements in child health and nutrition (Gantner, 2007). However, being in a male-headed household does not necessarily translate to women not having any say in any decision making processes.

Though not many studies consider this, as Sharma and Subramanyam (2021) suggested, in households where men have high gender-equitable attitudes and thus, also grant women with some decision-making power, the risk of having an undernourished child could possibly be reduced. Therefore, when discussing male-headed households, it should not just be assumed that women have no decision making power on several matters. This study suggests that women's final say in decision making should also be accounted for. To do this, data on the decision making power of mothers provided by the Demographic and Health Survey could be used.

It is expected that a father with a high educational attainment and a well-paid job (non-farm job) is less likely to have an undernourished child (Azzarri, Carletto, Davis, Nucifora, & Sohnesen, 2011; Mahmood, Abbas, Kumar, & Somrongthong, 2020; Tariq, Sajjad, Zakar, Zakar, & Fischer, 2018; Keino, Plasqui, Ettyang, & van den Borne, 2014). Nevertheless, this does not necessarily have to be the case. Fathers could be well educated and well-paid but have different priorities that lead to an unfavourable allocation of resources.

Moreover, previous studies indicate that a father's occupation influences a child's nutritional status, but do not provide much detail. Keino et al., (2014) for example, indicated that fathers working farm jobs are more likely to have stunted children than fathers that do not work in farms. However, studies do not indicate which non-farm job exactly translates into a better nourished child. Regarding the role of grandfathers, it could be seen that quite some researchers

were able to separate maternal and paternal grandfathers, and their role on child survival. Unfortunately, this is not the case with a child's nutritional status. Maybe the lack of data is what limits this separation.

Most researchers and scholars have focused on the role other variables such as economic growth, socioeconomic status of households and mother's nutritional status play on child undernutrition. This means that little focus is put on the role men play on child undernutrition. Additionally, while the literature used in the theoretical framework refers to developing countries, limited research has been conducted on a specific group of West African countries. Currently, most research is on one individual West African country. Therefore, this study looked to fill the gap by examining the role men play on child undernutrition in 12 West African countries.

Hypotheses

After observing the literature, the hypotheses that have been formulated are as follows:

Hypothesis 1: Children coming from male-headed households are less likely to be stunted.

Hypothesis 2: Children coming from households where fathers are better educated and have a job are less likely to be stunted.

Hypothesis 3: Children coming from households where grandfathers co-reside are less likely to be stunted.

Hypothesis 4: Children coming from polygamous households are more likely to be stunted.

The figure below (figure 1) shows the conceptual framework of my hypotheses.

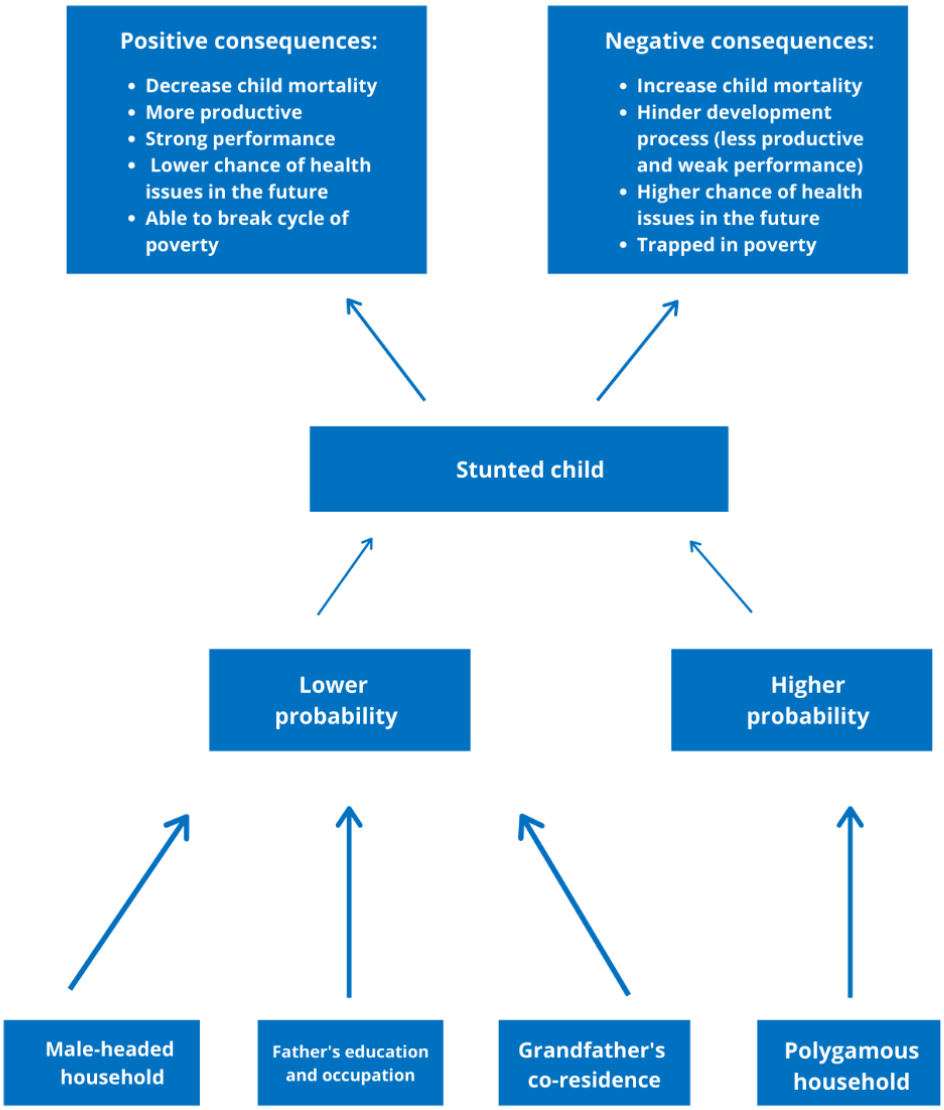

Figure 1: Conceptual framework

Data

The type of data that was used in this paper is secondary data. Secondary data is data that has already been collected by others and can be provided through publications, statistics, and websites. Though this paper made use of surveys, it is not considered primary data, because it has already been collected by other scholars and researchers. The data sources used in this paper were from the Demographic and Health Survey (DHS; https://www.dhsprogram.com/) and the Worldwide Governance Indicators (WGI; https://databank.worldbank.org/). The data collected was from 12 West African countries covering the period of 1993-2020.

The data collected by the DHS has been collected through more than 400 surveys and 90 countries and has been properly analyzed to provide a trusted and accurate representation on topics such as health and nutrition (The DHS Program, 2021). For purposes of this research, the DHS provided valid information regarding anthropometric outcomes of children and their nutritional status, to be specific, the z-scores of height for age, weight for age, and weight for height (Harttgen, Klasen, & Vollmer, 2013)**.** In addition to this, the DHS also provided data concerning variables such as household head, education and occupation of father, whether the father has more than one wife, whether the grandfather lives in the household, the SES of households, mother's nutritional status, child characteristics and women empowerment.

One data that was not provided by the DHS is the data regarding institutions. This data was provided by the WGI. The WGI consisted of six dimensions of governance which are Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption (Kaufmann, Kraay, & Mastruzz, 2011). The only dimension considered in this study was control of corruption, since corruption is a big problem in West African countries (Atuobi, 2007).

Originally, the dataset contains information of children between 0 to 59 months old from 14 West African countries covering the period of 1986-2020. This data was collected through interviews with mothers between 15 and 49 year old. Because it is difficult to distinguish between a child being stunted and fetal growth, it was decided to exclude children between zero (0) and six (6) months old, as was also done in a paper by Schrijner & Smits (2018a). Missing and flagged cases have been removed from the dataset, as indicated in the DHS's guide

(Croft, et al., 2018). This analysis covered 58,845 children (28,949 girls and 29,896 boys) in 12 West African countries covering the period from 1993 to 2020.

The sample used in this paper consisted of 12 West African countries. The West African countries considered are Benin, Burkina Faso, Gambia, Ghana, Guinea, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

A summary statistics is provided in table 1. Here, the second column summarizes the whole dataset and the fourth column summarizes the sub-sample of stunted children. Additionally, the sixth column indicates the coded values for each of the binary or categorical variables considered.

Variable	Number of observations (n = 58,845)	%	Number of stunted children (n = 22,789)	(Stunted) %	Coded values
Stunting					
Yes	22,789	38.73			1
No	36,056	61.27			0
Men - related variables					
Sex of household head					
Male	51,804	88.03	20,383	89.44	1
Female	7,041	11.97	2,406	10.56	0
Father's education					
Higher educated fathers	11,907	20.23	3,265	14.33	1
Lower educated fathers	46,938	79.77	19,524	85.67	0
Father's occupation					
Well-paid fathers	15,838	26.91	5,108	22.41	1
Less well-paid fathers	43,007	73.09	17,681	77.59	0
Grandfather in household					
Yes	6,026	10.24	2,195	9.63	1
No	52,819	89.76	20,594	90.37	0
Polygamous household					
Yes	20,115	34.18	8,932	39.19	1
No	38,730	65.82	13,857	60.81	0
Household socioeconomic status					
Source of drinking water					
Improved	21,895	37.21	7,625	33.46	1
Unimproved	36,950	62.79	15,164	66.54	0
Toilet facility					
Improved	26,799	45.54	8,781	38.53	1
Unimproved	32,046	54.46	14,008	61.47	0
Electricity					
Yes	19,477	33.10	5,667	24.87	1
No	39,368	66.90	17,122	75.13	0

Radio					
Yes	40,450	68.74	14,958	65.64	1
No	18,395	31.26	7,831	34.36	0
TV					
Yes	18,639	31.68	5,055	22.18	1
No	40,195	68.32	17,728	77.79	0
Fridge					
Yes	6,480	11.01	1,309	5.74	1
No	52,365	88.99	21,480	94.26	0
Motorcycle					
Yes	19,142	32.53	7,210	31.64	1
No	39,703	67.47	15,579	68.36	0
Area of residence					
Urban	19,018	32.32	5,344	23.45	1
Rural	39,827	67.68	17,445	76.55	0
Mother's nutritional status					
Mother's education					
Higher educated mothers	6,584	11.19	1,380	6.06	1
Lower educated mothers	52,261	88.81	21,409	93.94	0
Mother's height					
Below 145 cm	851	1.45	459	2.01	1
Above 145 cm	57,994	98.55	22,33	97.99	0
Currently pregnant					
Yes	8,797	14.95	3,891	17.07	1
No or unsure	50,048	85.05	18,898	82.93	0
Child characteristics					
Child's gender					
Boy	29,896	50.80	12,182	53.46	1
Girl	28,949	49.20	10,607	46.54	0
Child's age					
6-8 months	3,519	5.98	729	3.19	0
9-11 months	3,324	5.65	824	3.61	1
12-17 months	7,345	12.48	2,540	11.15	2
18-23 months	5,979	10.16	2,573	11.29	3
24-35 months	13,520	22.98	6,088	26.71	4
36-47 months	13,655	23.21	5,780	25.36	5
48-59 months	11,503	19.55	4,255	18.67	6
Child is a twin					
Yes	1,189	2.02	593	2.60	1
No	57,656	97.98	22,196	97.40	0
Women empowerment					
Decisions making					
Father alone	34,938	59.37	14,544	63.82	4
Mother alone	5,210	8.85	1,788	7.85	1
Mother and father together	18,697	31.77	6,457	28.33	2

Table 1: Summary statistics - Characteristics of children aged between 6 - 59 months in this study

The dependent variable in this paper was child undernutrition, namely stunting. A child is stunted if he or she is too short for his or her age (World Health Organization, 2020b). According to the World Health Organization (2006), a child is undernourished when the z-score is two SD below the median on the reference population. To determine if a child is undernourished, this variable was a dummy variable. One (1) indicated a child who is stunted, while zero (0) indicates the opposite. As is the case with the dependent variable, most of the independent variables were coded as dummy variables. Binary/dummy variables are coded with either one (1) or zero (0). The variables that are not coded as dummy variables are either categorical variables or continuous variables.

