Factors related to mortality of children under 5 years in Uganda: Analysis of 2016 Uganda Demographic and Health Survey (DHS)

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This certifies that the Masters Thesis
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"And I am certain that God, who began the good work within you, will continue his work until it is finally finished on the day when Christ Jesus returns." Philippians 1:16 NLT

Thank you,
YeJin Lee

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Abstract

Factors related to mortality of children under 5 years in Uganda: Analysis of 2016 Uganda Demographic and Health Survey (DHS)

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(Directed by Professor So Yoon Kim, M.D., Ph.D.)

This study aims to examine the under 5 child mortality in Uganda with consideration of socioeconomical, maternal, environmental, and health clinic access factors following the Mosley and Chen analytical framework for the study of child survival in developing countries. The Demographic and Health Survey conducted in 2016 and the data collected through the survey was utilized for this analysis. Chi-square analysis and logistic regression was utilized to examine whether there is a statistical significance between mortality of children under 5 and the factors considered in the research model.

Results found that among the maternal factors age, parity, and interval between births, age and parity were found to be significant when considering all the factors that were studied. Among the environmental factors the source of drinking water and type of toilet facility were considered but had their significance disappear with added factors. Lastly in the health clinic access factor number of antenatal care visits were found to be significant and associated with under 5 child mortality.

Considering the results of the analysis, more efforts to raise awareness about adolescent sexual reproductive health and maternal parity, along with improvement in perinatal maternal and child health service delivery- especially antenatal care visit services to reduce mortality of children under 5 is recommended.

Keywords: Under 5 mortality, Uganda, Maternal and Child Health, Global health, DHS.

I. Introduction

1. Background and Necessity of Study

The 17 Sustainable Development Goals (SDGs) designated by the United Nations to be accomplished by the year 2030 includes target 2.3 “to end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births.” Also related is target 3.7, “to ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes” (UN SDGs, 2018).

However, from the available data from 2015, average of 15,000 children were still dying every day and 3.9% of all children dying before reaching five years of age globally. Although about half the time set to achieve the SDG goals has passed, it is prospected that the set targets are far away from being achieved with many countries still having child mortality rates higher that 2.5% (Roser, 2019). According to UNICEF’s Child Mortality Report 2020, about 48 million children under 5 years are projected to die between 2020 and 2030 with half of these deaths from newborns whose death could be avoided through high coverage of quality antenatal care, skilled care at birth and for those who are sick, and post natal care of mother and child. The disparities are great between regions with uneven progress in reaching these goals especially in sub-Saharan Africa due to socio-economic disparities that affect children’s chances of

survival. Sub-Saharan Africa had the highest under-five mortality rate in the world with 76 deaths per 1,000 live births in 2019, equivalent of 1 child in 13 dying before turning 5 years of age (UNICEF, 2020).

Especially in Uganda where a third of households are headed by women in a average household size of 4.5 members, a woman has around 5.4 children during her lifetime (UBOS 2017). Hence, maternal and child health is of utmost importance considering the ever growing population status in Uganda. Although over the years, Uganda has had steady decline in infant and under-five mortality, the under 5 mortality rate in 2019 still remains at 45.8 per 1,000 births, higher than that of the SDG target of 25 per 1,000 births (WHO, 2020). Some of the known causes for these deaths are known to be pneumonia (16%), malaria (13%), diarrhea (10%) and HIV/AIDS (7%). This is most likely to be closely related to the fact that the national coverage of improved source of drinking water being 70% and only 16% of households using improved toilet facilities in 2011 and 8% of mothers with children under 5 claiming to have soap and water readily available for hand washing. The child mortality is also unevenly distributed in the country with rural areas having significantly higher morality rates than urban areas even though urban areas are high also. In particular, Karamoja, Southwest, West Nile and other western regions being known to have the highest mortality (UNICEF, 2019). Although various research has been conducted regarding child mortality in specific regions in Uganda, identifying major factors that may be associated with under 5 mortality in the overall population with maternal, socio-economical, environmental, and health service access will be essential step in finding prevention measures.

2. Purpose of Study

The purpose of this study was as follows.

First, examine women with previous pregnancy experience within 5 years and assess whether their socioeconomic characteristic factors are statistically significant in making a difference on whether the child is alive at birth

Second, examine the maternal factors, environment factors, and health clinic access factors with consideration of the socioeconomic determinants and analyze the relationship between the factors

Third, analyze whether the maternal, environmental, and health clinic access factors have a significant relationship to whether the child under 5 years is alive.

3. Research Methodology

3.1 Research data and Sample selection

3.1.1 Research data source and data collecting process

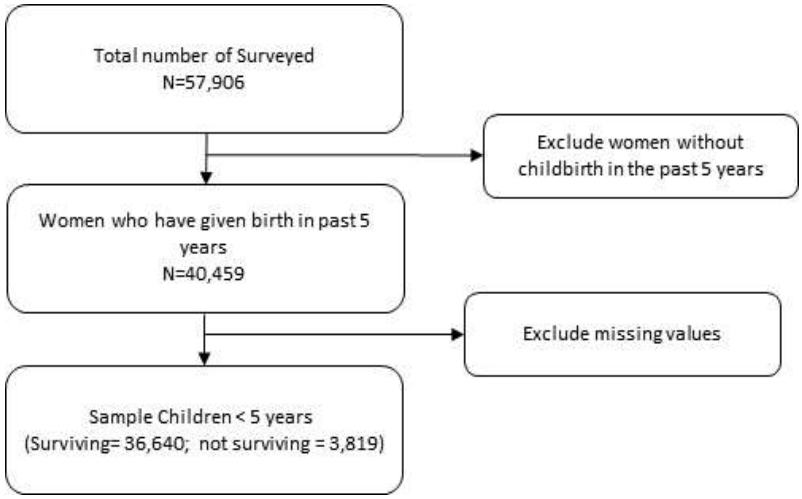
This research utilized data from the Demographic and Health Survey (DHS) of Uganda 2016, the last version of the survey to date for the quantitative study of childbirth outcomes in adolescents and related factors. The DHS data was developed by the United Stages Agency for International Development (USAID).

Anyone who gained permission to utilize DHS data can access and use the data for research. The DHS contains socio-demographic characteristics, maternal and child health information from a representative sample of households nation-wide. In Uganda, the full DHS was conducted six times in 1988-90, 1995, 2000-01, 2006, 2011, and 2016. The next round was planned to be conducted in 2021. Hence the most recent version from 2016 was utilized for this investigation.

3.1.2 Sample selection: inclusion criteria, exclusion criteria

In this research, of the total number (N=57,906) that were surveyed, the sample included those that have given birth in the past 5 years from 2012-2016 and excluded women who have not given birth in the past 5 years. Excluding women who have not given birth in the past 5 years left 40,459 women as the sample. From the number of women who have given childbirth in the past 5 years, 36,640 children under 5 years survived, and 3,819 children did not survive.

