

# An Assessment of the Effects of Heterogeneous Family Structures on Early Child Health in Zambia

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## ABSTRACT

**Background:** Ending preventable deaths of newborns and children under 5 years of age by 2030 is one of the targets of the Sustainable Development Goals. Data from the 2013-14 Zambia Demographic and Health Survey (ZDHS) shows that there has been improvement in some indicators of child health over the years and this has coincided with the widespread demographic changes in family formation. However, studies undertaken to link family formation/structure with child health have come up with contradicting results. It's hypothesized that children from monogamous households tend to have much better health outcomes compared to single or polygynous households. This study therefore set out to examine the effect of heterogeneous family structures on early child health.

**Methods:** Using cross sectional data from the 2013-14 ZDHS, the study employed a two-stage cluster sample design using the Kids Recode (KR) data file which contains information about children under the age of five (5) of interviewed women. Analysis was conducted at three levels: descriptive, bivariate and multivariate and Chi square tests were used to examine the association between the factors associated with early child health.

**Results:** The findings indicate significant differences in the health of children under five among the different family structures in Zambia. With the ever married and polygamous marriage categories showing higher odds ( $aOR=1.2$  and  $aOR=1.1$ ;  $p<0.05$ ), respectively of children with poor health. The study also established that mother's nutrition status ( $aOR=5.3$ ;  $p<0.05$ ), place of residence ( $aOR=1.3$ ;  $p<0.05$ ), gender of child ( $aOR=0.8$ ;  $p<0.05$ ), breastfeeding ( $aOR=0.5$ ;  $p<0.05$ ) and antenatal care ( $aOR=0.8$ ;  $p<0.05$ ) visits were also among other factors associated with the early child health in Zambia.

**Conclusion:** The study concludes that family structure has a statistically significant effect on early child health and there is heterogeneity in the health outcomes of the children from the different forms of marriage.

*Key words:* Family Structure, Early Child Health, Marriage, ZDHS 2013-14, Zambia.

## INTRODUCTION

The past few decades have seen significant changes in the family structure of households in Africa. These

changes have been initiated partly as a result of the enduring tensions between traditional and modern values and structures which have led to widespread accounts of families abandoning key traditional practices in favor

of modern ones [1]. The evolution from the traditional to the modern value system is evident from the gradual transformations of African marriages from polygamous to monogamous unions, preference for smaller family sizes and the delay/postponement of marriage [1]. With the solidification of the modern value system, significant changes in the fertility rates have occurred in Africa and particularly more so in urban areas as opposed to rural areas [1, 2]. In addition, there has been a rapid decline in the proportion of women marrying before the age of 20 in most countries [1]. However, polygamy particularly among rural households remains rife and this is largely attributed to the imperative that having many wives results in many children who in turn provide essential labor services in rural agricultural production and livelihoods [1, 3, 4, 6].

Zambia has not been an exception to the modern value transformation experienced in most parts of Africa. The country has been experiencing widespread demographic changes in the family formation over the years [5, 6]. These include the reduction in the number of marriages and subsequent rise in the number of children born into households with a single parent, the rise in the ever married category (widowed, divorced, or separated) and the delaying and postponing of marriage among other things [6]. According to the Zambia Demographic and Health Survey (ZDHS) 2013-14, Zambia's fertility has declined from 6.5 births per woman in 1992 to 5.3 births per woman in 2013, translating into a more than one-child decline in about two decades [6]. However, despite the overall decrease in fertility, fertility rates in rural areas remain high (6.6 births per woman) compared to urban areas (3.7 births per woman). In addition, the median age at first birth has increased though marginally from 19.1 in 1992 to 19.3 in 2013 for the youngest cohort of women (age 20-24) [6]. This suggests that childbearing is slowly becoming uncommon in the age below 15 years compared to olden times when childbearing below the age of 15 was not uncommon. With regards to family structure, statistics from the 1992 and 2013-14 ZDHSs show that, there has been a reduction in both polygynous and monogamous marriages, with the polygynous marriages dropping from 18% to 12% and monogamous marriages from 63% to 60% between the 1992 and 2013-14 period [6, 7]. Monogamous marriages however, continue to be the majority among the two family structures (87% women and 92% men) [6].