The men related independent variables are male-headed households, father's education and occupation, grandfather's co-residence, and polygamous culture. Male-headed households indicate a households lead by men. Here, one (1) indicated a male-headed household and zero (0) indicated a female-headed household. A father's educational attainment could have been one of the following categories, namely no education completed, incomplete primary, primary education completed, incomplete secondary, secondary education completed and higher than secondary education completed.

Following the definition used in previous papers of Azzarri el at. (2011), Mahmood et al. (2020) and Tariq et al. (2018), I have decided to make father's education a binary variable where one (1) indicated a better and highly educated father and zero (0) indicated a lower or not educated father. Better and higher educated fathers are fathers who completed secondary or higher education, while lower educated fathers are fathers with no education, incomplete primary, complete primary and incomplete secondary. This was also the case with mother's education.

A father's occupation was categorized as professional/technical/ managerial, clerical, sales, services, skilled manual, unskilled manual, household and domestics, agriculture (self-employed or employee). For father's occupation, one (1) indicated a well-paid job and zero (0) indicated lower-paid jobs. Jobs in the fields of professional/technical/managerial, clerical and sales were categorized as better paid jobs, while agricultural (self-employed or employee), household and domestic, services, skilled manual, and unskilled manual are categorized as less well-paid jobs. This was based on the level of education obtained by the father.

In other words, fathers who completed secondary or higher education have better-paid jobs compared to fathers with a lower educational attainment who have less well-paid jobs. Highly and well educated citizens have more opportunities to be employed and advance to better positioned jobs (Ali & Jalal, 2018; Kusmin & Gibbs, 2000).

For grandfather's co-residence, one (1) indicated a co-residing grandfather and zero (0) indicated a non-co-residing grandfather. Children are considered to live with their grandfather when the household head is a man and the relationship the child has with the household head as grandchild. Lastly, households are considered polygamous households when the husband has two or more wives. For polygamy, one (1) indicated a polygamous household and zero (0) indicated a non-polygamous household.

In addition to these independent variables, the control variables were mother's nutritional status, household socioeconomic status, child characteristics, women empowerment, and control of corruption.

The first and main control variable was mother's nutritional status. The factors associated with mother's nutritional status were the mother's education attainment, if she is currently pregnant, and if her height is below 145 centimeters. For mother's height, one (1) indicated a height below 145 centimeters and zero (0) indicated a height above 145 centimeters. Mother's height was defined differently by every author. Some authors look at a height below 160 centimeters, while some consider a height below 150 centimeters (Balalian, Simonyan, Hekimian, Deckelbaum, & Sargsyan, 2017; Handayani, Siagian, & Aritonang, 2017). In this case, the value of 145 centimeters was applied as suggested in Kang and Kim's (2019) paper. For currently pregnant mothers, one (1) stood for yes or zero (0) stood for no or unsure.

The second control variable was household characteristics, which was proxied as the relative socioeconomic status of households. To determine the household characteristics, ownership of assets of the households was investigated. The assets considered were radio, television, refrigerator, and motorcycle. For electricity, radio, TV, fridge, and motor, one (1) stood for yes and zero (0) stood for no. In other words, households having one (1) as a value do possessed the assets.

Households with an improved water source and sanitation facility were also observed. For water source and toilet facility, one (1) indicated an improved and zero (0) indicated an unimproved. A water source was considered an improved water source if the water coming from piped connections into a dwelling, plot or yard, public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs and rainwater collection (World Health Organization, 1993, p. 85). A water source was considered an unimproved water source if the water coming from unprotected dug wells, unprotected springs, cart with small tank/drum, bottled water, tanker truck, and surface water (river, dam, lake, pond, stream, canal, irrigation channels) (World Health Organization, 1993, p. 85).

A toilet facility was considered an improved toilet facility if it was from the following facilities: flush or pour-flush to piped sewer system, septic tank or pit latrine, ventilated improved pit (VIP) latrine, Pit latrine with slab and composting toilet (World Health Organization & UNICEF, 2010, p. 12). A toilet facility was considered an unimproved toilet facility if it was from the following facilities: flush or pour-flush to elsewhere, pit latrine without slab or open pit, bucket, hanging toilet or hanging latrine, no facilities or bush or field and shared or open to public use (World Health Organization & UNICEF, 2010, p. 12). Finally, the area of residence was also considered. For area of residence, one (1) indicated the urban area and zero (0) indicated the rural area.

The third control variable was child characteristics. Child characteristics looked at the age and gender of the child and whether the child was a twin. For gender, one (1) indicated that the child is a boy and zero (0) indicated that the child is a girl. The child's age was a categorical variable, running from the value zero (0) to six (6), covering children from six (6) to 59 months. For twin, one (1) stood for yes and zero (0) stood for no.

The fourth control variable was women empowerment. Women empowerment gave an indication of the role women play and the control and ability they have to make decisions. To measure the level of women empowerment, women's final say in the decision making process was considered. Women empowerment was also a categorical variable with three (3) different values, namely mother decides alone, father decides alone and mother and father decide together.

Finally, the last independent variable was institutions as proxied by control of corruption. “Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests”. (The World Bank, 2021) Governance variables were considered political risk variables when they have a negative impact on a certain factor. The political risk index ranges from −2.5 (weakest) to +2.5 (strongest). Hence, the lower the index, the higher the level of e.g., corruption and vice versa. Control of corruption was a continuous variable ranging from -1.22 to -0.01.

Methodology

The aim of this study was to capture the impact of the role men play on child undernutrition. To do this, 12 West African countries were considered covering the period of 1993-2020. The dependent variable employed in this study was child undernutrition measured by stunting. The main independent variables were male-headed households, father's education and occupation, grandfather co- residence, and polygamous culture.

In theory, children coming from a male-headed household are less likely to be stunted. Furthermore, children who have a better educated and well-paid father and children co-residing with their grandfather are also expected to be less stunted. This meant that the relationship between father's education, father's occupation and male-headed households and child undernutrition is expected to be significantly negative. On the other hand, children coming from a household where the father has more than one wife - referred to as polygamy (culture) - were expected to be more stunted. Additionally, mother's nutritional status was controlled for as well as household socioeconomic status, child characteristics and women empowerment. Finally, institutions as proxied by control of corruption was also included.

The most commonly used methods to examine the previous relationships were a bivariate and multilevel logistic regression (Abuya, Ciera, & Kimani-Murage, 2012; Ayogu, Afiaenyi, Madukwe, & Udenta, 2018; Ersino, Zello, Henry, & Regassa, 2018; Gelu, Edris, Derso, & Abebe, 2018; Haidar, Abate, Kogi-Makau, & Sorensen, 2005; Liben, Abuhay, & Haile, 2016; Tariq, Sajjad, Zakar, Zakar, & Fischer, 2018). In a logistic regression, the dependent variable is categorical with two possible outcomes, namely yes or no. A logistics regression is the best model to be employed since the dependent variable - stunting - is a dummy variable where one (1) indicates an undernourished child, while zero (0) indicates the opposite.

A multilevel model enables one to recognize that the trends of undernutrition vary per country and per child. Additionally, a multilevel analysis a enables one to quantify the association between a state-level exposure and an individual-level outcome such as the probability of being undernourished, having accounted for household, parental and individual covariates (Subramanyam et al, 2011). Therefore, I a multilevel logistic regression was applied to explain the probabilities of stunting on different factors because it enabled the addressing of the context of stunting and test the hypotheses.

After running the bivariate analysis, a multilevel logistic regression was run three ways, namely a two-level random intercept model, a two-level random slope model with an independent covariance and a two-level random slope with an unstructured covariance.

Results

Men related variables

The main hypothesis to be tested was the impact of male characteristics on stunting in West African countries. Therefore, the first model included the four men related variables. The men related variables were male-headed household, father's education, and occupation, co-residing grandfather and polygamous households All variables were statistically significant at a 95% confidence level.

Results of men related variables show that the odds of child stunting in male-headed households is about 1.13 time the odds of child stunting in non-male-headed households. Moreover, the odds of child stunting when having a higher educated father and well-paid father is about 0.51 and 0.80 time the odds of child stunting when having a lower educated father and less well-paid father. The odds of child stunting in a household where the grandfather co-resides is about 0.91 time the odds of child stunting in a household where the grandfather does not co-reside. Lastly, the odds of child stunting in a polygamous household is about 1.28 time the odds of child stunting in a non-polygamous household.

Mother's nutritional status

Considering the influential impact mothers have on their children's nutritional status, a second model with only women characteristics was applied, in this case the main control variable being mother's nutritional status. Mother's nutritional status consists of mother's education, if the mother's height is below 145 centimeters and if she is currently pregnant. All of the three variables were statistically significant at a 95% confidence level.

Results from the second model revealed that the odds of child stunting when having a higher educated mother is about 0.35 time the odds of child stunting when having a lower educated mother. Moreover, the odds of child stunting when the mother's height is below 145 centimetres is about 1.78 time the odds of child stunting when the mother's height is above 145 centimetres. Lastly, the odds of child stunting with a currently pregnant mother is about 1.29 time the odds of child stunting with a non-pregnant mother.