Figure 1. Sample Selection Method



3.2 Research Model

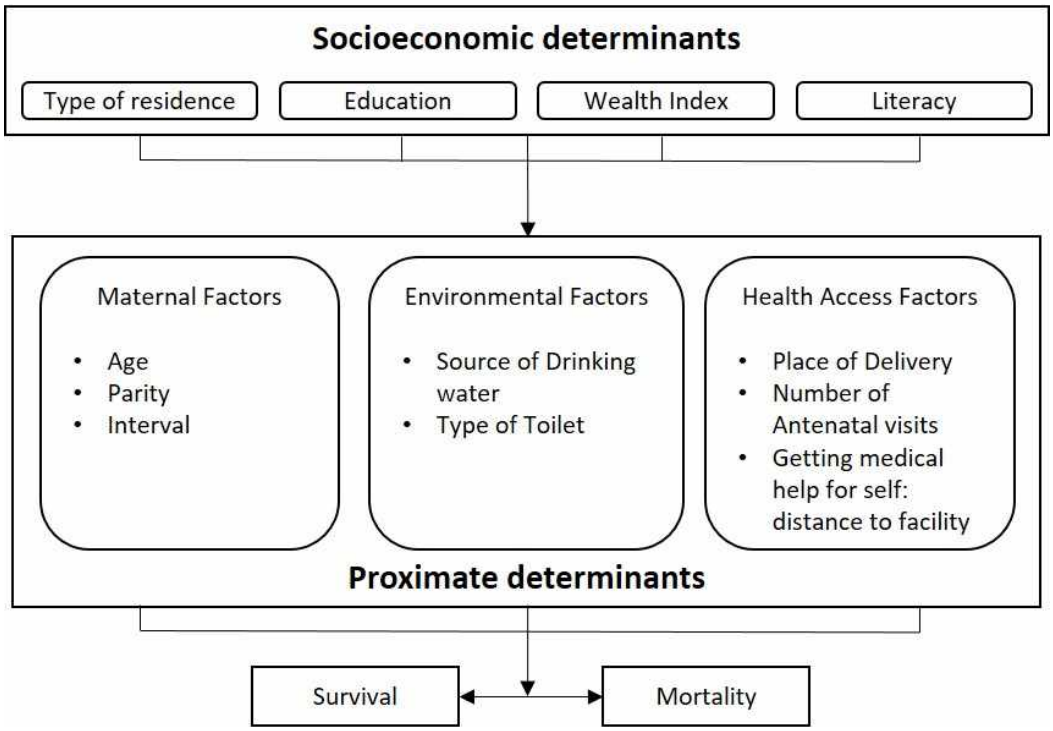
In this research, Mosley and Chen's model on infant mortality in developing countries was utilized to analyze what factors were related to the mortality of children under 5 years from the DHS data. According to Mosely-Chen's analytical framework for the study of child survival, socioecononomic determinants and proximate determinants that have a relationship to the survival of a child.

In this research the socioeconomic determinants included region, type of place of residence, educational level, religion, literacy, wealth index.

As for the proximate factors that include maternal factors, environment factors, and personal illness control/personal preventive measures- which is interpreted through health clinic access factors, were examined in this study. Although there are other components within the

proximate determinants, due to the limited available data in the DHS study, only factors that could be utilized from the DHS data set were included.

Figure 2. Mosley and Chen analytical framework for the study of child survival



3.3 Definition of Research Variables

3.3.1 Dependent Variable

The dependent variable in this study is whether the child was alive or not.

3.3.2 Independent Variables

The independent variables related to socioeconomic factors, maternal factors, environmental factors, and health clinic access factors were analyzed in this study. The socioeconomic factors included type of place of residence, highest educational level, wealth index combined, and literacy. Maternal factors included age, parity, and interval. Environmental factors included source of drinking water and type of toilet facility. For the health clinic access factors, place of delivery, number of antenatal visits, and whether getting medical help with regards to distance to health facility were considered.

For maternal factors, age of the mother whether they were adolescents (15-19 years old) or older was considered. For parity or the number of children they had was categorized to 1-3 children and more than 4 children. For interval less than 36 months and greater than 36 months were divided.

In the environmental factors, the source of drinking water and type of toilet that is utilized in the home was analyzed, with both being categorized as either as being unimproved or improved. The categorization was according to the DHS Statistics guide, and can be seen in table 1 and table 2 below.

Table 1. Source of Drinking Water Category

Unimproved	Improved
• Unprotected well	• Piped water
• Surface from spring	• Piped into dwelling
• Unprotected spring	• Piped to yard/plot
• River/dam/lake/ponds/stream/canal/irrigation channel	• Piped to neighbor
• Other	• Public tap/standpipe
	• Tube well water
	• Tube well or borehole
	• Dug well (open/protected)
	• Protected well
	• Protected spring
	• Rainwater
	• Tanker truck
	• Cart with small tank
	• Bicycle with jerrycans
	• Bottled water
	• Satchet water

Table 2. Type of Toilet Category

Unimproved	Improved
• Flush to somewhere else	• Flush Toilet
• Pit latrine without slab/open pit	• Flush to piped sewer system
• No facility	• Flush to septic tank
• No facility/bush/field	• Flush to pit latrine
• Bucket toilet	• Flush, don't know where
• Hanging toilet	• Pit toilet latrine
• Other	• Ventilated Improved Pit latrine
	• Pit latrine with slab
	• Composting toilet/Ecosan

In the health access factors, the place of delivery whether it was at a health facility or some other place, the number of antenatal visits whether they were 4 or more visits as per WHO recommendation or less, whether getting medical help with consideration of the distance to facilities was a problem or not was analyzed. The study variables are summarized in table 3 below.

Table 3. Study Variables

Variables		Categories
Dependent Variables		
Child is alive		Yes, No
Independent Variables		
Socioeconomic factors	Type of place of residence	Urban Rural
	Highest Educational level	No education Primary Secondary Higher
	Wealth Index Combined	Lowest Second Middle Fourth Highest
	Literacy	Cannot read at all Able to read only parts of sentence Able to read whole sentence No card with required language Blind/visually impaired
Maternal Factors	Age	15-19 years 20 years and over
	Parity	1-3 children 4 or more children
	Interval	less than 36 months greater than 36 months
Environmental Factors	Source of Drinking Water	Unimproved Improved
	Type of Toilet Facility	Unimproved Improved
Health Clinic Access Factors	Place of Delivery	Other Health Facility
	Number of antenatal visits	0-3 visits 4 or more visits
	Getting Medical help for self: distance to health facility	Not a problem Big problem

3.4 Data Analysis

To analyze the DHS 2016 data for the socioeconomic factors, maternal factors, environmental factors, and health clinic access factors in relation to their significance to mortality of children under 5 years, the Chi-square test and Logistic regression analysis was conducted.

3.5 Ethical Approval

The ethical approval and exemption for this study was received from the institutional review board of Yonsei University Severance Hospital on December 2020 (IRB No: Y-2020-0196).

II. Literature Review

1. Socioeconomic factors and Child survival

Numerous studies have validated the significance of socioeconomic determinants on child survival. In a study by Hobcraft (2011) that compared the socioeconomic factors in infant and child mortality considering five factors- mother's education, husband's occupation and education were found to be significantly affecting the child mortality. Similar studies conducted with the Nigerian Demographic Health Survey showed that mortality was highest among mothers with no education and children born in households with unimproved toilets also had experienced highest mortality rate (Adeolu, 2016).

Specifically in a study by Amouzou on the child mortality and socioeconomic status in Sub-Saharan Africa, it was also found that there was a positive association between illiteracy and under 5 mortality rate, and a negative association between urbanization and under 5 mortality rate. Per capita income had shown a consistent negative relationship with under 5 mortality rate, but over the past decade its effect has increased while urbanization and illiteracy have diminished (Amouzou, 2004). Another study analyzing factors associated with under 5 mortality in Rwanda, Uganda, and Tanzania highlighted the disparities between urban and rural areas. Despite mortality rates of children under age of 5 showing decrease each year at a national level, yet rural areas where more than 75% of the Ugandan population live still had higher under 5 mortality rates- 75 per 1000 live births compared to the national average which was 67 per 1000 live births

in 2016. This study also found significant associations between care giver education, time to reach a facility in which to receive health care, number of antenatal care visits, and fever in the last 2 weeks before the survey and under 5 mortality (Agho, 2020).