Family structure/formation has an influence on the health status of children [8]. Many studies have shown that there exists a link between family structure and children's health outcomes [9, 10, 11, 12, 13]. The nature of the association is however unclear as studies have come up with contradicting results. While some studies have come to the conclusion that children living with two married parents (monogamous) are more likely than those from other types of families (single or polygynous) to be in excellent or very good health [10, 11], others have concluded that children

living in polygynous marriages have better health outcomes [13, 14].

One of the targets of the Sustainable Development Goals (SDGs) is to ensure healthy lives and promote well-being for all at all ages by 2030 [15]. This ultimately shows the importance that the world (Zambia inclusive) places on the health of children. Apart from the SDGs, Zambia has also implemented several child health interventions such as scaling up and sustaining high-impact nutrition interventions including Vitamin A supplements, Iron-folate supplements, early initiation of breastfeeding, infant and child feeding, and management of malnutrition programs [16]. Data from the 2013-14 ZDHS shows that, there has been some marked improvements in some indicators of child health over the years. For instance, neonatal and under-5 mortality rates have declined over the 15-year period preceding the survey by 17% and 41% respectively. Stunting however, worsened for the severely stunted children from 15% to 17%, while the proportion of stunted children has remained unchanged in the period 1992 to 2013-14 [6, 7]. Given the improvement in some of the child health indicators and the prevailing trends in family structure, particularly the reduction in polygynous marriages, one is left to wonder if there is a link between the two variables in Zambia as established by studies undertaken elsewhere. Therefore, this research seeks to address the question "What are the effects of family structure on early child health?"

The main objective of this study is to examine the influence of heterogeneous family structures on early child health in Zambia. Specifically, the study intends to:

- Assess whether there are any significant differences in the health of children under five among the different family structures in Zambia.
- Determine the factors associated with the health of children under five in Zambia.

The hypothesis made in this study is that, children from monogamous households tend to have much better health outcomes than those from single, polygynous or ever married households. This notion is supported by the recent spate of articles, mostly based on large-scale African Demographic and Health Surveys (DHS) which conclude that polygyny has a significantly negative effect on child health, reporting that children in polygynous and other households are consistently more likely to be of ill health or die in early childhood than children in monogamous households [10, 17].

## METHODS

### Data

The study used data from the 2013-14 Zambia Demographic and Health Survey (ZDHS) to assess the

effects of family structure on early child health. A complex two stage sampling design was used. In the first stage, 722 enumeration areas (EAs) or clusters were selected (305 in urban and 417 in rural areas) based on probability proportionate to size. The second stage involved selecting the households from the EAs which resulted in 18,052 household being selected. However, only 15,920 of the 16,258 households occupied at the time of data collection were successfully interviewed representing a 98% response rate. The target population of this study was all women aged 15-49 who had living children under the age of five, hence the study employed the Kids Recode (KR) data file. In total, the sample had 13,457 living children under the age of five of interviewed women aged 15-49.

### Outcome Variable

The outcome variable in this research was early child health which was proxied by weight-for-age (WAZ) Z-scores. The justification for the use of WAZ is that, it is a composite index of height-for-age (HAZ) - a measure of child stunting and weight-for-height (WHZ) - a measure of child wasting and therefore stands as a much stronger measure of early child health as it accounts for both chronic and acute undernutrition [6]. The study recoded the WAZ Z-scores into a dichotomous variable (underweight and not underweight), a categorization similar to that made by Nguetack et al. [18].

### Explanatory Variables

The main explanatory variable in this study was family structure which was categorized into 4 categories [single (never married), monogamous, polygynous and ever married (widowed, divorced, or separated)]. The importance of including this variable was to assess the varied effects of the different categories on early child health outcomes. The other independent and intervening variables employed in the study included: Mother's nutrition status which was based on body mass index (BMI). Women who were pregnant and women with a child under age 2 months were excluded from the BMI calculation. The motivation for this variable choice was that, since the nutritional status of the mother is likely to have adverse effects on the health status of the child i.e. mothers with poor nutrition may pose great danger to the health of the child [6], it is therefore important to know the extent to which this variable affects early child health outcomes; Place of residence categorized as urban and rural from the 2013-14 ZDHS [6]; and gender of the child.