Additionally, a third model was applied that included both the men related variables as well as the women characteristics, which is the mother's nutritional status. After estimating the third

model, the odd ratios regarding women characteristics have slightly changed. All variables were statistically significant at a 95% confidence level.

Results from the third model revealed that the odds of child stunting when having a higher educated mother is about 0.46 time the odds of child stunting when having a lower educated mother. Moreover, the odds of child stunting when the mother's height is below 145 centimetres is about 1.73 time the odds of child stunting when the mother's height is above 145 centimetres. Lastly, the odds of child stunting with a currently pregnant mother is about 1.28 time the odds of child stunting with a non-pregnant mother.

Results of men related variables show that the odds of child stunting in male-headed households is about 1.11 time the odds of child stunting in non-male-headed households. Moreover, the odds of child stunting when having a higher educated father and well-paid father is about 0.66 and 0.83 time the odds of child stunting when having a lower educated father and less well-paid father. The odds of child stunting in a household where the grandfather co-resides is about 0.92 time the odds of child stunting in a household where the grandfather does not co-reside. Lastly, the odds of child stunting in a polygamous household is about 1.27 time the odds of child stunting in a non-polygamous household. Note that all of the results are statistically significant so, both the men related variables as mother's nutritional status have an impact on stunting.

The fourth and last model includes all of the variables I used in this study. In the fourth model all of the results were significant at a 95% confidence level and a 90% confidence level. Hence, household socioeconomic status, child characteristics, women empowerment and institutions have an impact on stunting.

When comparing the first, the second model and the third model, it can be noted that the odds of a child being stunted decreased once the men related variables have been included. This is a clear indication in support of the first hypothesis. Men play an important role on reducing child undernutrition. Hence, their impact must not be neglected, but must be taken into account.

The results from the four models can be seen in table 2 on the next page.

Factor	Model 1	Model 2	Model 3	Model 4
	Odds Ratio (S.E.)	Odds Ratio (S.E.)	Odds Ratio (S.E.)	Odds Ratio (S.E.)
Intercept	0.514*** (0.050)	0.657*** (0.147)	0.500*** (0.049)	0.500*** (0.049)
Men - related variables				
Sex of household head	1.134*** (0.032)		1.112*** (0.031)	1.112*** (0.031)
Father's education	0.515*** (0.013)		0.662*** (0.018)	0.662*** (0.018)
Father's occupation	0.800*** (0.017)		0.827*** (0.018)	0.827*** (0.018)
Grandfather in household	0.911*** (0.027)		0.919* (0.027)	0.919* (0.027)
Polygamy	1.279*** (0.051)		1.267*** (0.043)	1.267*** (0.043)
Mother's nutritional status				
Mother's education		0.345*** (0.012)	0.460*** (0.017)	0.460*** (0.017)
Mother's height		1.776*** (0.126)	1.732*** (0.123)	1.732*** (0.123)
Currently pregnant		1.288*** (0.031)	1.279*** (0.031)	1.279*** (0.031)
Household socioeconomic status				
Source of drinking water				0.966* (0.020)
Toilet facility				0.936*** (0.020)
Electricity				0.926*** (0.026)
Radio				0.956*** (0.019)
TV				0.733*** (0.021)
Fridge				0.727*** (0.028)
Motorcycle				0.965* (0.020)
Area of residence				0.758*** (0.018)
Child characteristics				
Child's gender				1.219*** (0.022)
Child's age				
6-8 months				0.338*** (0.016)
9-11 months				0.447*** (0.020)
12-17 months				0.710*** (0.022)
18-23 months				1.103* (0.036)
24-35 months				1.137*** (0.029)
48-59 months				0.787*** (0.021)
Child is a twin				1.734*** (0.107)
Empowerment				
Mother alone				0.859*** (0.029)
Mother and father				0.841*** (0.018)
Institutions				
Control of corruption				1.186** (0.073)
Country level				
var(1.polygamy)	0.011 (0.007)	0.079 (0.037)	0.006 (0.005)	0.004 (0.003)
var(_cons)	0.103 (0.044)	0.185 (0.149)	0.105 (0.044)	0.103 (0.044)

***P < 0,001 **P < 0,01 *P < 0,05 (n = 58,845 of which 22,789 is stunted)

Table 2: Multilevel logistic regression analyses of stunting of children aged 6–59 months in 12 West African countries: odds ratios and standard errors (n = 58,845)

On this page, table 3 and table 4 are found, which show the adjusted predictions (predictive margins) regarding sex of household head and the decision making power. Moreover, table 5, which shows the results of the interaction term, is also found.

	Margin	Delta Method Std. Err.	z	P>z	[95% Conf.	interval
Sex of household head						
Female	0.342	0.006	56.500	0.000	0.331	0.355
Male	0.379	0.002	168.060	0.000	0.375	0.384

Table 3 : Adjusted predictions (predictive margins) - Sex of household head

	Margin	Delta Method Std. Err.	z	P>z	[95% Conf.	interval
Decision making						
Mother alone	0.347	0.007	49.990	0.000	0.333	0.360
Mother and father/partner	0.349	0.004	94.500	0.000	0.342	0.356
Father alone	0.393	0.003	141.730	0.000	0.388	0.399

Table 4 : Adjusted predictions (predictive margins) - Decision making power

Factor	Model 4
	Odds Ratio (S.E.)
Sex of household sex#desicion-making	
Male#motheralone	0.990 (0.080)
Male#motherandfather	0.973(0.062)

Table 5: Interaction term - sex of household head and decision-making

Discussion

The following section discussed the results of my study and compare the findings with previous studies. The first part of the discussion covers the men related variables, which was the main focus of this study.

Men related variables

A previous study conducted by Gantner (2007) showed that resources controlled by women are more likely to manifest greater improvements in investments concerning a child's health and nutrition. In support of this, Sethuraman, Lansdown and Sullivan (2006) and Sharma and Subramanyam (2021) also concluded that women who are able to make decisions by themselves reduce the risk of having an undernourished child. Contrary to this, studies in different developing countries have proven that children coming from female-headed households are likely to be stunted and wasted (Asif & Akbar, 2021; Ayogu, Afiaenyi, Madukwe, & Udenta, 2018; Haidar, Abate, Kogi-Makau, & Sorensen, 2005; Liben, Abuhay, & Haile, 2016). A possible explanation could be that women may have less income and access to resources and nutritious food, among other things (Workie, Mekonen, Fekadu, & Mekonen, 2020; Onyango, Tucker, & Eisemon, 1994).

Therefore, the first hypothesis was that children are less likely to be undernourished in male-headed households, as men have the main and most important role to provide for their families. It was found that in West African countries, the odds of child stunting increase instead of decrease in households led by man. Besides this, I calculated adjusted predictions at mean and found that male-headed households result in a probability of having a stunted child equal to 37.9 percent as opposed to 34.3 percent for an individual who is otherwise average, but in a female-headed household (see table 3 in the Results section). In other words, children coming from female-headed households have a lower probability of being stunted. The difference in percentages could be explained by the behavior, attitude, perception and priorities between women and men.

Table 8 and table 9 show that a majority of women both in male-headed as well as female-headed households have low or no education. Nevetheless, female-headed households still managed to have a lower probability of having a stunted child. This might possibly be because women indeed invest more efficiently in a child's health and nutrition since their priorities are

to be responsible for their child's development and spend their income on food, childcare and health servces. This in turn improves the child's nutritional status and hence, reduces the risk of undernutrition among the child(ren) (Gantner, 2007; Sethuraman, Lansdown, & Sullivan, 2006; Sharma & Subramanyam, 2021; Drammeh, Hamid, & Rohana, 2019; Pryer, Rogers, & Rahman, 2004; Muraya, Jones, Berkley, & Molyneux, 2016).

On the other hand, as seen in the Results section, West African households led by men are more likely to have a stunted child. An explanation for this might be that households led by men have different priorities and thus, allocate the money or resources on non-nurtitious food and/or non-food activities (Drammeh, Hamid, & Rohana, 2019). Hence, this finding suggests that although women are lower educated in both male-headed households as well as female-headed, it is their ability to make decisions that seem to be what impacts stunting

It must be noted that the definition of female-headed household provided by the articles referenced in the Theoretical framework is a bit unclear (Asif & Akbar, 2021; Haidar, Abate, Kogi-Makau, & Sorensen, 2005; Liben, Abuhay, & Haile, 2016) . None of these authors have indicated what is meant by female-headed household. This is because the data provided by the DHS does not make clear whether a house is led by a female because the husband is missing or because he gave up control. Consequently, I also did not define female-headed households. If data were provided on this matter, I would have used it to make a distinction and to provide clarity on what is meant by female-headed household.

While the gender of a household head significantly plays an important role on a child's nutritional status, one of the most important and impacting processes in a society that must not be forgotten is education. Countries - especially developed countries - regularly invest in education. Education is the main source of gaining and expanding your knowledge and developing skills that will surely benefit the country, its citizens and its economy in the future. Therefore, the second hypothesis was that literate and higher educated fathers are less likely to have a stunted child (Vollmer, Bommer, Krishna, Harttgen, & Subramanian, 2017; Azzarri, Carletto, Davis, Nucifora, & Sohnesen, 2011; Mahmood, Abbas, Kumar, & Somrongthong, 2020; Tariq, Sajjad, Zakar, Zakar, & Fischer, 2018; Heady, 2014).

Consistent with the second hypothesis, it was found that in West African countries, the odds of having a stunted child decrease by 13.4 percent when having a highly educated father versus a

lower educated father. This is not only the case with fathers, but also with mothers (Abuya, Ciera, & Kimani-Murage, 2012; Keats, 2018; Heath & Jayachandran, 2016; Gelu, Edris, Derso, & Abebe, 2018). As shown in the Results section, the odds of having a stunted child decrease by 54.0 percent when highly educated mother versus a lower educated mother. In fact, the probability of a child being stunted lowers more when the mother has a higher education than when the father has a higher education (54 percent vs 34 percent). This could be seen under the Mother's nutritional status paragraph in the Results section and/or in table 2.

Apart from a person's educational attainment, his or her occupation also plays an important role. The hypothesis was that fathers occupying a better, decent and well-paid job are less likely to have a stunted child (Hasan, Ahmed, & Chowdhury, 2013; Keino, Plasqui, Ettyang, & van den Borne, 2014). Consistent with the hypothesis, it was found that better-paid fathers indeed lower the probability of a child being stunted. The odds of having a stunted child decrease by 17 percent when the father has a well-paid job versus a less well-paid job. Additionally occupations which lead lower the probability of a child being stunted were investigated. In their study, Keino et al. (2014) did indicate that fathers with non-farm jobs are less likely to have stunted children but did not indicate which jobs precisely are considered non-farm jobs.