2. Maternal, Environmental, and Health clinic access factors and Child survival

2.1 Maternal Factors

According to the Mosley and Chen model, the maternal factors that were associated with child mortality were mother's age, parity, and interval between births.

Childbearing at an early age is known to not only to impact the mortality of the pregnant adolescent but also elevate risks for newborns and their health outcomes. According to WHO's Global health estimates 2015, newborns born from mothers under 20 years of age had greater risks of low birth weight, preterm delivery and other severe neonatal conditions. This was also validified in metanalysis and systemic literature review research conducted by Gronvic and Sandoy from University of Berngen Center for International health. This research also found that adolescents in Sub-Saharan Africa had higher risk of preterm birth, maternal and perinatal mortality, and also lower birth weight and pre-eclampsia/eclampsia. However, risk of stillbirth and small for gestation age babies were lower, and insignificant among young mothers (Grovic, 2018).

Considering the characteristics of adolescents that are different from that of adult women, studies comparing perinatal outcomes have also been examined. In Karabulut's study that compared perinatal outcomes and risk factors and normal reproductive age women, adolescents had lower educational status, and was found to give birth to newborns with lower birth weight. Antenatal problems were seen less frequently in normal reproductive age, and it was concluded that with sufficient antenatal care, adolescent pregnancy was not associated with increase in adverse pregnancy outcome except low birth weights. In another study, ratio of pregnancy induced hypertension and postpartum hemorrhage was higher in adults but anemia was more common in adolescents. Low birth weight and extremely low birth weight rates were significantly higher in adolescents, although 5 minute Apgar scores were found to be higher than the adult group (Bildiricin, 2013). There are many physiological, social differences between adolescents and adults, in which most are of disadvantage to adolescents. Through this research, it will be examined whether this is the case of Uganda in 2016.

Another maternal factor known for having association with child mortality is birth parity. Research by Sonneveldt utilizing DHS data from 10 highly fertile countries compared the differences between parity of 3 and parity of 6, and found that there was a difference of 12% in under-five mortality rate, associating higher parity with higher mortality rate (Sonneveldt, 2013). Research by Kozuki analyzing DHS data sets from 47 low and middle income countries showed similar results showing statistically significant association with high parity and child mortality (Kozuki, 2013).

More country specifically, a study conducted in 2015 about under 5 mortality in Uganda found that the number of births in the past 1 year to be a factor associated with increased risk of child mortality. This research discovered that women who birthed more than two children in the year had a higher risk of the child dying before turning 5 years old, highlighting the importance of child spacing and birth intervals (Nasejje, 2015).

Although more research have yet to confirm its validity, there have also been some studies that claim high parity being associated with iron-deficiency anemia which has implications with premature birth of children- a phenomenon called "maternal depletion." Prematurity was also highly associated with child mortality in many research findings. There are also other research claiming that babies at high parity having lower birth weight, but it is not clear whether it is a problem of maternal undernutrition or closely spaced pregnancy (Haaga, 1989).

2.2 Environmental Factors

Other factors that may be associated with under 5 mortality are environmental factors. Considering diarrhea being known as one of the major causes of under 5 mortality in Uganda, environmental factors including those related to sanitation most likely has an impact on child health and survival. In a study by Ezeh in Nigeria, it was found that children aged 1-4 years living in households with both unimproved source of water and sanitation facilities having high risk of child mortality compared to those who had improved sources (Ezeh, 2014). Similar findings were yielded in other such research, one by Alemu revealing that

a 1% increase in access to improved sanitation possibly influencing infant mortality by a rate of about two infant deaths per 1000 live births, along with significant decline in infant mortality being linked to improvements in education, health and sustainable economic growth also (Alemu, 2017).

For the case of Uganda, a study by Nambuusi on the under 5 mortality in Uganda with consideration of geographical variations yielded the results that mid-north and west Nile regions showing improved source of drinking water reducing under 5 mortality, and North east regions with improved sanitation facilities (Nambuusi, 2019).

2.3 Health Clinic Access factors

Significant factors that are most often associated with under 5 mortality are those related to health clinic or facility access. The place of delivery recommended by WHO is in health facilities where adequate and timely interventions can take place in case of any complications during childbirth. Where the child is delivered was found to be significant in whether the child survives or not in some research. In a cohort study on perinatal mortality in Eastern Uganda, those who delivered at home were 3.7 times more likely to experience a perinatal death compared those who delivered in a health facility or with a traditional birth attendant in assistance. Delivering at home was found to be strongly associated with stillbirths and early neonatal deaths (Nankabirwa, 2011). However, there were also some research that state the contrary. A research conducted in Ghana found that facility birth does not necessarily convey that birth outcomes as always being positive, and suggested that only facilities in

which emergency obstetric, newborn care can be provided could be seen as having a positive impact in assisting child survival during childbirth (Gabrysch, 2019).

There was also extensive amount of research related to the number of antenatal care (ANC) visits and neonatal mortality. Previous to the 2016 WHO ANC model, the four-visit focused ANC (FANC) model in which four antenatal care visits at critical times in pregnancy was given as the guideline for positive pregnancy experience and childbirth outcome. However, in 2016 the WHO updated the guidelines to eight different contacts for maximal impact (WHO, 2016). However as the most recent and available data from the DHS was from births preceding 2016, the four visit focus model can be considered as the standard in which the DHS data was considered and analyzed.

A study by Pervin on antenatal care in Bangladesh found that the odds of perinatal mortality was 2 times higher among women who received less than 1 ANC visit compared to those who had received more than 3 ANC visits. In addition, ANC visits were associated with increased uptake of facility-based delivery. Similar studies conducted in Kenya with highest odds of neonatal mortality among neonates whose mother did not attend any ANC visits along with those in which skilled birth attendants were not present (Arunda, 2017). A systematic review and meta-analysis on the impact of antenatal care on neonatal mortality in sub-Saharan Africa also yielded results that utilization of at least one antenatal care visit by a skilled provider reducing the risk of neonatal mortality by 39% (Tekelab, 2019). Analysis of 69 low and middle income countries' antenatal care

services also found that 1 ANC visit being associated with 1.04% reduced probability of neonatal mortality and a 1.07% lower probability of infant mortality, with 4 ANC visits and a skilled provider reducing the probability further by 0.56% and 0.42% (Kuhnt, 2017). Another study in Bangladesh associated receipt of atleast four ANC visits to skilled birth attendant use and institutional delivery (Ryan, 2019) which could imply that the health clinic access factors investigated in this study may be multicollinear to some extent with ANC visits and delivery place being related.

Distance to health facility was another factor that was found to be associated with child mortality. In research conducted by Karra et al. at Harvard T.H. Chan School of Public Health, the relationships between distance to facility, service utilization, and child mortality in low and middle income countries were analyzed. The results conveyed that children who lived within 1 kilometer of a health facility had lower odds of neonatal mortality compared to those living further away. In addition, women living 10 kilometers and further away had lower odds of in-facility delivery compared to women who live within 1 kilometer (Karra, 2017).