Other variables included were mother's age at birth of child categorized as <20, 20-34 and 35+.

This categorization was made, to compare child health outcomes among teenage mothers, those in the prime age of child bearing and the older mothers approaching the end of child bearing; Vaccination of child, categorized into vaccinated and not vaccinated. The motivation behind the inclusion of this variable was that, childhood vaccination may protect children against disease and lead to improved child health [19]. The study also included breastfeeding as a measure of nutritional habits. According to Mejia [20] breastfeeding reduces infant mortality and has benefits for child health in both the short and long term. This study categorized the breastfeeding variable into three: Never breastfed, breastfed up to two years ( $\leq 2$ ) and breastfed more than two years ( $> 2$ ). This categorization is similar to the categorization made by Mejia [20] and was made based on the WHO recommendation of continued breastfeeding for up to 2 years or longer [21].

As an indicator of antenatal care (ANC), the number of ANC visits the mother made for the last birth was included. The variable was categorized as less than four (<4) visits and four or more (4+) visits. This categorization was based on the WHO recommendation that, a pregnant woman should at least attend four visits during pregnancy. ANC improves the range of health outcomes for women and children [22]. Mother's employment status was another variable included in the study. Women remain the primary caregivers for children, therefore, with an income they are likely to improve the nutrition status for themselves and their children and also seek better health care. This is likely to have a positively effect on child health outcomes as income increases the living standards of families.

### Statistical Analysis

The study employed three levels of statistical analysis (Univariate, Bivariate and Multivariate) using STATA 14. Sample weights for the Kids Recode (KR) data file and the SVY command in STATA were applied to adjust for disproportionate sampling and Non-response. Bivariate analysis was used to examine the association between the factors associated with early child health using the Chi square test while multivariate analysis involved the use of binary logistic regression. The multivariate analysis involved running two binary logistic regression models. Model 1 was an unadjusted model which involved regressing the four categories of family structure on early child health. Model 2 on the other hand was an adjusted model which involved regressing the four heterogeneous categories of family structure on early child health after controlling for mother's nutrition status, place of residence, gender of child, mother's age at birth of child, vaccination, breastfeeding, ANC visits and mother's employment status. Tests for collinearity among the predictor variables were examined using the pairwise correlation coefficient. Statistical significance was determined when  $p < 0.05$ .

## RESULTS

### Descriptive Characteristics of the Sample

In total, the sample had 13,457 living children under the age of five of interviewed women aged 15-49 in the 2013-14 ZDHS. Table 1 presents the descriptive characteristics of the sample. The prevalence of children under the age of five who were underweight was 14.6%. The results showed that 51% of children in the study were male. Further, rural areas accounted for the highest proportion of the living children under the age of five of interviewed women aged 15-49 in the 2013-14 ZDHS (66% versus 34% for urban areas).

According to the family characteristics, the majority (72%) of interviewed women aged 15-49 in the 2013-14 ZDHS were in monogamous marital unions, whereas those in the ever married and polygynous unions accounted for approximately 10% each. The women in the single category accounted for only 7.5%. In terms of mother's characteristics, mothers in the 20-30 age category accounted for 67.3% of the children under the age of five of interviewed women aged 15-49 in the 2013-14 ZDHS. Among the women interviewed, half were underweight. In addition, the majority (97.5%) of the interviewed women breastfed their children for two years and above in line with the WHO/UNICEF optimum recommendation of breastfeeding [21]. The results further revealed that, approximately 55% of the interviewed mothers were working. In terms of maternal and child care, 90% of the children under the age of five were vaccinated and only 39% of the interviewed mothers made the recommended four or more ANC visits to a health facility.

The results from the pairwise correlation coefficient revealed weak correlation among the variables as no coefficient was above 0.7 (results are shown in Appendix 1).

### Bivariate Analysis

Table 2 shows the results of bivariate analysis of the percentage of the nutritional status of children under the age of five by family, maternal & child care and economic characteristics. The results from the Chi square test revealed that the factors associated with early child health (WAZ) were family structure ( $p < 0.041$ ), mother's nutrition status ( $p < 0.000$ ), and gender of child ( $p < 0.002$ ). Other factors included; breastfeeding ( $p < 0.000$ ), ANC visits ( $p < 0.000$ ) and mothers employment status ( $p < 0.021$ ).