It was found that all the occupations mentioned in the Data section do bring about a decrease in the probability of a child being stunted, but the probability lowers even more with fathers working in the clerical, household and domestic and services field. It is understandable that a child is less likely to be stunted if his or her father works in the household and domestic field, since the father's daily job is to clean and/or take care of children. On the other hand, it would be more logical that better-paid jobs such as jobs in the professional/ technical/ managerial field decrease the odds of a child being stunted quite a lot. This is not the case currently, as it lowers the odds of a child being stunted with only 8 percent.

Besides fathers, grandfathers are also a male figure that play a role on a child's live, including its developmental and nutritional status. Although not much research has been conducted to examine the relationship between grandfather's co-residence and child undernutrition, some previous studies have shown the importance of grandfathers on child undernutrition (Adachi & Urabe, 2021; McEniry, Flórez, Pardo, Samper-Ternent, & Cano-Gutierrez, 2017; Schrijner & Smits, 2018a). Therefore, the third hypothesis was that children co-residing with their grandfathers are less likely to be stunted.

Consistent with this hypothesis, it was found that in West African countries, the odds of a child being stunted decrease by 9 percent if the grandfather co-resides with the child versus if the grandfather does not co-reside. This brings questions about the statement presented by Suomalainen (2017), who suggested that grandfathers are less involved in the process of taking care of a child, as their role is to teach them work related tricks and how to survive. Furthermore, this finding is an indication that not only grandmothers help in keeping their grandchildren healthy because of their traditional role as women and their maternal instinct, but that grandfathers also influence a child's development and nutritional status positively.

To continue with the men related variables, polygamy is to be discussed. It has been hypothesized that polygamous households are more likely to have stunted children (Mshida, Kassim, Mpolya, & Kimanya, 2018; Senbanjo, Oshikoya, Odusanya, & Njokanma, 2011; Amare, Arndt, Mahrt, & Mavrotas, 2021). Consistent with the fourth hypothesis, it was found that the odds of a child being stunted increases by 26.7 percent in polygamous households versus a non-polygamous household. This was expected, because fathers not only have to take care and provide for one wife and his children, but also for more wives and maybe, even more children. This of course leads to less investments in necessary things such as nutritious food that is needed maintain a healthy child. Additionally, polygamous household may have different practices and behaviours when it comes to taking care and raising a child. Finally, the bargaining power of women also reduces in polygamous households, which could lead to more undernutrition among children (Amare, Arndt, Mahrt, & Mavrotas, 2021).

Control variables

In addition to being the head of the household, father's education and occupation, grandfather's co-residence and polygamous practices, other factors that also influence a child's nutritional status are mother's nutritional status, the socioeconomic status of households, child characteristics, women empowerment and institutions. Therefore, they have been included in the analysis as control variables. Consequently, in this section the abovementioned control variables were to be discussed by starting with household socioeconomic status.

The socioeconomic status of a household is certainly an important factor that influences and determines the nutritional status of a child. A poor household socioeconomic status can have

devastating impact on and hinders the development and well-being of a child (Letourneau, Duffett-Leger, Levac, Watson, & Young-Morris, 2013; Abuya, Ciera, & Kimani-Murage, 2012). This statement is also supported by previous studies who found that socioeconomic factors play a crucial role in child undernutrition (Correia, et al., 2014; Kang & Kim, 2019; Biadgilign, Shumetie & Yesigat, 2016; Subramanian & Subramanyam, 2015).

In conclusion, households with a low socioeconomic status tend to have less ownership of assets, less education completed by household heads, poor water, sanitation, and toilet facilities and no or less access to electricity. Thus, children coming from a low socioeconomic household (Correia, et al., 2014) and a rural area (De Souza, 2017) with, among other things, less access to sanitation and clean drinking water (Smith & Haddad, 2015; Headey, Hoddinott, Ali, Tesfaye, & Dereje, 2015) are more likely to be undernourished.

Aside from nutritious food, clean and improved source of drinking water and toilet facility is required to maintain a child healthy. Improved source of drinking water and toilet facility avoid bacteria that could cause serious and even, fatal diseases. It would, therefore, be expected that improved source of drinking water and toilet facility decrease the odds of a child being stunted (Subramanian & Subramanyam, 2015; Biadgilign, Shumetie & Yesigat, 2016; Smith & Haddad, 2015; Headey, Hoddinott, Ali, Tesfaye, & Dereje, 2015).

It was found that the odds of having a stunted child in West African households with an improved water source, toilet facility, electricity, radio, TV, fridge and motorcycle decrease by 3 percent, 6 percent, 7 percent, 4 percent, 27 percent, 27 percent and 3 percent, respectively versus households with an unimproved water source, unimproved toilet facility, no electricity, no radio, no TV, no fridge and no motorcycle. This fit with the facts as radio and TV's stream educational programs such as sesame streets, refrigerators prevent food from spoiling and motorcycles function as means of transportation. Hence, consistent with previous studies, households possessing assets such as electricity, radio, TV, refrigerator, and motorcycle and households with improved water source and toilet facilities significantly lower the odds of a child being stunted.

Last but not least, consistent with the hypothesis and previous studies, it was found that the odds of a child being stunted when he or she comes from an urban area decreases by 24.2 percent versus when he or she comes from a rural area. This could possibly be because

individuals coming from rural areas are poorer, lack resources and services, are more illiterate and thus, have less opportunities to be employed, limiting their ability to properly take care of a child (Kapur, 2019). It is worth mentioning that an asset index could have been used to measure the impact of the socioeconomic status of a household. However, it was decided to use data collected from the DHS to find out the exact impact each asset has on stunting separately.

Secondly, mother's nutritional status is discussed. On numerous occasions, it has been proven that mothers play a significantly important and influential role on a child's life, development, and nutritional status (Kang & Kim, 2019; Harttgen, Klasen, & Vollmer, 2013; Heath & Jayachandran, 2016; Cui, Liu, & Zhao, 2019; Abuya, Ciera, & Kimani-Murage, 2012; Keats, 2018; Gelu, Edris, Derso, & Abebe, 2018; Headey, Hoddinott, Ali, Tesfaye, & Dereje, 2015; Vollmer, Bommer, Krishna, Harttgen, & Subramanian, 2017; De Souza, 2017). Mother's education has already been discussed in the Results and Discussion section together with father's education. Thus, I only discuss mother's height and if she is currently pregnant was discussed.

Previous studies have shown that mothers who are currently pregnant and mother's height play a vital role on a child's nutritional status (Harttgen, Klasen, & Vollmer, 2013; Kang & Kim, 2019; Balalian, Simonyan, Hekimian, Deckelbaum, & Sargsyan, 2017; Handayani, Siagian, & Aritonang, 2017). Consistent with Kang and Kim (2019) and Harttgen, Klasen and Vollmer (2013), it was found that in West African countries, mothers who are currently pregnant and mothers with a height below 145 centimetres increase the odds of their child being stunted. The odds of a child being stunted increases when the mother is currently pregnant, because the mother may be less able to take care of the older children as more attention and energy is put into the 'soon to be born' or new born child.

Thirdly, child characteristics is discussed. Abuya, Ciera, and Kimani-Murage (2012), Harttgen, Klasen and Vollmer (2013), Tekile, Woya and Basha (2019), Abdurahman et al. (2016) and Kang and Kim (2019) found that boys are more likely to be stunted than girls. Consistent with them, it was found that in West African countries, the odds of a child being stunted increases with 21.9 percent when the child is a boy versus a girl and 73 percent when the child is a twin versus non-twin. While a majority of research has shown that boys are more likely to be stunted

than girls, no research has provided an explanation on why this is the case. This certainly gives an indication that further research is needed on this topic.

Furthermore, the child's age also influences his or her nutritional status. Boah et al. (2019) suggest that children between 6-35 months are more likely to suffer from undernutrition. I found that in West African countries, the odds of a child being stunted increases more when he or she is between 18 and 35 months old. This may be because of decreased attention in case there are younger children in the family (Roba, et al., 2021). Unfortunately, it cannot be said with certainty if this was the case for the West African households because the child's birth order was not considered.

Fourthly, empowerment is discussed. With increasing levels of gender inequalities, it is worth considering women empowerment as a variable since the role women play on a child's nutritional status is valuable and vital. Empowered women are self-determined, have the ability to control resources and make decisions by themselves. Sethuraman, Lansdown and Sullivan (2006) found a significant relationship between women empowerment and a child's nutritional status in South India. This suggests that countries could experience a reduction in child undernutrition when women have more decision-making autonomy over decisions regarding e.g., household resources (Gelu, Edris, Derso, & Abebe, 2018). This suggestion is not only revelant when it comes to women, but also when men have high gender-equitable attitudes that allow women's involvement in decision making (Sharma & Subramanyam, 2021).

It was found that the odds of a child being stunted decrease by 14.1 percent when the mother makes decisions alone versus when the father makes the decision alone. On top of that, it was found that when decisions are made as a couple, - where both the father as the mother have a saying - the odds of the child being stunted decrease by 15.9 percent significantly versus when the father makes a decision alone.

I also wanted to measure the impact of the decision making power of women in a male-headed household have on stunting. Therefore, it was decided to include an interaction term in the fourth model. Here, the odds of child stunting when the mother decides alone in a male-headed household decrease by 1 percent versus when the father decides alone in a male-headed household. Furthermore, the odds of child stunting when the mother and father decide together in a male-headed household decrease by 3 percent versus when the father decides alone in a

male-headed household. Note that none of these two findings were significant at any level (see table 5).

Additionally, I calculated adjusted predictions at mean and found that the probability of a child being stunted in a household where the father alone makes decisions in the household is 39.3 percent, whereas this decreases by approximately 4 percent in situations where the mother makes certain decisions alone or together with the father (see table 4 in the Results section). This finding suggests that fathers with high gender-equitable attitudes not only value and show appreciation for women by empowering, encouraging and including them in the decision-making process, but that they also contribute to their child's nutritional status.

Lastly, institutions as proxied by control of corruption is discussed. Institutions play a vital role in a country. Good, strong and high quality institutions such as good governance, political stability, control of corruption and a decent law and order system have a negative relationship with child undernutrition. This suggests that high quality institutions considerably contribute to reducing child undernutrition, especially stunting (Biadgilign, et al., 2019; Smith & Haddad, 2015). High quality institutions thus, are important because they facilitate access to quality services and focus on the well-being and development of a country.

