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Effect of Health Extension Service on Under-Five Child Mortality and Determinants of Under-Five Child Mortality in Derra District, Oromia Regional State, Ethiopia

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ABSTRACT

Under five-child mortality is the highest in Ethiopia even though it decreased steadily in last two decades. Hence, this study aimed to identify the risk factors and effects of Health Extension Service on under-five child mortality in Derra district, Ethiopia. The study used a random sample of 446 mothers from the district and analyzed. One-fourth (23.5%) of mothers experienced at least one under-five child mortality in the last thirteen years and the propensity score analysis also indicated that utilizing and being model in HEP reduced under five child mortality by 29.84% and 15.71%, respectively. The Poisson regression model identified that Kebeles, being model in HEP, mother educational level, mother age at first birth, source of drinking water and Place of child delivery were significant risk factors of under-five child mortality per mother. Hence, the health sectors and district health offices have to work on a health extension program to increase the community awareness of basic preventive and promotive health service, and minimize risk factors of under-five child mortality.

Key words: Health Extension, Model Family, Propensity score analysis, Poisson regression, Under-five child mortality

Background

Mortality in childhood around the world shows a remarkable progress in child survival and millions of children have better survival chances than in 1990. Specifically, under-five mortality rate fell to 41 deaths per 1,000 live births in 2016 from 93 in 1990 a 56 percent reduction. In all countries, the under-five mortality rate reduced by more than two-thirds. Among those countries, 28 low and lower-middle-income countries achieved a two-thirds or more reduction in the under-five mortality rate since 1990. The total number of under-five deaths dropped to 5.6 (5.3, 5.8) million in 2016 from 12.6 (12.4, 12.8) million in 1990. On average, 15,000 children died every day in 2016, compared to 34,000 in 1990 (UNIGME (UN Inter-Group for Child Mortality Estimation), 2017). Despite the progress, millions of children die due to preventable or treatable disease and lack of limited access of basic health intervention such as vaccination, nutrition, clean water, sanitation and medical treatment of infectious disease (UNIGME (UN Inter-Group for Child Mortality Estimation), 2015, 2017).

Globally, under-five deaths unevenly distribute and about 80 per cent of under-five deaths occur in two regions, sub-Saharan Africa and Southern Asia, and about half the worldwide under five-child death occurred in six countries namely, India, Nigeria, Pakistan, the Democratic Republic of the Congo, Ethiopia and China. Sub-Saharan Africa remains the region with the highest under-five mortality rate in the world, and had an average of 79 deaths per 1,000 live births with global share of under-five child mortality of 49.2 percent in 2016 (UNIGME (UN Inter-Group for Child Mortality Estimation), 2017).

The current death toll of Ethiopia (58 death/1,000) is relatively higher as compared to neighboring countries such as Kenya (49 deaths/1,000), Eritrea (45 deaths/1,000), and Rwanda (39 deaths /1,000 live births) in 2016. However, Ethiopia has registered a sound reduction of

under-five death rate between 1990 and 2016 from 203 deaths per 1,000 live births to 58 deaths per 1,000 live births(UNIGME(UN Inter-Group for Child Mortality Estimation), 2017). Even though the death toll of Ethiopia is relatively higher than neighboring countries, it achieved the millennium development goal (59 deaths per 1000 live birth) of child mortality before 2015.

Diseases that are readily preventable or treatable with proven, cost-effective interventions cause most under-five deaths. Infectious diseases and neonatal complications are responsible for the vast majority of under-five deaths globally(UNIGME(UN Inter-Group for Child Mortality Estimation), 2017) . Ethiopia has launched an innovative community-based health extension services program in 2003 at national level to improve access and utilization of preventive, promotive, and basic curative services especially for children and mothers (Federal Ministry of Health Ethiopia, 2005). Impact of health extension service on child and maternal mortality revealed significantly influence child health indicators, which could be attributable such as DPT3, BCG, OPV3, measles and full immunization to the presence of the HEP in the districts in Tigray regional state of Ethiopia(Amare, 2013; Banteyerga, 2011).