III. Uganda Sexual Reproductive Health and Child Mortality

1. Sexual Reproductive health in Uganda

Sexual reproductive health of women in Uganda and related issues closely impacts child mortality. Services available and accessible for women along with awareness about its necessity forecasts the outcomes of pregnant women and their children. Not only services be available for perinatal care, but also the family planning and prevention of diseases that can impact sexual and reproductive health of women through out her lifetime. According to research conducted, only 39% of women were utilizing any sort of contraceptive, and 15% had a met need for birth spacing (HNN, 2017). Only 59.9% of pregnant women aged 15-29 years in Uganda have attended the WHO recommended 4 antenatal care visits before childbirth in 2016, and since then it has decreased even further to 56.7% in 2018 (UNICEF, 2020). Around 97% did have atleast 1 antenatal care visit, but only 21% had their first antenatal care visit within 20 weeks of conception. During pregnancy, about 64% had used insecticide treated nets and 56% who were HIV positive were receiving antiretroviral therapy (HNN, 2017). One out of 272 pregnant women dies either during pregnancy, while giving birth, or after delivery (UNICEF, 2019).

Early childbearing has also become an issue in Uganda with 28.4% of women giving birth before the age of 18 in 2016 (UNICEF, 2020). Adolescent pregnancies have health implications associated with pre-term labor, intrauterine growth retardation, low birth weight, neonatal death, obstructed labor, genital fistula, and eclampsia (Ochen, 2019).

Much to the government and national efforts, institutional deliveries in health facilities has risen from 57.4% in 2011 to 73.4% in 2016 (UNICEF 2020). However, many issues still remain considering the child mortality despite efforts to improve women's sexual reproductive health in Uganda.

2. Child Mortality in Uganda

A major growing concern of the Ugandan government in public health is child survival. Although the neonatal mortality ratio declined from 33 deaths to 27 deaths per 1,000 live births from 2001 to 2006, it stagnated from 2006 to 2016 (Asimmwe, 2019). According to UNICEF's data, one out for 37 newborns die within 1 month in Uganda, and nearly 1 out of 16 children do not make it alive to their fifth birthday (UNICEF, 2019). There are many factors that are known to be related to neonatal mortality. One that is highlighted in many research is pre-term birth- which are babies born before 37 weeks, consisting 14% of births in Uganda and 226,000 babies per year. The risk factors related to preterm birth in Uganda are many. Adolescence of the mother is known to be one that is known to be closely related to preterm birth, and Uganda apparently has an adolescent birth rate of 132 girls out of 1,000 girls. Birth intervals of less than 24 month is also a commonly known factor, and about 8% of births were found to be less than 24 months. Anemia among women of childbearing age found to be 32% also can cause preterm birth, along with hypertension found to be 28% in women. Also a serious risk

factor contributing to preterm birth was solid fuel used for indoor cooking which was 96%. Others such as violence during pregnancy of 16% and only 8% of households having a place to wash hands with soap and water were also seen as risk factors of preterm birth in Uganda that could lead to neonatal death (HNN, 2017).

Not only are the neonatal mortality an issue in Uganda, the mortality of children the under 5 child mortality rate also is high, at 52 per 1,000 live births in 2016. Since then, the rates have decreased to 45 per 1,000 live births by 2019. Although the mortality rates of children under 5 have since then decreased, yet an estimate of 74,053 children under 5 years died in Uganda in 2019 (UNICEF, 2020). Some causes for these under 5 year mortalities are known to be pneumonia (16%), malaria (13%), diarrhea (10%) and HIV/AIDS (7%) according to UNICEF data in 2019.

The government of Uganda, ministry of health has made multiple strategies and plans to overcome the issues with child survival. The Uganda Constitution and Children both protect and promote child health within a legal framework. National Development Plan and Health Sector Strategic Plans also include aims to fulfil child survival goals. The Child Survival Strategy from 2009 also contained goals, objectives that aim to reduce under five mortality- with intervention packages of maternal and newborn healthcare, treatment of major childhood diseases, vaccination against preventable diseases, nutrition interventions, malaria prevention and treatment, HIV prevention and treatment, even water and sanitation interventions (MOH, 2009). Despite all these efforts, there still remains gaps that are fundamentally continuing to cause under 5 child mortality from being reduced.

IV. Results

1. General Characteristics

1.1 General Characteristics of respondents

For the analysis, of the total 57,906 that were surveyed, women who had given birth in the past 5 years were 40,459 people. Of the sample group, total 3,819 people responded that their child is not alive and 36,640 replied that their child is alive.

The chi-square test was utilized to analyze the relationship between the socio-economic factors and survival of children under 5. Considering the mortality of children under age of 5 years in the sample, in urban areas 493 (7.7%) did not have their child survive and 5,915 (92.4%) had their child survive. In rural areas 3,326 (9.8%) did not have their child survive and 30,725 (90.2%) had their child survive.

As for education, among those who had no education 948 (12.9%) did not have their child survive, for those with primary education 2,467 (9.5%), those with secondary education 357 (6.2%) and those with higher education 46 (3.3%) did not have their child survive. This showed the trend in child mortality rate decreasing with mothers who had attained higher education.

For wealth index, those in the lowest category had 1,182 (10.7%) did not have their child survive. While in the highest category only 336 (6.4%) did not survive. This goes to show that those who were wealthier were more likely to have their child survive than those who were in the lower wealth category.

In relationship to literacy, those who could not read at all 2,199 (11.1%) did not have their child survive whereas 17 (7.9%) who were able to read whole sentences did not have their child survive in the group. This signifies literate mothers were more likely to have their child survive.

All in all, considering the general socio-economical characteristics of the respondents, higher the education level which most likely correlates with higher literacy and wealth following the education level, the likelihood of child survival was higher. Those with more education, wealth and able to read could have had more access to healthcare both financially and also in terms of awareness, compared to those who had less leading to child survival differences. Below in table 4 shows the results of the analysis, with all the p values showing significance.

Table 4. General Characteristics of respondents and Survival of children under 5

Variables	Categories	U5 Child survival		
		No N(%)	Yes N(%)	p value
Socio Economic determinants	Type of place of residence			
	Urban	493 (7.7)	5915 (92.3)	p<0.001
	Rural	3326 (9.8)	30725 (90.2)	
	Education			
	No education	948 (12.9)	6387 (87.1)	
	Primary	2467 (9.5)	23514 (90.5)	p<0.001
	Secondary	357 (6.2)	5356 (93.8)	
	Higher	47 (3.3)	1383 (96.7)	
	Wealth Index Combined			
	Lowest	1182 (10.7)	9900 (89.3)	
	Second	931 (10.3)	8139 (89.7)	
	Middle	787 (9.5)	7525 (90.5)	p<0.001
	Fourth	583 (8.6)	6180 (91.4)	
	Highest	336 (6.4)	4896 (93.6)	
	Literacy			
	Cannot read at all	2199 (11.1)	17527 (88.9)	
	Able to read parts of sentence	451 (9.4)	4351 (90.6)	
	Able to read whole sentence	1142 (7.3)	14520 (92.7)	p<0.001
	No card with required language	17 (7.9)	199 (92.1)	
	Blind/Visually impaired	10 (0.3)	43 (81.1)	

2. Relationship between socioeconomic factors and maternal factors

The maternal factors that were considered were age, parity, and interval between births.