Consistent with previous studies, it was found that the odds of a child being stunted in a corrupt country increases by 18.6 percent versus a non-corrupt country. This is because corruption negatively impacts trust in (government) officials (Uslaner, 2015), decreases foreign direct investments and incentives to invest (Canare, 2017; Bardhan, 1997), reduces tax revenue, increase income inequality and decrease government spending in e.g. health and education (Dong & Torgler, 2010).

Hence, corruption harms (economic) growth, impedes proper development (d'Agostino, Dunne, & Pieroni, 2016; Azfar, Lee, & Swamy, 2001) and makes a group richer, while the rest keeps getting poorer (Uslaner, 2015). If countries want to experience a reduction in the number of undernourished children, attention must be paid to this finding since corruption remains a major issue in developing countries, especially Sub-Saharan and West African countries (Transparency International, 2021).

Advantages, disadvantages and limitations of the dataset and this study

It could be noted that most of my results in the Results and Discussion section are consistent with results from previous studies. A majority of the previous studies used in this thesis are studies conducted in developing countries. Although not necessarily conducted specifically in only West African countries, it could be concluded that the pattern concerning child undernutrition is similar in all developing countries. Hence, the outcome of some factors may vary, but overall it is the same factors that influence child undernutrition - in this case stunting - in other developing countries as well.

Moreover, every author who wanted to examine the relationship between any factor and child undernutrition made use of the Demographic and Health Survey (DHS). The DHS provides data on both maternal as child health, nutrition, fertility, mortality, diseases, and family planning, among other indicators. Thus the DHS dataset is the most ideal dataset for these types of analyses and hence, the results can be considered consistent since both the results of this study and previous studies' results are based on the same dataset. Some additional advantages of the DHS is that it consists of standardized data collection procedures, has strict and high quality uniformed training for interviewers, allows comparability across populations over time and has high response rates (Corsi, Neuman, Finlay, & Subramanian, 2012).

Apart from the advantages, there are disadvantages. First, the data was not collected on a yearly basis and is collected independently within countries. As a consequence, the countries included in the dataset were not measured at the same time, which could have limited the contemporaneous cross national comparison (Corsi, Neuman, Finlay, & Subramanian, 2012). Moreover, it was not easy to define a causal relationship (Balian, et al., 2014). The cross sectional nature of the study design allows me to only examine the association between variables, but not causality (Correia, et al., 2014; Kang & Kim, 2019; Sharma & Subramanyam, 2021). To address causality, a designed experiment is the method to be used. Additional limitations of this dataset/ study is that the data is collected through responses provided by mothers. This means that all children have a present mother. This could have an influence on the outcome.

Also, it was not possible to obtain data from children whose grandfather do not live with them (Schrijner & Smits, 2018a). Furthermore, it was not possible to distinguish whether the current partner of the respondent is the biological father of the child. In addition, the dataset also does

not provide information on the height of the father (Vollmer, Bommer, Krishna, Harttgen, & Subramanian, 2017). Considering the role mother's height plays, it could also be interesting to examine the role paternal height plays on his child's nutritional status. This study did not consider the quantity and quality of food that the children consume nor does it consider childcare practices like maternal feeding behavior and child eating present in the countries (Mutoro, Garcia, Kimani-Murage, & Wright, 2020). Lastly, this study did not know/consider how much knowledge the parents have on topics such as health and nutrition.

Further research

Further research is needed on the role non-co-residing grandparents play on their grandchild's nutritional status. The fact that a grandfather does not co-reside with the child does not mean that he does not play an important role on his grandchild's life. It could be possible that they also influence the child's development, health, nutrition, and life positively. Hence, it may be relevant to examine the role non co-residing grandfathers play but unfortunately, the DHS does not collect data on this matter. A suggestion to the DHS would be to consider this option. They could collect data by asking questions such as "Does the child have a non-co-residing grandfather?" if yes, "Do they provide, spend time and/or have a voice on decisions concerning the child's life?".

Furthermore, further research also is needed on which other cultural practices besides polygamy that potentially impact a child's nutritional status in West African countries. In the African region, individuals embrace their heritage and hold strong to their culture, beliefs and traditions. Religious practices, cultural taboos and childcare practices have all proven to be influential when it comes to a child's nutritional status (Mutoro, Garcia, Kimani-Murage, & Wright, 2020; De Souza, 2017; Tela, Gebremariam, & Beyene, 2020; Kerr, Chilanga, Nyantakyi-Frimpong, Luginaah, & Lupafya, 2016). Identifying cultural practices present in a country is relevant because it allows you to understand why people do or behave a certain way.

Lastly, further research is needed on the reason why boys are more likely to be stunted. Up until now, limited research has been able to provide an explanation on why boys are more likely to be stunted. Some of the current studies just indicate the results without providing a discussion on the mechanisms that causes gender differences. The other studies that discuss the findings suggest that the sex differences are because of social reasons or based on speculations.

Further research is therefore needed to base arguments on evidence, not speculations. Understanding and addressing the mechanisms influencing sex differences may have implications for nutrition policies and practices (Thurstans, et al., 2020).

Recommendation

One of the main objectives of conducting research is to come up with solutions and/or recommendations for the problem(s) identified. Therefore, the following section discusses (policy) recommendations that could potentially contribute to a reduction in child undernutrition.

The first recommendation concerns education. Many studies, including Abuya, Ciera and Kimani-Murage (2012), Keats (2018), Heath and Jayachandran (2016) and Gelu et al. (2018), have recognized the significant association between maternal education and child undernutrition. While attention is often paid to maternal education, Vollmer et al. (2017), Heady (2014), Azzarri et al. (2011), Mahmood et al. (2020) and Tariq et al. (2018) recognize that paternal education is also associated with child undernutrition. Evidence from both this study as well as previous studies have illustrated the great and positive impact education has on a reduction on child undernutrition. In other words, (highly) educated parents may improve their child's health and nutritional status.

The problem, however, is that levels of education tend to be low in developing countries. In support of this, information obtained from the dataset used shows that 50.84 percent (29,917) of fathers have no education and 59.51 percent (35,018) of mothers have no education. These numbers could be seen in table 7 and table 8. These numbers are alarming because more than half of the mothers and fathers who participated in the interviews have no education. Education is and will always be important. Education helps in the process of developing an individual on a personal, social, political, economic, or cultural level, equips individuals with social, cognitive and knowledge based skills needed for the future and opens and enhances opportunities to enter the labor market (Bhardwaj, 2016). Moreover, education can break poverty cycles, ensure better living conditions, and improve the quality of life.

For these reasons, it is recommended to invest in education. Moreover, countries must improve the quality of years of schooling (Gelu, Edris, Derso, & Abebe, 2018). Improved years of schooling can influence nutrition since it enables parents to earn higher income which could directly or indirectly lead to improvements in a child's health and nutrition (Vollmer et al., 2017). To achieve improved years of schooling, policies, strategies, or interventions must be implemented to not only increase school enrollment, but to also keep children in school.

Finally, the inclusion of health knowledge skills in school curricula may also be a relevant recommendation (Abuya, Ciera & Kimani-Murage, 2012). Such courses provide information and contribute to the expansion of knowledge on topics such as health, nutrition, and family planning, which would be helpful in the future. These health related topics are important in reducing undernutrition among children and parents. In Bangladesh for example, programs that emphasized on family planning succeeded in reducing the number of undernourished children (Heady et al., 2015). In Ghana too, the child's nutritional status has improved after educational nutrition interventions were implemented (Awuuh, Appiah, & Mensah, 2019).

The second recommendation concerns current norms and cultural beliefs and practices. Kerr et al. (2016) have shown that one of the main reasons that prevent men from taking proper care of their child are gender constriction and norms, culture, and community level perceptions. The main perception is that it is a women's role to be the caretaker of a child. These perceptions are exactly what shape some of the hegemonic masculinities attitudes related to childcare responsibilities and domestic work (Kerr et al., 2016). These wrong perceptions should call on changes in traditions, culture, norms, and beliefs. This process is nevertheless not easy. Culture and cultural norms evolve slowly (Guiso, Herrera, & Morelli, 2016). Norms can be changed via leadership, massive shift and/or sanctions.

Therefore, the recommendation would be to involve communities - especially men - in nutritional education programs that address hegemonic masculinities related to child nutrition (Kerr et al., 2016). Moreover, men could also participate in programs that target men's gender-related attitudes and undernutrition such as the Integrated Child Development Services, to get more involved with topics related to the health of their children (Sharma & Subramanyam, 2021). A study conducted by Mkandawire and Hendriks (2018) showed that men's perception regarding gender roles has changed after policies and interventions related to their involvement with maternal and childcare were implemented. These programs can be the first step to change gender norms as they alter men's way of thinking and behavior, leading to improvements in social factors that affect a child's care, health, and nutrition.

Conclusion

Developing countries experience long periods of challenges as there are high levels of poverty and hunger, high mortality rates and low levels of education year after year. Besides these challenges, an issue that has also been present in developing countries is child undernutrition. "Child undernutrition refers broadly to the condition in which food intake is inadequate to meet a child's needs for physiological function, growth, and the capacity to respond to illness." (Wells, et al., 2019, p. 831) As it has received more attention lately, some countries have managed to reduce the high and alarming numbers of undernourished children below the age of five. This, nevertheless, does not mean that child undernutrition is not considered a major concern anymore.

Recent numbers provided by the World Health Organization indicate that in 2020 alone, 144 million children under the age of five were stunted, 47 million were wasted and 45% of the deaths of children under five years are directly or indirectly linked to undernutrition (World Health Organization, 2020a). There are four sub-forms of child undernutrition - as mentioned in the introduction - but the sub-form relevant in this study was stunting. Child undernutrition must not be considered as one additional challenge for developing countries, but deserves attention, especially from the government and governmental institutions.

Consequences of child undernutrition are not only a short term, but also carry on in the long term (Wali, Agho, & Renzaho, 2019). Just to mention some consequences, child undernutrition weakens the immune system exposing children to (severe) infectious and non-infectious diseases, lowers levels of productivity and hinders development (Egata, Berhane, & Worku, 2014; World Health Organization, 2021). These consequences and the seriousness of the issue have motivated authors to conduct research on this topic.

A majority of previous studies on child undernutrition have examined the relationship between child undernutrition and relevant factors such as mother's nutritional status, household socioeconomic status, child characteristics and economic growth. A factor that has received a lot of attention is mother's nutritional status. A mother's education, occupation, height, habits, health, nutrition and (marital) status have shown to be the most influential factor impacting a child's nutritional status (Harttgen, Klasen, & Vollmer, 2013).