Results from the bivariate analysis further reveal that, for family structure which is the main explanatory variable, out of a total of 14.6% children under the age of five who were underweight in Zambia, the majority came from the ever married category followed by the polygynous category (16.7% and 16.3% respectively). The single and monogamous categories accounted for only 14.3% and 14.2% respectively.

**TABLE 1. Descriptive Characteristics of the sample of living children under the age of five (5) of interviewed women aged 15-49, ZDHS 2013-14.**

	N (%)
<b>Nutritional Status of Children(using WHO standard, &gt;2SDs)</b>	
Underweight	1,621 (14.6)
Not Underweight	9,501 (85.4)
<b>Family Structure</b>	
Single	981 (7.5)
Monogamy	9,453 (72)
Polygyny	1,361 (10.4)
Ever married	1,335 (10.2)
<b>Mothers Nutrition Status</b>	
Underweight	5,507 (49.6)
Not Underweight	5,615 (50.4)
<b>Type of Residence</b>	
Urban	4,522 (34.2)
Rural	8,609 (65.8)
<b>Gender of Child</b>	
Male	6,884 (50.9)
Female	6,447 (49.1)
<b>Mothers age at Birth of Child</b>	
<20	2,429 (18.5)
20-34	8,841 (67.3)
35+	1,860 (14.2)
<b>Vaccination</b>	
Vaccinated	11,993(89.6)
Not Vaccinated	1,390 (10.4)
<b>Breastfeeding</b>	
Never Breastfed	302 (2.5)
<=2	11,350 (91.4)
>2	758 (6.1)
<b>Antenatal Care Visits</b>	
<4	8,013 (61.3)
4+	5,118 (38.7)
<b>Mothers Employment Status</b>	
Working	7,201 (55.2)
Not Working	5,884 (44.8)

### Multivariate Binary Logistic Results

Model 1 shows the unadjusted result of the primary explanatory variable (family structure) and child health (nutritional status of children). The results revealed that, only the ever married category was significant in explaining the variations in early child health. According to the results in

**TABLE 2. Nutritional status of children under the age of five (5) by family, maternal & child care and economic factors, ZDHS 2013-14**

<b>Nutritional Status of Children (Using WHO standard, &gt;2 SDs)</b>					
	<b>Not Underweight</b>		<b>Underweight</b>		<b>P-values</b>
	<b>%</b>	<b>95% CI</b>	<b>%</b>	<b>95% CI</b>	
<b>Family Structure</b>					
Single	85.7	[82.8 - 88.2]	14.3	[11.8 - 17.2]	<b>0.041*</b>
Monogamy	85.8	[84.8 - 86.8]	14.2	[13.2 - 15.2]	
Polygyny	83.7	[81.0 - 86.1]	16.3	[13.9 - 19.0]	
ever married	83.3	[80.4 - 85.8]	16.7	[14.2 - 19.6]	
Total	85.4	[84.5 - 86.2]	14.6	[13.8 - 15.5]	
<b>Mothers Nutrition Status</b>					
Underweight	76.2	[74.8 - 77.7]	23.8	[22.3 - 25.2]	<b>0.000***</b>
Not Underweight	94.3	[93.6 - 95.0]	5.7	[5.0 - 6.4]	
Total	85.4	[84.5 - 86.2]	14.6	[13.8 - 15.5]	
<b>Place of Residence</b>					
Urban	87.4	[85.7 - 88.9]	12.6	[11.1 - 14.3]	<b>0.003**</b>
Rural	84.4	[83.4 - 85.3]	15.6	[14.7 - 16.6]	
<b>Gender of child</b>					
Male	84.2	[83.1 - 85.2]	15.8	[14.8 - 16.90]	<b>0.002**</b>
Female	86.6	[85.4 - 87.7]	13.4	[12.3 - 14.6]	
Total	85.4	[84.5 - 86.2]	14.6	[13.8 - 15.5]	
<b>Mothers age at birth of Child</b>					
<20	84.3	[82.1 - 86.2]	15.7	[13.8 - 17.9]	<b>0.449</b>
20-34	85.6	[84.6 - 86.6]	14.4	[13.4 - 15.4]	
35+	85.5	[83.4 - 87.5]	14.5	[12.5 - 16.6]	
Total	85.4	[84.5 - 86.2]	14.6	[13.8 - 15.5]	
<b>Vaccination</b>					
Vaccinated	85.3	[84.4 - 86.1]	14.7	[13.9 - 15.6]	<b>0.391</b>
Not Vaccinated	86.9	[83.2 - 89.9]	13.1	[10.1 - 16.9]	
Total	85.4	[84.5 - 86.2]	14.6	[13.8 - 15.5]	
<b>Breastfeeding</b>					
Never Breastfed	77.1	[67.0 - 84.8]	22.9	[15.2 - 33.0]	<b>0.000***</b>
<=2	86	[85.1 - 86.8]	14	[13.2 - 14.9]	
>2	80.3	[76.7 - 83.5]	19.7	[16.5 - 23.3]	
Total	85.5	[84.6 - 86.3]	14.5	[13.7 - 15.4]	
<b>Antenatal Care Visits</b>					
<4	84	[82.9 - 85.1]	16	[14.9 - 17.1]	<b>0.000***</b>
4+	87.4	[86.2 - 88.5]	12.6	[11.5 - 13.8]	
Total	85.4	[84.5 - 86.2]	14.6	[13.8 - 15.5]	
<b>Mothers Employment Status</b>					
Working	84.5	[83.3 - 85.6]	15.5	[14.4 - 16.7]	<b>0.021*</b>
Not Working	86.5	[85.2 - 87.7]	13.5	[12.3 - 14.8]	
Total	85.4	[84.5 - 86.2]	14.6	[13.8 - 15.5]	