Considering the age of surveyed mothers and type of residence, for the 15-19 year adolescent group 157 (15.8%) were found to be living in urban areas and 837 (84.2%) living in rural areas. As for the 20 years and above adult group 6251 (15.8%) were found to be living in urban areas and 33,214 (84.2%) in rural areas. For education, in the 15-19 year adolescent group 37 (3.7%) had no education, 774 (77.9%) had primary education, 179 (18.0%) had secondary education, and 4 (0.4%) had higher level of education. In the 20 years and above adult group, 7,298 (18.5%) had no education, 25,207 (63.9%) had primary education, 5,534 (14.0%) had secondary education, 1,426 (3.6%) had higher level of education. For wealth index in the 15-19 year adolescent group, 276 (27.8%) were in the lowest and 115 (11.6%) were in the highest wealth category. In the 20 years and over adult group, 10,806 (27.4%) were in the lowest wealth category and 5117 (13.0%) in the highest wealth category. For literacy, 15-19 year adolescent group had 261 (36.3%) who could not read at all and 440 (44.3%) who were able to read the whole sentence. As for the 20 years and over adult group, 19,365 (49.1%) could not read at all and 15,222 (38.6%) were able to read whole sentences.

Considering the parity of surveyed mothers and type of residence, of the mothers with 1-3 children, 2501 (24.2%) lived in urban areas and 7,853 (75.8%) lived in rural areas. Of the mothers with 4 or more children 3907 (13.0%) lived in urban areas and 26198 (87.0%) lived in rural areas. As for

education, of the mothers with 1-3 children 686 (6.6%) had no education, 6,061 (58.5%) had primary education, 2,710 (26.2%) had secondary education, 897 (8.7%) had higher level of education. Of the mothers with 4 or more children 6,649 (22.1%) had no education, 19,920 (66.2%) had primary education, 3,003 (10.0%) had secondary education, and 533 (1.8%) had higher level of education. For wealth index, of the mothers with 1-3 children 2,181 (21.1%) were in the lowest, and 2,353 (22.7%) were in the highest wealth category. Of the mothers with 4 or more children 8,901 (29.6%) were in the lowest and 2,879 (9.6%) were in the highest wealth category. For literacy, of the mothers with 1-3 children 3.003 (29.0%) could not read at all and 5,856 (56.6%) were able to read whole sentences while in the mothers with 4 or more children, 16,723 (55.5%) could not read at all and 9,806 (32.6%) were able to read whole sentences.

Considering the interval in which the surveyed mother had given birth in months after the previous childbirth, those who had an interval of less than 36 months and those who had an interval greater than 36 months were compared. Of mothers who had less than 36 month interval between childbirths, 2,778 (12.5%) lived in urban areas and 19,459 (87.5%) lived in rural areas. Of mothers who had greater than 36 months intervals between childbirth 1,563 (19.9%) lived in urban areas and 6,292 (80.1%) in the rural areas. For education, of the mothers with less than 36 months interval, 4,670 (21.0%) had no education, 14,720 (66.2%) had primary education, 2,408 (10.8%) had secondary education 439 (2.0%) had higher level of education. Of the mothers with more than 36 months interval, 1,374 (17.5%) had no education, 4,912 (62.5%) had primary education, 1,202 (15.3%) had secondary

education, 367 (4.7%) had higher level of education. For wealth index, of the mothers with less than 36 months interval, 6,655 (29.9%) were in the lowest and 2,062 (9.3%) were in the highest wealth category. Of the mothers with more than 36 months interval, 1,870 (23.8%) were in the lowest and 1,340 (17.1%) were in the highest wealth category. For literacy, of the mothers with less than 36 months interval, 12,049 (54.2%) could not read at all, and 7,507 (33.8%) were able to read whole sentences. Of the mothers with more than 36 months interval, 3,600 (45.8%) could not read at all and 3,251 (41.4%) were able to read whole sentences. Table 5 summarizes the results on the relationship between socioeconomic factors and maternal factors.

Table 5. Relationship between socioeconomic determinants and maternal factors

Variables	Categories	Maternal Factors								
		Age			Parity			Interval		
		15-19 yrs N(%)	20+yrs N(%)	p value	1-3 children N(%)	4+ children N(%)	p value	<36 months N(%)	>36 months N(%)	p value
Socio Economic determinants	Type of place of residence									
	Urban	157 (15.8)	6251 (15.8)	0.970	2501 (24.2)	3907 (13.0)	<0.001	2778 (12.5)	1563 (19.9)	<0.001
	Rural	837 (84.2)	33214 (84.2)		7853 (75.8)	26198 (87.0)		19459 (87.5)	6292 (80.1)	
	Education									
	No education	37 (3.7)	7298 (18.5)	<0.001	686 (6.6)	6649 (22.1)	<0.001	4670 (21.0)	1374 (17.5)	<0.001
	Primary	774 (77.9)	25207 (63.9)		6061 (58.5)	19920 (66.2)		14720 (66.2)	4912 (62.5)	
	Secondary	179 (18.0)	5534 (14.0)		2710 (26.2)	3003 (10.0)		2408 (10.8)	1202 (15.3)	
	Higher	4 (0.4)	1426 (3.6)		897 (8.7)	533 (1.8)		439 (2.0)	367 (4.7)	
	Wealth Index Combined									
	Lowest	276 (27.8)	10806 (27.4)	0.001	2181 (21.1)	8901 (29.6)	<0.001	6655 (29.9)	1870 (23.8)	<0.001
	Second	273 (27.5)	8797 (22.3)		2107 (20.3)	6963 (23.1)		5175 (23.3)	1676 (21.3)	
	Middle	175 (17.6)	8137 (20.6)		1881 (18.2)	6431 (21.4)		4771 (21.5)	1574 (20.0)	
	Fourth	155 (15.6)	6608 (16.7)		1832 (17.7)	4931 (16.4)		3574 (16.1)	1395 (17.8)	
	Highest	115 (11.6)	5117 (13.0)		2353 (22.7)	2879 (9.6)		2062 (9.3)	1340 (17.1)	
	Literacy									
	Cannot read at all	361 (36.3)	19365 (49.1)	<0.001	3003 (29.0)	16723 (55.5)	<0.001	12049 (54.2)	3600 (45.8)	<0.001
	Able to read parts of sentence	190 (19.1)	4612 (11.7)		1438 (13.9)	3364 (11.2)		2531 (11.4)	949 (12.1)	
	Able to read whole sentence	440 (44.3)	15222 (38.6)		5856 (56.6)	9806 (32.6)		7507 (33.8)	3251 (41.4)	
	No card with required language	2 (0.2)	214 (0.5)		54 (0.5)	162 (0.5)		117 (0.5)	44 (0.6)	
	Blind/Visually impaired	1 (0.1)	52 (0.1)		3 (0.0)	50 (0.2)		33 (0.1)	11 (0.1)	

3. Relationship between socioeconomic factors and environmental factors

The environmental factors that were considered were source of drinking water and type of toilet.

Considering the source of water and the type of place of residence, of those who were utilizing unimproved source of drinking water 630 (6.8%) were living in urban areas and 8,620 (93.2) were living in rural areas. Among those who were utilizing improved source of drinking water, 5,607 (18.7%) were living in urban areas and 24,623 (74.1%) were living in rural areas. For education, of those who were utilizing unimproved source of drinking water, 1,869 (20.2%) had no education and 100 (1.1%) had higher education. Among those who were utilizing improved source of water, 5,348 (17.7%) had no education and 1,283 (4.2%) had higher education. For wealth index, among those who were utilizing unimproved source of drinking water, 2,292 (24.8%) were in the lowest and 389 (4.2%) were in the highest wealth category. Among those who were utilizing unimproved source of water, 8,540 (28.3%) were in the lowest and 4,668 (15.4%) were in the highest wealth category. For literacy, among those who were utilizing unimproved source of drinking water 4,656 (50.3%) could not read at all and 3,326 (36.0%) were able to read whole sentences. Among those who were utilizing improved source of drinking water 14,641 (48.4%) could not read at all and 11,899 (39.4%) were able to read whole sentences.