While most studies draw attention on the role women play on child undernutrition, fewer studies consider the role men play on their child's nutritional status. Men's attitude, behavior, (nutritional) knowledge, nutritional status, contribution, support and guidance, involvement, and commitment have proven to have an impact on a child's nutritional status (Sharma & Subramanyam, 2021; Kansiime, Atwine, Nuwamanya, & Bagenda, 2017; Ambikapathi, et al., 2021; Haywood, 2015; McEniry, Flórez, Pardo, Samper-Ternent, & Cano-Gutierrez, 2017). In addition to this, men provide, take care, and lead their families, contribute economically, and make important household decisions (Go, 2017; Fingleton-Smith, 2018). Yet not much research has been conducted to examine the role men play on child undernutrition.

Therefore, the main hypothesis to be tested in this study was the impact of men related variables on child undernutrition in West African countries. The men related variables were male-headed households, father's education and occupation, grandfather's co-residence, and polygamous culture. Besides the men related variables, mother's nutritional status, household socioeconomic status, child characteristics, women empowerment, and corruption was controlled for. This study considered 12 West African countries covering the period of 1993-2020. The data used in this study has been collected from the Demographic and Health Survey and the World Governance Indicators (WGI). The methods used to examine the relationship between men related variables and stunting are bivariate analysis and multilevel logistics regressions.

Interestingly, the results prove that men play an important role on a child's nutritional status. Considering men's role as provider and leader of a family, it would be expected that households led by men lower the probability of having a stunted child. Inconsistent with the first hypothesis, the odds of a child being stunted increases in a male headed household in comparison to a female-headed household. This could possibly be because of the different priorities men have in comparison to women. A women's priority is most of the times to be responsible, take care of her children and make sure that child does not miss anything. Men on the other hand, could have priorities that do not include their child, leading to less investments in (nutritious) food (Drammeh, Hamid, & Rohana, 2019).

Fathers with more education get the chance to expand their knowledge on topics such as health and nutrition and also, have more opportunities to get a well or better-paid job, which could translate in more investments in their child and his or her health and nutrition (Ambikapathi, et

al., 2021; Keino, Plasqui, Ettyang, & van den Borne, 2014). Consistent with the second hypothesis, in West African countries, the odds of child stunting decrease with highly educated and well-paid fathers in comparison to lower educated and less well-paid fathers.

Another male figure that influences a child's nutritional status are grandfathers. Grandfathers improve a child's cognitive abilities, school enrollment and thus, development and nutritional status (Schrijner & Smits, 2018b; McEniry, Flórez, Pardo, Samper-Ternent, & Cano-Gutierrez, 2017; Tanskanen & Danielsbacka, 2016; Adachi & Urabe, 2021). Consistent with the third hypothesis, the odds of a child being stunted decrease when the grandfather co-resides with the child versus when the grandfather does not co-reside.

The last men related variable is culture as proxied by polygamy. Polygamy can be accompanied with economic, social, and educational constraints that affect the child negatively (Al-Sharfi, Pfeffer, & Miller, 2016; Dissa, 2016; Amare, Arndt, Mahrt, & Mavrotas, 2021). Consistent with the fifth hypothesis, the odds of a child being stunted increases in polygamous households in comparison to non-polygamous households.

Not only were men related variables researched, but five control variables were also included in the analysis. The control variables are mother's nutritional status, household socioeconomic status, child characteristics, women empowerment and institutions.

First control variable discussed was mother's nutritional status. Women's traditional role of taking care of the children in combination with their maternal instincts may give them an edge over men, hence women play a great and important role on a child's nutritional status. I found that the higher the level of education attainment, the lower the odds of having a stunted child. This impact is even greater than father's education. Moreover, the odds of a child being stunted increases with currently pregnant mothers and mothers height lower than 145 centimetres in comparison to non-pregnant mothers and mothers with a height above 145 centimetres.

The second control variables discussed was the socioeconomic status of households. Households with an improved water source and toilet facility, possessing of assets such as electricity, TV, radio, motorcycle and refrigerator and residing in an urban area decrease the odds of a child being stunted in comparison to households with unimproved facilities, households that do not possess of these assets and households in rural areas.

The third control variable discussed was child characteristics. Consistent with Abuya, Ciera, and Kimani-Murage (2012), Harttgen, Klasen and Vollmer (2013), Kang and Kim (2019) and Boah et al (2019), it was found that boys, twins and children between the age of 18-35 are more likely to be stunted. The fourth control variable discussed was women empowerment. Empowered, encouraged and autonomous women have the ability to make decisions by themselves. This empowerment could translate to positive results such as a reduction in child undernutrition (Sethuraman, Lansdown, & Sullivan, 2006; Sharma & Subramanyam, 2021; Gantner, 2007).

Nonetheless, women do not have to make decisions alone to translate to positive outcomes. Decisions made together are also beneficial. The problem, however, is that most decisions are made by the man only. Therefore, men with high gender-equitable attitudes (men who value women's input and involve women in the decisions making) could also decrease the odds of having an undernourished child (Sharma & Subramanyam, 2021). Consistent with Gantner (2007) and Sethuraman, Lansdown and Sullivan (2006) statement, it was found that mothers making decisions alone decrease the odds of their child being stunted more compared to when the fathers make decisions alone. Moreover, the odds of a child being stunted also decreases more when fathers consider the mother's decision. The findings have proven that it is not only mother's education that significantly impact stunting, but also their ability to make decisions.

The fifth and last control variable discussed was institutions as proxied by corruption. Corruption deserves attention as it continues to be an issue in developing countries. Corruption not only has national consequenses, but also international consequences. Consistent with Biadgilign et al. (2019) and Smith and Haddad (2015), my results show that corruption increases the probability of a child being stunted.

That being said, it can be concluded that mother's nutritional status, household's socioeconomic status, child characteristics, women empowerment, and institutions all influence stunting. The factor that particularly and noticeably influences child undernutrition significantly is mother's nutritional status. This has been shown in previous studies, my study and will probably be shown in future studies. Nevertheless, my study has also contributed to a new viewpoint. The overall conclusion of this study was that men play both a positive as well as a negative role on a child's nutritional status. Thus, although women play a vital on their

child's life, development, and nutritional status, my study proved that merits must not be taken away from the role men play. In other words, men also matter.

Acknowledgements

First and foremost, I would like to thank God for the strength He has given me to persevere and never give up. I would also like to express my sincere gratitude to my supervisor, Dr. Jana Vyrastekova for her patience, assistance, valuable and constructive comments and suggestions, and immense knowledge. Besides my supervisor, I would like to thank my family and two close friends for their support throughout this process. I will forever be grateful to all of you.

References

Abdurahman, A. A., Mirzaei, K., Dorosty, A. R., Rahimiforoushani, A., & Kedir, H. (2016). Household food insecurity may predict underweightand wasting among children aged 24–59 months. *Ecology of food and nutrition, 55(5)*, 456-472.

Abuya, B. A., Ciera, J., & Kimani-Murage, E. (2012). Effect of mother's education on child's nutritional status in the slums of Nairobi. *BMC pediatrics, 12(1)*, 1-10.

Adachi, M., & Urabe, D. (2021). Diet diversity was limited in Malawi resulting in stunting despite availability of foods in markets. *Pediatrics International (63)* , 311–315.

Ali, M. S., & Jalal, H. (2018). Higher Education as a Predictor of Employment: The World of Work Perspective. *Bulletin of Education and Research, 40(2)*, 79-90.

Al-Sharfi, M., Pfeffer, K., & Miller, K. A. (2016). The effects of polygamy on children and adolescents: a systematic review. *Journal of family Studies, 22(3)*, 272-286.

Amare, M., Arndt, C., Mahrt, K., & Mavrotas, G. (2021). Polygynous family structure and child undernutrition in Nigeria. *The Journal of Development Studies*, 1-22.

Ambikapathi, R., Passarelli, S., Madzorera, I., Canavan, C. R., Noor, R. A., Abdelmenan, S., . . . Gunaratna, N. S. (2021). Men's nutrition knowledge is important for women's and children's nutrition in Ethiopia. *Maternal & child nutrition, 17(1), e13062.*, 1-13.

Anjorin, S. S., Uthman, O. A., Ameyaw, E. K., Ahinkorah, B. O., Chattu, V. K., Bishwajit, G., . . . Yaya, S. (. (2020). Undernutrition, polygynous context and family structure: a multilevel analysis of cross-sectional surveys of 350 000 mother–child pairs from 32 countries. *BMJ global health, 5(10), e002637*, 1-15.

Asif, A. M., & Akbar, M. (2021). On the decomposition of rank-dependent indicator of socio-economic inequalities in child malnutrition: Some empirical findings. . *Socio-Economic Planning Sciences, 101025*, 1-7.

Atuobi, S. M. (2007). *Corruption and state instability in West Africa: An examination of policy options.*

Awuuh, V. A., Appiah, C. A., & Mensah, F. O. (2019). Impact of nutrition education intervention on nutritional status of undernourished children (6-24 months) in East Mamprusi district of Ghana. *Nutrition & Food Science*, 262-272.

Ayogu, R. N., Afiaenyi, I. C., Madukwe, E. U., & Udenta, E. A. (2018). Prevalence and predictors of under-nutrition among school children in a rural South-eastern Nigerian community: a cross sectional study. *BMC public health, 18(1),* 1-9.

Azfar, O., Lee, Y., & Swamy, A. (2001). The causes and consequences of corruption. *The Annals of the American Academy of Political and Social Science, 573(1),* 42-56.

Azzarri, C., Carletto, G., Davis, B., Nucifora, A., & Sohnesen, T. P. (2011). *Child undernutrition in Mozambique.* Maputo, Mozambique: World Bank/UNICEF.

Balalian, A. A., Simonyan, H., Hekimian, K., Deckelbaum, R. J., & Sargsyan, A. (2017). Prevalence and determinants of stunting in a conflict-ridden border region in Armenia-a cross-sectional study. *BMC nutrition, 3(1),* 1-13.

Balian, S., Bornstein, T., Bradley, S., Cross, A., Fishel, J., Florey, L., . . . Zweimueller, S. (2014). *Understanding and Using the Demographic and Health Surveys – DHS Curriculum Facilitator's Guide.*

Bardhan, P. (1997). Corruption and development: a review of issues . *Journal of economic literature, 35(3),* 1320-1346.

Bhardwaj, A. (2016). Importance of education in human life: A holistic approach. *International Journal of Science and Consciousness, 2(2),* 23-28.