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

SDs = Standard Deviations, CI = Confidence Interval, % = Percentage, p-value = Calculated Probability Value

Table 3, children under the age of five born to those in the ever married category had statistically significant higher odds (OR=1.2; 95% CI [1.0-1.5]) of being underweight (poor health) relative to those who were in monogamous marriage unions. The results further revealed that, despite the other categories of family structure (single, polygyny) not being statistically significant, the odds of their children being underweight relative to the monogamous category were higher (OR=1.0 and OR=1.2; 95% CI: 0.8-1.3 and CI: 1.0-1.4), respectively).

Model 2 presents the adjusted odds ratios of the selected variables on the nutritional status of children under the age of five. The results showed that, after controlling for the effects of family, maternal and child care and economic characteristics, two categories of family structure (ever married and polygyny) were statistically significant predictors of the weight of children under the age of five. Children in the ever married and polygynous marriage unions had higher odds of being underweight compared to those in monogamous unions (aOR=1.1 and aOR=1.2; 95% CI: 1.0-1.5 and CI: 0.9-1.4), respectively). The odds of children born to mothers who were underweight were 5.3 times higher compared to those whose mothers who were not underweight (aOR=5.3; 95% CI: 4.5-6.2). Children born to mothers in rural areas had 1.3 times higher odds of being underweight compared to those born to mothers in urban areas (aOR=1.3; 95% CI: 1.1-1.5). The results further revealed that, female children had 0.8 times lower odds of being underweight compared to their male counterparts (aOR=0.8; 95% CI: 0.7-0.9). It was also established that, children who received vaccination had 1.4 times higher odds of being underweight compared to those that did not receive vaccination (aOR=1.4; 99% CI: 1.0-1.9). Further, the results also revealed that, children who were breastfed up to two years of age had 0.5 times lower odds of being underweight compared to those who were never breastfed (aOR=0.5; 95% CI: 0.3-0.9). Finally, the results showed that children whose mothers had four or more ANC visits had 0.8 times lower odds of being underweight compared to those whose mothers had less than 4 ANC visits (aOR=0.8; 90% CI:0.7-0.9).

Model 2 has been adjusted for mother's nutrition status, place of residence, gender of child, mother's age at birth of child, vaccination, breastfeeding, ANC visits and mother's employment status

## DISCUSSION

The results of our study showed that, the prevalence of children under the age of five who were underweight was 14.6%. This goes to show that one-seventh of the children of interviewed women in this study were either chronically or acutely undernourished and this could partly be attributed to the family setting (structure) in which the children are born. According to the findings of the study,

the type of home (divorced, widowed or separated) and the number of parents (three or more) had an effect on the health of the child. Therefore, given that early child health is robustly associated with later life course outcomes, it was especially important to understand how family structure leads to variation in early child health.