Considering the type of toilet facility utilized and the type of place of residence, among those who were utilizing unimproved toilets 2,562 (8.7%) were living in urban areas and 27,046 (91.3%) were living in rural

areas. Among those who were utilizing improved toilets 3,846 (35.4%) were living in urban and 7,005 (64.6%) were living rural areas. Regarding education, of those who were utilizing unimproved toilets 6,433 (21.7%) had no education and 370 (1.2%) had higher education. For those utilizing improved toilets, 902 (8.3%) had no education and 1,060 (9.8%) had higher education. For wealth index, among those who were utilizing unimproved toilets 10,486 (35.4%) were in the lowest and 922 (3.1%) were in the highest category for wealth. Among those who were utilizing improved toilets 596 (5.5%) were in the lowest and 4,310 (39.7%) were in the highest category for wealth. As for literacy, those utilizing unimproved toilets 4,656 (50.3%) could not read at all and 3,326 (36.0%) were able to read whole sentences. Among those who were utilizing improved toilets 3,216 (29.6%) could not read at all and 6,193 (57.1%) were able to read whole sentences. Table 6 summarizes the results on the relationship between socioeconomic factors and environmental factors.

Table 6. Relationship between socioeconomic determinants and environmental factors

Variables	Categories	Environmental Factors					
		Source of drinking water			Type of toilet facility		
		Unimproved N(%)	Improved N(%)	p value	Unimproved N(%)	Improved N(%)	p value
Socio Economic determinants	Type of place of residence						
	Urban	630 (6.8)	5607 (18.5)	<0.001	2562 (8.7)	3846 (35.4)	<0.001
	Rural	8620 (93.2)	24623 (74.1)		27046 (91.3)	7005 (64.6)	
	Education						
	No education	1869 (20.2)	5348 (17.7)	<0.001	6433 (21.7)	902 (8.3)	<0.001
	Primary	6370 (68.9)	18972 (62.8)		19936 (67.3)	6045 (55.7)	
	Secondary	911 (9.8)	4627 (15.3)		2869 (9.7)	2844 (26.2)	
	Higher	100 (1.1)	1283 (4.2)		370 (1.2)	1060 (9.8)	
	Wealth Index Combined						
	Lowest	2292 (24.8)	8540 (28.3)	<0.001	10486 (35.4)	596 (5.5)	<0.001
	Second	2447 (26.5)	6418 (21.2)		7809 (26.4)	1261 (11.6)	
	Middle	2352 (25.4)	5752 (19.0)		6666 (22.5)	1646 (15.2)	
	Fourth	1770 (19.1)	4852 (16.1)		3725 (12.6)	3038 (28.0)	
	Highest	389 (4.2)	4668 (15.4)		922 (3.1)	4310 (39.7)	
	Literacy						
	Cannot read at all	4656 (50.3)	14641 (48.4)	<0.001	16510 (55.8)	3216 (29.6)	<0.001
	Able to read parts of sentence	1168 (12.6)	3525 (11.7)		3412 (11.5)	1390 (12.8)	
	Able to read whole sentence	3326 (36.0)	11899 (39.4)		9469 (32.0)	6193 (57.1)	
	No card with required language	93 (1.0)	120 (0.4)		190 (0.6)	26 (0.2)	
	Blind/Visually impaired	7 (0.1)	45 (0.1)		27 (0.1)	26 (0.2)	

4. Relationship between socioeconomic factors and health clinic access factor.

The health clinic access factors that were considered were place of delivery, number of antenatal visits, and whether the mothers were able to get medical help for oneself considering the distance to the health facility.

Considering the place of delivery, 2,477 (88.1%) living in urban areas gave birth in a health facility and 334 (11.9%) gave birth somewhere other than a health facility. Among those who lived in rural areas, 8,713 (68.5%) delivered in a health facility and 3,998 (31.5%) delivered somewhere else. With regards to education, 1,248 (60.0%) of those with no education gave birth in health facilities and 832 (40.0%) gave birth elsewhere. Of those who had higher education 781 (96.7%) gave birth in health facilities whereas 27 (3.3%) gave birth somewhere other than a health facility. For wealth index, 2,689 (64.8%) who were in the lowest wealth category gave birth in the health facilities and 1,463 (35.2%) gave birth somewhere other than the health facilities. For those in the highest wealth category 2,235 (92.7%) gave birth in the facilities and 145 (7.3%) gave birth elsewhere. In regards to literacy, those who could not read at all 4,071 (63.1%) delivered in the health facilities and 2,378 (36.9%) delivered somewhere else. Amongst those who were able to read whole sentences 5,628 (80.6%) delivered in health facilities and 1,355 (19.4%) delivered somewhere other than in a facility.

Considering the number of antenatal visits and place of residence 1,368 (66.9%) had 4 or more antenatal visits in urban areas and 677 (33.1%) had less than four visits. In rural areas 4,819 (58.6%) had 4 or more visits whereas 3,399 (41.4%) had less than four visits. As for education, those who

had no education 707 (55.2%) had 4 or more antenatal visits and 574 (44.5%) had less than 4 visits. Those who had higher education 462 (75.2%) had 4 or more visits and 152 (24.8%) less than 4 visits. For wealth and number of antenatal visits, lowest category had 1,140 (45%) having less than 4 visits, and 1,396 (55.0%) having more than 4 visits. In the highest category, 1,251 (69.2%) had 4 or more visits and 558 (30.8%) had less than 4 visits.

Considering whether getting medical help for oneself in regards to distance to health facility is a problem or not, 4,877 (76.1%) in urban areas stated that it was not and 1,531 (23.9%) stated it was a problem. In rural areas 17,399 (51.1%) found it as not a problem whereas 16,652 (48.9%) found it as a problem. For education those with no education 3,686 (50.3%) found getting medical help not be a problem whereas 3,649 (49.7%) people found it to be a problem. In comparison, those with higher education a greater percentage 1,151 (80.5%) people found it to be not a problem, and fewer people of 279 (19.5%) found it to be a big problem. For wealth index, those who were in the lowest category 4,705 (42.5%) found it not to be problem whereas 6,377 (57.5%) found it to be a problem. Compared with those in the highest wealth index, where 4,177 (79.8%) found it to not be a problem had a higher percentage and fewer people 1,055 (20.2%) found it to be a problem. For literacy, those who could not read at all- 9,991 (50.6%) found it to not be a problem and 9,735 (49.4%) found it to be a big problem. In comparison 9,577 (61.1%) people who could read whole sentences found it to be not a problem and 6,085 (38.9%) to be a problem.

Table 7 summarizes the results on the relationship between socioeconomic factors and health clinic access factors.