Biadgilign, S., Ayenew, H. Y., Shumetie, A., Chitekwe, S., Tolla, A., Haile, D., . . . Gebre, B. (2019). Good governance, public health expenditures, urbanization and child undernutrition nexus in Ethiopia: an ecological analysis. *BMC health services research, 19(1),* 1-10.

Biadgilign, S., Shumetie, A., & Yesigat, H. (2016). Does economic growth reduce childhood undernutrition in Ethiopia? *PloS one, 11(8), e0160050,* 1-14.

Boah, M., Azupogo, F., Amporfro, D. A., & Abada, L. A. (2019). The epidemiology of undernutrition and its determinants in children under five years in Ghana. *Plos one, 14(7), e0219665,* 1-23.

Bredenkamp, C., Buisman, L. R., & Van de Poel, E. (2014). Persistent inequalities in child undernutrition: evidence from 80 countries, from 1990 to today. . *International journal of epidemiology, 43(4),* 1328-1335.

Canare, T. (2017). The effect of corruption on foreign direct investment inflows: Evidence from a panel of Asia-Pacific countries. In M. dela Rama, & C. Rowley, *The Changing Face of Corruption in the Asia Pacific: Current Perspectives and Future Challenges* (pp. 35-55). Elsevier.

Correia, L. L., Silva, A. C., Campos, J. S., Andrade, F. M., Machado, M. M., Lindsay, A. C., . . . Cunha, A. J. (2014). Prevalence and determinants of child undernutrition and stunting in semiarid region of Brazil. *Revista de saude publica, 48*, 19-28.

Corsi, D. J., Neuman, M., Finlay, J. E., & Subramanian, S. V. (2012). Demographic and health surveys: a profile. *International journal of epidemiology, 41(6)*, 1602-1613.

Croft, T. N., Marshall, A. M., Allen, C. K., Arnold, F., Assaf, S., & Balian, S. (2018). *Guide to DHS statistics.* Rockville, Maryland, USA. Retrieved from https://dhsprogram.com/Data/Guide-to-DHS-Statistics/index.cfm

Cui, Y., Liu, H., & Zhao, L. (2019). Mother's education and child development: Evidence from the compulsory school reform in China. *Journal of Comparative Economics, 47(3)*, 669-692.

d'Agostino, G., Dunne, J. P., & Pieroni, L. (2016). Corruption and growth in Africa. . *European Journal of Political Economy, 43*, 71-88.

De Souza, L. R. (2017). Correlates of child undernutrition in Yemen. *Bandung, 4(1)*, 1-27.

Direr, A. (2020). *Bringing present bias back to the present.* HAL - Archieve ouverte (⟨hal-02133525v3⟩.

Dissa, Y. (2016). Polygamy in Mali: social and economic implications on families. *International Journal of African and Asian Studies*, 99-108.

Dong, B., & Torgler, B. (2010). *The consequences of corruption: evidences from China.* SSRN.

Drammeh, W., Hamid, N. A., & Rohana, A. J. (2019). Determinants of household food insecurity and its association with child malnutrition in Sub-Saharan Africa: A review of the literature. *Current Research in Nutrition and Food Science Journal, 7(3)*, 610-623.

Dreze, J., & Sen, A. (1989). *Hunger and public action. Clarendon Press.* Oxford University Press.

Egata, G., Berhane, Y., & Worku, A. (2014). Predictors of acute undernutrition among children aged 6 to 36 months in east rural Ethiopia: a community based nested case-control study. . *BMC pediatrics, 14(1)*, 1-10.

Engle, P. L. (1997). The Role of Men in Families: Achieving Gender Equity and Supporting Children. *Gender and Development 5, (2)*, 31-40.

Ersino, G., Zello, G. A., Henry, C. J., & Regassa, N. (2018). Gender and household structure factors associated with maternal and child undernutrition in rural communities in Ethiopia. *Plos one, 13(10), e0203914*, 1-20.

Fingleton-Smith, E. (2018). The lights are on but no (men) are home. The effect of traditional gender roles on perceptions of energy in Kenya. *Energy research & social science, 40*, 211-219.

Gantner, L. (2007). *PROGRESA: An integrated approach to poverty alleviation in Mexico.* New York: Cornell University Press.

Gelu, A., Edris, M., Derso, T., & Abebe, Z. (2018). Undernutrition and associated factors among children aged 6–59 months living in slum areas of Gondar city, northwest Ethiopia: a cross-sectional study. *Pediatric health, medicine and therapeutics*, *9*, 81-88.

Go, A. (2017, December 1). *Engaging Men to Improve Nutrition and Gender Equality | Agrilinks*. Retrieved from Agrilinks: https://www.agrilinks.org/post/engaging-men-improve-nutrition-and-gender-equality

Guiso, L., Herrera, H., & Morelli, M. (2016). Cultural differences and institutional integration. *Journal of International Economics, 99*, S97-S113.

Haidar, J., Abate, G., Kogi-Makau, W., & Sorensen, P. (2005). Risk factors for child under-nutrition with a human rights edge in rural villages of North Wollo, Ethiopia. *East Afr Med J, 82(12)*, 625-630.

Haile, D., Azage, M., Mola, T., & Rainey, R. (2016). Exploring spatial variations and factors associated with childhood stunting in Ethiopia: spatial and multilevel analysis. *BMC pediatrics, 16(1)*, 1-14.

Handayani, F., Siagian, A., & Aritonang, E. Y. (2017). Mother's education as A determinant of stunting among children of age 24 to 59 months in North Sumatera province of Indonesia. *IOSR J. Humanit. Soc. Sci, 22*, 58-64.

Harttgen, K., Klasen, S., & Vollmer, S. (2013). Economic growth and child undernutrition in sub-Saharan Africa. *Population and development review, 39(3)*, 397-412.

Hasan, M. M., Ahmed, S., & Chowdhury, M. A. (2013). Food insecurity and child undernutrition: evidence from BDHS 2011. *Journal of Food Security, 1(2)*, 52-57.

Haywood, L. (2015, June 21). *How dad's nutrition impacts children's health - Better the Future*. Retrieved from Better the Future - Together we will end chronic disease where it starts: https://betterthefuture.org/how-dads-nutrition-impacts-childrens-health/

Headey, D. (2014). *An analysis of trends and determinants of child undernutrition in Ethiopia, 2000–2011*. . Washington: International Food Policy Research Institute (IFPRI).

Headey, D., Hoddinott, J., Ali, D., Tesfaye, R., & Dereje, M. (2015). The other Asian enigma: explaining the rapid reduction of undernutrition in Bangladesh. *World Development, 66*, 749-761.

Heath, R., & Jayachandran, S. (2016). *The causes and consequences of increased female education and labor force participation in developing countries (No. w22766).* Cambridge: National Bureau of Economic Research.

Jafree, S. R. (2020). *The Sociology of South Asian Women's Health.* Springer Nature.

Kang, Y., & Kim, J. (2019). Risk factors for undernutrition among children 0–59 months of age in Myanmar. *Maternal & child nutrition, 15(4), e12821*, 1-13.

Kansiime, N., Atwine, D., Nuwamanya, S., & Bagenda, F. (2017). Effect of male involvement on the nutritional status of children less than 5 years: a cross sectional study in a rural southwestern district of Uganda. *Journal of nutrition and metabolism*, 1-9.

Kapur, R. (2019). *Problems and Challenges in Rural Areas.*

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2011). The Worldwide Governance Indicators: Methodology and Analytical Issues1 . *Hague journal on the rule of law, 3(2)*, 220-246.

Keats, A. (2018). Women's schooling, fertility, and child health outcomes: Evidence from Uganda's free primary education program. *Journal of Development Economics, 135*, 142-159.

Keino, S., Plasqui, G., Ettyang, G., & van den Borne, B. (2014). Determinants of stunting and overweight among young children and adolescents in sub-Saharan Africa. *Food and nutrition bulletin, 35(2)*, 167-178.

Kennedy, E., & Peters, P. (1992). Household food security and child nutrition: the interaction of income and gender of household head . *World development, 20(8)*, 1077-1085.

Kerr, R. B., Chilanga, E., Nyantakyi-Frimpong, H., Luginaah, I., & Lupafya, E. (2016). Integrated agriculture programs to address malnutrition in northern Malawi. *BMC Public Health, 16(1)*, 1-14.

Kusmin, L. D., & Gibbs, R. M. (2000). Less-educated workers face limited opportunities to move up to good jobs. *Rural America/Rural Development Perspectives, 15(2221-2019-2437)*, 32-43.

Lavecchia, A. M., Liu, H., & Oreopoulos, P. (2015). *Behavioral economics of education: Progress and possibilities.* Bonn: Institute for the Study of Labor (IZA).

Letourneau, N. L., Duffett-Leger, L., Levac, L., Watson, B., & Young-Morris, C. (2013). Socioeconomic status and child development: A meta-analysis. *Journal of Emotional and Behavioral Disorders, 21(3)*, 211-224.

Liben, M. L., Abuhay, T., & Haile, Y. (2016). Determinants of child malnutrition among agro pastorals in northeastern Ethiopia: a cross-sectional study. *Health Science Journal, 10(4)*, 1-10.

Mahmood, T., Abbas, F., Kumar, R., & Somrongthong, R. (2020). Why under five children are stunted in Pakistan? A multilevel analysis of Punjab Multiple indicator Cluster Survey (MICS-2014). *BMC public health, 20(1)*, 1-15.

McEniry, M., Flórez, C. E., Pardo, R., Samper-Ternent, R., & Cano-Gutierrez, C. (2017). *Examining the Multigenerational Effects of Obesity, Overweight and Stunting in a Latin American Middle Income Country: The Case of Colombia.* Madison, Wisconsin: Center for Demography and Ecology | University of Wisconsin-Madison.

Mkandawire, E., & Hendriks, S. L. (2018). A qualitative analysis of men's involvement in maternal and child health as a policy intervention in rural Central Malawi. *BMC pregnancy and childbirth, 18(1)*, 1-12.

Mshida, H. A., Kassim, N., Mpolya, E., & Kimanya, M. (2018). Water, sanitation, and hygiene practices associated with nutritional status of under-five children in semi-pastoral communities Tanzania. *The American journal of tropical medicine and hygiene, 98(5)*, 1242-1249.

Mtambo, O. P., Katoma, V., & Kazembe, L. N. (2016). Analysis of severe childhood stunting in Namibia. *International Journal of Statistics and Applications 2016, 6(2)*, 81-88.

Muraya, K. W., Jones, C., Berkley, J. A., & Molyneux, S. (2016). Perceptions of childhood undernutrition among rural households on the Kenyan coast–a qualitative study. *BMC Public Health, 16(1)*, 1-11.