The study found that family structure had a statistically significant effect on early child health. This result conforms to other empirical studies [8, 24]. The finding suggests considerable heterogeneity in the outcomes among children from the different forms of marriage. In particular, children of mothers from the ever married category had significantly higher odds of being underweight (poor health) in both the unadjusted and adjusted models compared to those from monogamous marriages. This result is in line with studies by Freeman and Brewer [8] and Brown [25] who found that children growing in a two-parent family tend to be associated with poor health outcomes. The plausible explanation to this result is that, children from the ever married category tend to be disadvantaged as their parents spend less time with them opting for more competing demands for their time [25]. In the same vein, the results from the adjusted model revealed that children from polygamous marriages had significantly higher odds of being underweight compared to those from monogamous marriages. This result is similar to the findings by Lawson et al. [13] and Wagner and Rieger [17] on polygamy and child health, who found that polygyny had a significantly negative effect on child health. This finding could be as a result of rivalry among the co-wives and aggression towards each other's children. Co-wife aggression creates a stressful environment, which could negatively affect the well-being of especially young children [26]. The single category was however, found to be not significant in explaining the variations in child health despite some studies [8, 24] finding that single headed households had negative effects on child health. The implication of these results is that, since the ever married and polygynous categories account for a reasonably high proportion (20%) of the marriages in Zambia and these category having higher odds of underweight children compared to monogamous marriages, the country is likely to have a number of people with diminished cognitive and physical development, reduced productive capacity and generally poor health as stated by Brown [25].

The study established that family structure was not the only variable explaining early child health in the adjusted model. The results revealed that, the mother's nutrition status was also a proximate determinant of children's health. According to the findings, mothers who were underweight at birth of their child, had higher odds of having underweight children compared to mothers who were not underweight. This result is consistent to the finding by Jawaregowda and Angadi [27]. This could be attributed to poor knowledge and understanding of micronutrient rich foods to meet theirs and their children's nutritional requirements. According to the ZDHS 2013-

**TABLE 3. Unadjusted and adjusted odd ratios of the factors associated with early child health**

VARIABLES	MODEL 1 (UNADJUSTED)		MODEL 2 (ADJUSTED)	
	Odds Ratio	Confidence Interval	Odds Ratio	Confidence Interval
<b>Family Structure</b>				
Single	1.0	0.8 - 1.3	1.0	0.8 - 1.3
Monogamy	Ref.		Ref.	
Polygyny	1.2	1.0 - 1.4	1.1*	0.9 - 1.4
Ever Married	1.2*	1.0 - 1.5	1.2*	1.0 - 1.5
<b>Mothers Nutrition Status</b>				
Not Underweight			Ref.	
Underweight			5.3***	4.5 - 6.2
<b>Place of Residence</b>				
Urban			Ref.	
Rural			1.3**	1.1 - 1.5
<b>Gender of Child</b>				
Male			Ref.	
Female			0.8***	0.7 - 0.9
<b>Mothers age at Birth of Child</b>				
<20			Ref.	
20 - 34			0.8	0.7 - 1.0
35+			0.8	0.6 - 1.0
<b>Vaccination</b>				
Not Vaccinated			Ref.	
Vaccinated			1.4*	1.0 - 1.9
<b>Breastfeeding</b>				
Never Breastfed			Ref.	
<=2			0.5*	0.3 - 0.9
>2			0.8	0.4 - 1.4
<b>Antenatal Care Visits</b>				
<4			Ref.	
4+			0.8**	0.7 - 0.9
<b>Mothers Employment Status</b>				
Working			1.1	0.9 - 1.3
Not Working			Ref.	
Constant			0.1***	0.0 - 0.2

\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ ,

Ref. = Reference Category

14, a woman with poor nutritional status, as indicated by a low body mass index (BMI), short stature, anaemia, or other micronutrient deficiencies, has a greater risk of obstructed labour; of having a baby with a low birth weight; of producing low-quality breast milk; of death from postpartum haemorrhage; and of morbidity for both herself and her baby [6]. Therefore, the results imply that, mothers with poor nutrition pose great danger to the

health status of the child. In addition, the study established that the mother's employment status, although significant in explaining the variations in early child health in the bivariate analysis, was found not to be significant in the multivariate analysis. The reason the result could have been this way was, in Zambia, like many developing countries, the primary role of women especially in rural areas is child care and housekeeping as opposed to engaging

in gainful employment. However, the importance of maternal employment cannot be downplayed as it benefits children's health by increasing parent's ability to purchase high-quality foods, housing, and medical care. This finding was in line with the result found by Mejia [20].