Table 7. Relationship between socioeconomic determinants and health clinic access factors

Variables	Categories	Health clinic access factor								
		Place of delivery			Number of antenatal visit			Getting Medical help for self: Distance to health facility		
		Other	Health Facility	p value	0-3	4 or more	p value	Not a problem	Big Problem	p value
Socio Economic determinants	Type of place of residence									
	Urban	334 (11.9)	2477 (88.1)	<0.001	677 (33.1)	1368 (66.9)	<0.001	4877 (76.1)	1531 (23.9)	<0.001
	Rural	3998 (31.5)	8713 (68.5)		3399 (41.4)	4819 (58.6)		17399 (51.1)	16652 (48.9)	
	Education									
	No education	832 (40.0)	1248 (60.0)	<0.001	574 (44.8)	707 (55.2)	<0.001	3686 (50.3)	3649 (49.7)	<0.001
	Primary	3077 (31.7)	6628 (68.3)		2648 (42.1)	3642 (57.9)		13682 (52.7)	12299 (47.3)	
	Secondary	396 (13.5)	2533 (86.5)		702 (33.8)	1376 (66.2)		3757 (65.8)	1956 (34.2)	
	Higher	27 (3.3)	781 (96.7)		152 (24.8)	462 (75.2)		1151 (80.5)	279 (19.5)	
	Wealth Index Combined									
	Lowest	1463 (35.2)	2689 (64.8)	<0.001	1140 (45.0)	1396 (55.0)	<0.001	4705 (42.5)	6377 (57.5)	<0.001
	Second	1240 (36.7)	2142 (63.3)		943 (42.9)	1256 (57.1)		4613 (50.9)	4457 (49.1)	
	Middle	877 (29.5)	2094 (70.5)		795 (40.8)	1152 (59.2)		4584 (55.1)	3728 (44.9)	
	Fourth	577 (22.1)	2030 (77.9)		640 (36.1)	1132 (63.9)		4197 (62.1)	2566 (37.9)	
	Highest	175 (7.3)	2235 (92.7)		558 (30.8)	1251 (69.2)		4177 (79.8)	1055 (20.2)	
	Literacy									
	Cannot read at all	2378 (36.9)	4071 (63.1)	<0.001	1774 (44.0)	2262 (56.0)	<0.001	9991 (50.6)	9735 (49.4)	<0.001
	Able to read parts of sentence	576 (28.9)	1420 (71.1)		557 (42.4)	756 (57.6)		2504 (52.1)	2298 (47.9)	
	Able to read whole sentence	1355 (19.4)	5628 (80.6)		1717 (35.4)	3134 (64.6)		9577 (61.1)	6085 (38.9)	
	No card with required language	21 (25.6)	61 (74.4)		24 (44.4)	30 (55.6)		158 (73.1)	58 (26.9)	
	Blind/Visually impaired	2 (16.7)	10 (83.3)		4 (44.4)	5 (55.6)		46 (86.8)	7 (13.2)	

5. Relationship between Child survival and proximate factors.

The relationship between child survival and the proximate factors-maternal, environmental, and health clinic access factors was analyzed through the chi-square test.

As shown in table 8 below, maternal factor of age in relation to survival of children under 5 showed statistical significance with p value of 0.012. Parity also showed statistical significance with p value of 0.000, as well as interval.

As for environmental factors, both source of drinking water and type of toilet facility showed statistical significance in relation to survival of children under 5.

In the health clinic access factor, place of delivery did not show statistical significance with p value of 0.086. For the number of antenatal visits that had p value of 0.000 and getting medical help for oneself regarding distance to health facility with p value of 0.027 both showing statistical significance in relation to child survival.

Table 8. Relationship between child survival and proximate factors

Variables	Categories	U5 Child survival		p value
		No N(%)	Yes N(%)	
Maternal Factors	Age			
	15-19 years	71 (7.1)	923 (92.9)	0.012
	20 years and above	3748 (9.5)	35717 (90.5)	
	Parity			
	1-3 children	505 (4.9)	9849 (95.1)	<0.001
	4 or more children	3314 (11.0)	26791 (89.0)	
	Interval			
	Less than 36 months	2233 (10.3)	19466 (89.7)	<0.001
	Greater 36 months	460 (5.5)	7933 (94.5)	
Environmental Factors	Source of Drinking water			
	Unimproved	1016 (11.0)	8234 (89.0)	<0.001
	Improved	2698 (8.9)	27532 (91.1)	
	Type of Toilet facility			
	Unimproved	2980 (10.1)	26628 (89.9)	<0.001
	Improved	839 (7.7)	10012 (92.3)	
Health clinic access factor	Place of delivery			
	Other	248 (5.7)	4084 (94.3)	0.086
	Health Facility	564 (5.0)	10626 (95.0)	
	Number of antenatal visit			
	0-3 visits	202 (5.0)	3874 (95.0)	<0.001
	4 or more visits	182 (2.9)	6005 (97.1)	
	Getting Medical help for self: Distance to health facility			
	Not a Problem	2038 (9.1)	20238 (90.9)	0.027
	Big Problem	1781 (9.8)	16402 (90.2)	

6. Significant factors in relation to child survival

In order to specify the proximal factors that are significant in relation to child survival, logistic regression was conducted and the results are as shown in table 9. The results from model I showed that among the maternal factors, age, parity, and interval as being significant in relation to child survival ($p < 0.05$). More specifically, the odds ratio showed that children from mothers 15-19 years had an odds ratio of 2.216 more likely to die than children from mothers age 20 years and above (OR=2.216, 95% CI 1.201-4.086). For parity, those who have had 4 or more children had the odds ratio of 3.128 more likely to have their child not survive (OR=3.128, 95% CI 2.649-3.694). As for interval between births, those with less than 36 months interval had a odds ratio of 1.867 more likely to not have their child survive (OR=1.867, 95% CI 1.683-2.072).

In model II, the environmental factors were additionally considered. Both source of drinking water and type of toilet were shown to be statistically significant ($p<0.05$). For the source of drinking water, utilizing unimproved source had an odds ratio of 1.169 higher likelihood of child not surviving (OR=1.169, 95% CI 1.059-1.290). For the type of toilet, utilizing unimproved toilet had an odds ratio of 1.215 higher likelihood of child not surviving (OR=1.215, 95% CI 1.110-1.331).

In model III, the health clinic access factors were additionally considered. Of the three factors, only number of antenatal visits had p value <0.05 showing significance. Those who had 0-3 visits had odds ratio of 1.590 higher of having their child not survive (OR=1.590, 95% CI 1.252-2.019) compared to those who had more than 4 visits. Place of

delivery and getting medical help for self considering the distance to the facility did not show statistical significance. Although in model II, the maternal and environmental factors showed significance in relation to child survival, in model III the significance disappeared for interval between births, source of drinking water, and type of toilet facility.

To summarize the results shown in table 9 below, in Uganda the maternal factor of age, parity, and health clinic access factor of number of antenatal care were found to be the most important factors in relation to survival of children under 5 years according to the DHS data from 2016.

Table 9. Results of Sequential Logistic Regression

Variables	Categories	Model I			Model II			Model III		
		OR	95%CI	p value	OR	95%CI	p value	OR	95%CI	p value
Maternal Factors	Age									
	15-19 years	2.216	1.201-4.086	0.011	2.205	1.164-4.174	0.015	3.235	1.571-6.662	0.001
	20 years and above	1.000			1.000			1.000		
	Parity									
	1-3 children	1.000			1.000			1.000		
	4 or more children	3.128	2.649-3.694	<0.001	3.096	2.611-3.670	<0.001	1.966	1.491-2.592	<0.001
	Interval									
	Less than 36 months	1.867	1.683-2.072	<0.001	1.861	1.674-2.069	<0.001	1.048	0.821-1.339	0.705
	Greater than 36 months	1.000			1.000			1.000		
Environmental Factors	Source of Drinking water									
	Unimproved				1.169	1.059-1.290	0.002	0.929	0.711-1.213	0.587
	Improved				1.000			1.000		
	Type of Toilet Facility									
	Unimproved				1.215	1.110-1.331	<0.001	1.054	0.797-1.393	0.713
	Improved				1.000			1.000		
Health clinic access factor	Place of delivery									
	Other							1.000	0.769-1.301	1.000
	Health Facility							1.000		
	Number of Antenatal visit									
	0-3 visits							1.590	1.252-2.019	<0.001
	4 or more visits							1.000		
	Getting Medical help for self: Distance to health facility									
	Not a Problem							1.000		
	Big Problem							0.872	0.684-1.113	0.273

V. Discussion

From the results of the data analysis, it can be concluded that age, parity, and number of antenatal care were the most significant factors that affect the survival of children under 5 years in Uganda from the 2016 data.