Mutoro, A. N., Garcia, A. L., Kimani-Murage, E. W., & Wright, C. M. (2020). Eating and feeding behaviours in undernourished and healthy children aged 6-24 months in low income areas in Nairobi, Kenya. *Maternal and Child Nutrition*, 1-10.

Onyango, A., Tucker, K., & Eisemon, T. (1994). Household headship and child nutrition: a case study in western Kenya. *Social Science & Medicine, 39(12)*, 1633-1639.

Pryer, J. A., Rogers, S., & Rahman, A. (2004). The epidemiology of good nutritional status among children from a population with a high prevalence of malnutrition. *Public health nutrition, 7(2)*, 311-317.

Roba, A. A., Assefa, N., Dessie, Y., Tolera, A., Teji, K., Elena, H., . . . Fawzi, W. (2021). Prevalence and determinants of concurrent wasting and stunting and other indicators of malnutrition among children 6–59 months old in Kersa, Ethiopia. *Maternal & Child Nutrition, e13172*, 1-12.

Schrijner, S., & Smits, J. (2018a). Grandparents and Children's stunting in sub-Saharan Africa. *Social Science & Medicine, 205*, 90-98.

Schrijner, S., & Smits, J. (2018b). Grandmothers and children's schooling in Sub-Saharan Africa. *Human Nature, 29(1)*, 65-89.

Sear, R. (2008). Kin and child survival in rural Malawi. *Human Nature, 19(3)*, 277-293.

Sear, R., & Mace, R. (2008). Who keeps children alive? A review of the effects of kin on child survival. *Evolution and human behavior, 29(1), 1-18*, 1-18.

Senbanjo, I. O., Oshikoya, K. A., Odusanya, O. O., & Njokanma, O. F. (2011). Prevalence of and risk factors for stunting among school children and adolescents in Abeokuta, Southwest Nigeria. *Journal of health, population, and nutrition, 29(4)*, 364-370.

Sethuraman, K., Lansdown, R., & Sullivan, K. (2006). Women's empowerment and domestic violence: the role of sociocultural determinants in maternal and child undernutrition in tribal and rural communities in South India. *Food and nutrition bulletin, 27(2)*, 128-143.

Shahin, W., Kennedy, G. A., & Stupans, I. (2019). The impact of personal and cultural beliefs on medication adherence of patients with chronic illnesses: a systematic review. *Patient preference and adherence, 13*, 1019—1035.

Sharma, A. J., & Subramanyam, M. A. (2021). *The intersectional role of paternal gender-equitable attitudes and maternal empowerment on child undernutrition in India.* medRxiv.

Smith, L. C., & Haddad, L. (2015). Reducing child undernutrition: past drivers and priorities for the post-MDG era. . *World Development, 68*, 180-204.

Soriano, B., & Garrido, A. (2016). How important is economic growth for reducing undernourishment in developing countries? *Food Policy, 63*, 87-101.

Subramanian, S. V., & Subramanyam, M. A. (2015). Limits to economic growth: why direct investments are needed to address child undernutrition in India. *Journal of Korean medical science, 30(Suppl 2)*, S131-S133.

Subramanyam, M. A., Kawachi, I., Berkman, L. F., & Subramanian, S. V. (2011). Is economic growth associated with reduction in child undernutrition in India? *PLoS Med, 8(3), e1000424*, 1-15.

Suomalainen, T. (2017). *Family structure, gender and childhood obesity: A case study in Peru.* Wageningen University – Department of Social Sciences.

Tanskanen, A. O., & Danielsbacka, M. (2016). Maternal grandfathers and child development in England: Impact on the early years. In A. Buchanan, & A. Rotkirch, *Grandfathers* (pp. 217-228). London: Palgrave Macmillan.

Tariq, J., Sajjad, A., Zakar, R., Zakar, M. Z., & Fischer, F. (2018). Factors associated with undernutrition in children under the age of two years: secondary data analysis based on the Pakistan demographic and health survey 2012–2013. *Nutrients, 10(6), 676*, 1-20.

Tekile, A. K., Woya, A. A., & Basha, G. W. (2019). Prevalence of malnutrition and associated factors among under-five children in Ethiopia: evidence from the 2016 Ethiopia Demographic and Health Survey. *BMC research notes, 12(1)*, 1-6.

Tela, F. G., Gebremariam, L. W., & Beyene, S. A. (2020). Food taboos and related misperceptions during pregnancy in Mekelle city, Tigray, Northern Ethiopia. *PloS one, 15(10), e0239451*, 1-14.

The DHS Program. (2021). *The DHS Program - team and Partners*. Retrieved from The DHS Program: https://dhsprogram.com/

The World Bank. (2021). *Worldwide Governance Indicators | Databank*. Retrieved from DataBank | The World Bank: https://databank.worldbank.org/reports.aspx?source=worldwide-governance-indicators

Thurstans, S., Opondo, C., Seal, A., Wells, J., Khara, T., Dolan, C., . . . Kerac, M. (2020). Boys are more likely to be undernourished than girls: a systematic review and meta-analysis of sex differences in undernutrition. *BMJ global health, 5(12), e0040*, 1-17.

Transparency International. (2021). *2020 - CPI - Transparency.org* . Retrieved from Home - Transparecy.org: https://www.transparency.org/en/cpi/2020/index/nzl

United Nations. (2011). *Men in Families and Family Policy in a Changing World.* New York: DESA.

Uslaner, E. M. (2015). The consequences of corruption. The Routledge handbook of political corruption. In P. Heywood, *The Routledge handbook of political corruption* (pp. 199-211). New York: Roudledge.

Vaezghasemi, M., Öhman, A., Eriksson, M., Hakimi, M., Weinehall, L., Kusnanto, H., & Ng, N. (2014). The effect of gender and social capital on the dual burden of malnutrition: a multilevel study in Indonesia. *PloS one, 9(8), e103849.*, 1-10.

Vollmer, S., Bommer, C., Krishna, A., Harttgen, K., & Subramanian, S. V. (2017). The association of parental education with childhood undernutrition in low-and middle-

income countries: comparing the role of paternal and maternal education. *International journal of epidemiology, 46(1),* 312-323.

Wali, N., Agho, K., & Renzaho, A. M. (2019). Past drivers of and priorities for child undernutrition in South Asia: a mixed methods systematic review protocol. *Systematic reviews, 8(1),* 1-8.

Wells, J. C., Briend, A., Boyd, E. M., Berkely, J. A., Hall, A., Isanaka, S., . . . Dolan, C. (2019). Beyond wasted and stunted—a major shift to fight child undernutrition. *The Lancet Child & Adolescent Health, 3(11),* 831-834.

Workie, S. B., Mekonen, T., Fekadu, W., & Mekonen, T. C. (2020). Level of Undernutrition and Its Determinants Among Children Aged 12–59 Months in Wolaita District, Ethiopia. *Pediatric health, medicine and therapeutics, 11,* 109-117.

World Health Organization. (1993). *Guidelines for drinking-water quality.* World Health Organization.

World Health Organization. (2006). *WHO child growth standards: length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: methods and development.* Geneva: WHO Press, World Health Organization.

World Health Organization. (2020a, April 1). *Fact sheets - Malnutrition*. Retrieved from WHO |World Health Organization: https://www.who.int/news-room/fact-sheets/detail/malnutrition

World Health Organization. (2020b). *UNICEF/WHO/The World Bank Group joint child malnutrition estimates: levels and trends in child malnutrition: key findings of the 2020 edition.*

World Health Organization. (2021). *Child health | WHO | Regional Office for Africa*. Retrieved from WHO | Regional Office for Africa: https://www.afro.who.int/health-topics/child-health

World Health Organization, & UNICEF. (2010). *Progress on sanitation and drinking-water: 2010 update.* WHO Press, World Health Organization.

Appendix

Variable	Observations	Mean	SD	Min	Max
Stunting	58,845	0.39	0.49	0	1
Height/age z - score (HAZ)	58,845	-1.54	1.82	-6	5.96
Men - related variables					
Sex of household head	58,845	0.88	0.32	0	1
Father's education	58,845	0.20	0.40	0	1
Father's occupation	58,845	0.27	0.44	0	1
Grandfather in household	58,845	0.10	0.30	0	1
Polygamy	58,845	0.34	0.47	0	1
Household socioeconomic status					
Source of drinking water	58,845	0.37	0.48	0	1
Toilet facility	58,845	0.46	0.50	0	1
Electricity	58,845	0.33	0.47	0	1
Radio	58,845	0.69	0.46	0	1
TV	58,845	0.32	0.47	0	1
Fridge	58,845	0.11	0.31	0	1
Bicycle	58,845	0.31	0.46	0	1
Motorcycle	58,845	0.33	0.47	0	1
Area of residence	58,845	0.32	0.47	0	1
Mother's nutritional status					
Mother's education	58,845	0.11	0.32	0	1
Mother's height	58,845	0.01	0.12	0	1
Currently pregnant	58,845	0.15	0.36	0	1
Child characteristics					
Child's gender	58,845	0.51	0.50	0	1
Child's age	58,845	3.86	1.75	0	6
Child is a twin	58,845	0.02	0.14	0	1
Empowerment					
Women empowerment	58,845	3.10	1.12	1	4
Institutions					
Control of corruption	58,845	-0.82	0.32	-1.22	-0.01

Table 6: Summary statistics (mean, minimum, maximum, and standard deviation) of characteristics of children aged 6 - 59 months in this study

Husband/partner's educational attainment	Freq.	Percent	Cum.
No education	29,917	50.84	50.84
Incomplete primary	4,379	7.44	58.28
Complete primary	5,412	9.20	67.48
Incomplete secondary	7,230	12.29	79.77
Complete secondary	7,235	12.30	92.06
Higher	4,672	7.94	100.00
Total	58,845	100.00	

Table 7: Frequency table - Husband/partner's educational attainment

Respondent's educational attainment	Freq.	Percent	Cum.
No education	35,018	59.51	59.51
Incomplete primary	5,861	9.96	69.47
Complete primary	5,072	8.62	78.09
Incomplete secondary	6,310	10.72	88.81
Complete secondary	4,538	7.71	96.52
Higher	2,046	3.48	100.00
Total	58,845	100.00	

Table 8 : Frequency table - Respondent's (mother's) educational attainment

	Mother's education		
Sex of household head	Lower education	Higher education	Total
Female	6,082	959	7,041
Male	46,179	5,625	51,804
Total	52,261	6,584	58,845

Table 9: Frequency table – Sex of household head and mother's education