In terms of place of residence, the results found that children born to mothers in rural areas had significantly higher odds of being underweight (poor health) compared to those born to mothers in urban areas. This result could be explained by the fact that, rural areas have few health facilities which provide adequate pre and post-natal care services despite having the highest Total Fertility Rates (TFR) in the country (6.6 versus 3.7 in urban areas) [6]. As a result, they are deprived of the essential health care that would improve the health of both the mother and the child. The implication is that, rural areas will have a large number of people with generally poor health and low productive capacity. The results also found gender of the child to be an important determinant of child health, with female children being less likely to be chronically or acutely undernourished compared to their male counterparts. Similar results were demonstrated by Rothenberg and Varga [28] and Radhakrishna and Ravi [29], in which they found that male children had higher odds of being underweight (poor health) compared to their female counterparts. This result, can be explained from a behavioural perspective. Svedberg [30] asserted that, the slight anthropometric advantage shown by girls, women, or both in many countries may suggest a historical pattern of preferential treatment of females due to the high value placed on women's agriculture labour. Another explanation for this result could be from a biological perspective as suggested by researchers from the University of Southern California who came to a conclusion that baby boys are more vulnerable because of their bigger size which raises the risk of a difficult birth and are also more likely to be born prematurely as they tend to have a weaker immune systems [31].

The results also revealed that children who received vaccination had higher odds of experiencing chronic and acute undernourishment compared to those that did not. Although vaccination status of the children was found not to be significant in the bivariate analysis, the opposite was true in the multivariate analysis. It is expected that childhood vaccination may protect children's health, however, the result from this study was adverse and contradictory to the findings from a study by Wamani et. al. [32], in which the authors found that children who had been fully vaccinated had better health outcomes than unvaccinated or partially vaccinated children. Children usually develop illness around the time they just receive vaccination, which is also a time of life when the risk of sudden infant death is rife, therefore, the possible explanation to this adverse result could have been the timing of the data collection. Data collection for the 2013-14 ZDHS commenced within a month after the Child Health Week, which is a bi-annual programme launched in 2001 by the government targeting

all children below 5 years with lifesaving interventions including immunizations, deworming and Vitamin A. As such, the collection of anthropometric data after this period may have led to the contrasting results of this study as they may not accurately represent the true picture prevailing in the country. The implication of this result is that it may lead to women absconding or avoiding vaccination of their children which is likely to have an effect on child mortality. Breastfeeding is yet another variable that was found to be significant in explaining the variations in early child health, with children who were breastfed up to two years of age having lower odds of chronic and acute undernourishment compared to those who were never breastfed. This result coincides with the results by Mejia [20], who found that breastfeeding for up to two years correlates positively with child health. The importance of this result is that it affirms the WHO recommendation of continued breastfeeding for up to two years [21], and shows the effectiveness of the child health interventions such as, the early initiation of breastfeeding programme [16].

Finally, the study found that children whose mothers attended four or more WHO recommended ANC visits had lower odds of being underweight (poor health). This result is in conformity with the result by Mejia [20] who found that mothers attending fewer antenatal care visits had a negative impact on child health. This is an important result because according to the ZDHS 2013-14 [6], increased antenatal is likely to improve early neonatal survival and newborn care as mothers are given the necessary information on how to take care of their newborns. This result implies that more women are likely to attend ANC as it increases the chances of survival of their children.

### Significance of the study

Firstly, since children depend largely upon their families to meet their basic needs, research on the home environment or family structure in which children are most at risk of adverse health outcomes provides useful information for programs aimed at reducing child mortality and generally improving the health status of children. Secondly, given that early child health is associated with later course of life outcomes, among them, long-term health and children's well-being, this study provides knowledge of how family structure leads to variations in early child health. Lastly, the study intends to bridge the knowledge gap in Zambia, in the area of family structure and child health. In short the research adds to the non-existent literature on this subject in Zambia.