More specifically in regards to the age of the mother, mothers who were between 15-19 years old had an odds ratio of 3.235 higher (OR=3.235, 95% CI 1.571-6.662) than those who were 20 years and above, to have their child not survive from results of model III that included all factors. This result is in line with preceding research that also claim that having children at adolescence or early age when the body is not fully developed can result in negative childbirth outcomes, along with other complications during pregnancy (WHO, 2014). Strong evidence show that pregnancy in adolescents may result in insufficient fetal growth due to the young mother's own linear growth that require nutrients also, lessening its availability for the fetus which may result in its death (Haaga, 1989).

In relation to parity, mothers who had given birth to 4 or more children had an odds ratio of 1.966 higher (OR=1.966, 95% CI 1.491-2.592) compared those who had 1-3 children, to have their child not survive from results of model III that included all factors. This result is in line with preceding research also, that had evidenced that higher parity births may be under conditions where the mother's body is depleted of nutrients that are needed for the fetus to fully develop hence resulting in child mortality (Haaga, 1989).

For health clinic access factors, those who only had 0-3 antenatal care visits had an odds ratio 1.590 higher (OR= 1.590, 95% CI 1.252-2.019) of their child not surviving than those who had 4 or more antenatal care visits. This result coincides with many other research results evidencing frequent visits to the health clinics for antenatal care resulting in positive outcomes in childbirth. Following the 4 antenatal care visit standards during pregnancy raises the chance of catching any possible problems that may arise during pregnancy that may cause negative health outcomes in the fetus.

Although it will not be further explored in this research, the three health clinic access factors can possibly be multicollinear or closely related in that the distance to the health facilities and whether there is a problem with access may have a relationship with the number of antenatal visits and whether the delivery takes place in the health facility. If such is the case, the number of antenatal visits that shows statistical significance can be seen as a representative factor in relation to survival of children under 5 years.

VI. Conclusion and Recommendations

Child mortality is an indicator frequently utilized as a measure of population health, representing a country's health status and its health system's capacity to deliver essential services. Although there were a variety of precedent research related to under 5 child mortality in Uganda, most were limited to certain regions or looking at only a few factors that may be associated with under 5 mortality. Through this research, the Mosley-Chen (1984) analytical framework for the study of child survival in developing countries was applied in an attempt to take a comprehensive look at which socio-economic, maternal, environmental, and health clinic access factors have significance on the survival of under 5 year children in Uganda.

As a retrospective study utilizing Demographic and Health Survey data that was collected in 2016, there were some limitations of the study. One would be recall bias, considering the characteristic of the data collected through a survey of mothers who had given birth within 5 years preceding the survey. Another limitation would be the difficulty of knowing the causality between factors as the data collected was cross sectional, simultaneously collected making it difficult to determine the temporal relationship between exposure and outcomes. Also, other factors that could be included in the Mosley-Chen framework such as nutrient status and injury could not be included and fully analyzed in this current study due to the limited content that was included in the DHS survey in 2016.

Despite the limitations of this study, statistical analysis of

socio-economic, maternal, environmental, and health clinic access on their association with child survival showed significance factors of age, parity, and number of antenatal care visits. Mothers whose age was between 15-19 years, and those whose parity was greater than 4 had more likelihood of their child not surviving, along with those who had less than 4 antenatal care visits. These three factors and their association with mortality of children under 5 may be signifying gaps in the health system and delivery of maternal and child health services.

Hence, in order to reduce mortality of children under 5 in Uganda, it can be carefully suggested that gaps related to maternal and child health services related to the three factors be tackled. Considering the results showing that adolescent mothers significantly more children die, it can be assumed that the physiological capacity of adolescents are not ready to have children nor the services in health facilities sufficient to meet the needs of adolescent mothers. With this in mind, education on family planning methods and sexual reproductive health for adolescents should be reinforced along with efforts to make health facilities a place where adolescents can access services more freely. Detailed study on other specific barriers related to adolescents, whether it is the financial aspect of getting to health facilities, or attitudes related to pregnancies in adolescents, or other factors would be helpful in clarifying the causality of child mortality in young mothers.

For parity also, having more children being associated to a higher mortality of children under 5 years, education and improvement of awareness on maternal physiological capacities and sociological impacts on

having more children is needed with consideration of cultural norms and values.

As for antenatal care visits, there may be many factors related to its association with child mortality. It may be the knowledge of mothers about the necessity of having frequent check ups in the health facilities, or it may be the quality of services available causing mothers to not want to go to the clinics, or other social, economic, environmental factors that is related. Further research is required to find out what causes a Ugandan mother to go or not to go for antenatal care visits. All in all, government and policies related to maternal and child health need to continue to support mothers for them to receive health care services in a timely and effective manner in order for more children under 5 years to survive.

Further research with the next round of DHS survey to be conducted in 2021 would be necessary to update on the current status of children under 5 years in Uganda, along with the possible factors that have significance in their survival.

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Abstract in Korean

국 문 요 약

우간다 5세 미만 아동의 사망과 관련된 요인 분석: 2016 우간다 인구보건 조사 중심으로

본 연구는 Mosley와 Chen의 분석 틀을 활용하여 우간다 5세미만 아동의 사망과 사회경제적 특성, 모성의 개인적 특성, 환경적 특성, 보건의료 서비스 접근 특성의 연관성을 분석하고자 하였다. 2016년에 조사된 우간다 인구보건 조사 자료를 활용하여 진행하였으며 카이제곱검정과 로지스틱 회귀분석을 통하여 5세 미만 아동의 사망과 연구하고자 하는 요인들 간의 연관성을 분석하였다.

연구 결과, 모성의 개인 특성인 모성의 나이와 출산력이 통계적으로 유의미한 요인으로 나타났으며, 환경적 요인 식수와 화장실 시설은 다른 요인들을 모두 고려했을 때 유의미하지 않은 것으로 나타났다. 마지막으로 보건의료 서비스 접근 특성과 관련하여서는 산전 관리를 위한 보건 시설 방문 횟수가 5세 미만 아동의 사망과 연관성이 있는 유의미한 요인으로 나타났다.

따라서 본 연구의 결과를 바탕으로 우간다 청소년의 성생식 건강과 산모의 출산력이 5세 미만 아동의 사망에 미치는 영향에 대한 인식 개선의 필요성을 강조하며 모자보건 서비스 특히 산전 관리 관련 서비스 개선에 더 많은 지원을 함으로써 우간다 5세 미만 아동의 사망을 감소시키는데 기여를 할 것을 제안한다.

핵심어: 5세 미만 아동 사망, 우간다, 모자보건, 국제보건, 인구보건 조사