The study used cross-sectional data and as such we cannot claim to explore the relationship between marriage type and child health for a specific mother, child, or household over time nor can we infer causality between the variables. The other limitation of using cross-sectional data is that, it does not fully capture the intrinsically dynamic quality of family life.



## CONCLUSION

In line with the empirical studies of the effect of family structure on early child health, this study concludes that family structure which was the main explanatory variable has a statistically significant effect on early child health outcomes. The study also establishes that, there is heterogeneity in the health outcomes of the children from polygynous and the ever married categories after controlling for the effects of family, maternal & child care and economic characteristics. With a relatively high proportion (20%) of marriages comprising ever married and polygynous marriages and these category having higher odds of underweight children compared to monogamous marriages, the country is likely to have a number of people suffering from diminished cognitive and physical development, reduced productive capacity and generally poor health.

The mother's nutrition status, place of residence, gender of child, breastfeeding, number of antenatal visits and mother's employment status are also among the other factors associated with the health of children under five in Zambia. Further, the study establishes that despite antenatal care visits being low, it is a very important determinant of early child health in Zambia.

## Policy Recommendations

Early childhood is a critical time period for establishing the solid foundations essential for children's long-term health and well-being. In this regard, it would be important to reduce to the greatest extent possible the exposure of children to adverse health. This study has established that a seventh of the children of interviewed women were underweight (poor health) and family structure was found to be a significant factor in explaining these variations. It would therefore, be important for policy makers to initiate programmes aimed at sensitizing people on the adverse effects of polygyny, divorce and separation on early child health outcomes. Further, policies should also be implemented targeting mothers on the importance of attending more than four antenatal care visits and breastfeeding their children up to at least two years of age. There is also a need for policy makers to introduce nutrition interventions in addition to the current pre and post-natal programs targeting pregnant women and mothers as their nutrition status is cardinal to the health of the child and also essential if the country is to achieve the Sustainable Development Goals of ending preventable deaths of newborns and children under 5 years of age by 2030.

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## Conflict of interest

The author declares that there were no conflicts of interest in this study.

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**APPENDIX 1**

	Family Structure	Mother Nutrition Status	Residence	Sex of Child	Mothers age at Birth of Child	Vaccination	Breastfeeding	Antenatal Care Visits	Mothers Employment status	Underweight
<b>Family Structure</b>	1.0000									
<b>Mother Nutrition status</b>	0.0052	1.0000								
	0.5794									
<b>Residence</b>	0.0887*	-0.0064	1.0000							
	0.0000	0.4946								
<b>Sex of Child</b>	-0.0144	0.0307*	-0.0019	1.0000						
	0.0095	0.0010	0.8244							
<b>Mothers age at Birth of Child</b>	0.1922*	0.0272*	0.0555*	0.0018	1.0000					
	0.0000	0.0037	0.0000	0.8337						
<b>Vaccination</b>	-0.0365*	-0.0278*	-0.0415*	0.0214*	0.0064	1.0000				
	0.0000	0.0030	0.0000	0.0129	0.4558					
<b>Breastfeeding</b>	0.0179*	0.0015	0.0793*	0.0034	0.0649*	0.1672*	1.0000			
	0.0434	0.8696	0.0000	0.7013	0.0000	0.0000				
<b>Antenatal Care Visits</b>	-0.0215*	-0.0305*	-0.0403*	0.0001	0.0681*	0.0866*	0.0266*	1.0000		
	0.0128	0.0011	0.0000	0.9894	0.0000	0.0000	0.0028			
<b>Mothers Employment status</b>	0.1065*	0.0262*	0.0616*	0.0118	0.1538*	0.0248*	0.0279*	-0.0026	1.0000	
	0.0000	0.0052	0.0000	0.1715	0.0000	0.0042	0.0017	0.7593		
<b>Underweight</b>	0.0330*	0.2565*	0.0347*	-0.0390*	-0.0167	0.0048	0.0211*	-0.0448*	0.0255*	1.0000
	0.0004	0.0000	0.0002	0.0000	0.0754	0.6072	0.0252	0.0000	0.0066	