The latest Ethiopia demographic and health survey (EDHS) indicate, under-five child mortality has significantly declined from 166 deaths per 1,000 live births in 2011 EDHS to 67 death per 1000 live birth (one in every 15 children does not survive to their fifth birthday) in 2016 EDHS. Based the regional state of Ethiopia, under five-child mortality run between 39 per 1000 in Addis Ababa to 125 per 1000 in Afar while it is 79 per 1000 live birth (1 in every 13 children does not survive to their fifth birthday) in Oromia regional state of Ethiopia(Central Statistical Agency (CSA) [Ethiopia] and ICF., 2017). Currently, the all childhood mortality of Ethiopia decreased over time and the under 5-child mortality was 55

per 1000 live birth (Ethiopian Public Health Institute(EPHI) [Ethiopia] and ICF, 2019). Even if Ethiopian under five-child mortality declined progressively, the death rate is the highest. Hence, the study aimed to identify the major risk factors and effects of Health extension Program on under five-child survival in Derra district, Oromia regional state of Ethiopia.

RESEARCH METHODS

Descriptions of Study Area and Population

The study conducted in Derra district of North Shewa Zone of Oromia regional state, which is 213 km far from Addis Ababa, the capital city of Ethiopia. The district is located between 12° 92' - 13° 12' N latitude and 34° 40' - 35° 80' E longitude and elevation from 1798 m to 2118 m above sea level and its administrative center is Gundo Meskel(Central Statistical Agency [Ethiopia] and and ICF International, 2012). The district has 34 kebeles and a total populations of 223,218 among these 115,442 are male and 117,778 are female (Federal Democratic Republic of Ethiopia Central Statistical Agency, 2013).

The Study Design

A cross-sectional study was conducted on randomly selected household from December 10, 2017-January 20, 2018) who fulfill the inclusion criteria of mothers who aged 15-49 and living in the area more than one year and have at least one under five child.

Sampling Techniques

Two-stage sampling technique was used to select the samples. At the first stage, ten kebeles were selected out of 34 kebeles by using simple random sampling techniques. The ten sampled kebeles were Dembi Birjie, Kabi Gololcha, Ada'a Melke, Cheka, Keraba, Becho Wajitu, Makefta Jiru, Gebro, Weglo Mika'el and Beyo Nono. At the second stage, household/women/ who fulfilled the inclusion criteria selected systematically.

Sample size determination

Using the pilot survey, the standard deviation of under-five mortality is 0.384, the total number of Household in selected kebeles $N = 9584$, significance level $\alpha = 0.05$, margin of error $d = 0.05$ and design effect $= 2.0$ (Turner, 2003). Then the sample size computed using (Cochran and Wiley, 1977) formula as: $n = \tilde{n} * deff$

Where: - n is total sample size for clustered

\tilde{n} Is the sample size for simple random samples and defined as:

$$\tilde{n} = \frac{n_0}{1 + \frac{n_0}{N}}$$

Where: - $n_0 = \frac{(Z_{\alpha/2})^2 S^2}{d^2} = \frac{(1.96)^2 0.384^2}{0.05^2} = 226.49 = 227$

$$n = \frac{227}{1 + \frac{227}{9584}} = 222.7 = 223 * 2.0 = 446$$

Then, the overall sample size is 446

Variable of interest in the study

Response variable: Under five-child Mortality:- is discrete variable and takes counted value of under-five year child deaths each mother has experienced in the last thirteen years (2004/5 to 2017/8) and Y_i takes count values, $y_i = 0, 1, 2 \dots$

Explanatory variables: Are variables these expected to have an effect on under-five child mortality per mother. These were ages of mothers, mother educational level, mother age at first birth, source of drinking water, place of last child birth, kebeles, utilization of HEP and being model in HEP.

Methods of Data Analysis

The study used descriptive statistics (percentage, mean, standard deviations and bar chart) and inferential statistics (propensity score analysis and Poisson regression) using Stata-14 software.

Propensity Score Analysis

Propensity is an appropriate measure of the conditional probability of receiving treatment, the scores used to estimate the causal effects of the treatment. The goal of propensity score analysis is to generate an estimate of the causal effect of the program or policy on its intended outcomes by matching on covariate patterns as (Rosenbaum et al., 1987) stated.

Let Y the outcome variable (under-five child death per mother), T be the treatment variables (Being model in HEP and Utilizing HEP) ($T=1$ treated, $T=0$ untreated) and X is observable covariate, the probability of receiving the treatment conditional on the covariate is: $P(x_i) = P_r(T_i = 1/X_i = x_i)$ and its Average treatment effect for treated is: $ATT = E(Y_i^1 - Y_i^0 / T = 1)$

Poisson regression model

The Poisson regression model is a regression model for count data where the dependent variable is count of non-negative values and the independent variable may be dichotomous, polychromous, or continuous; categorical factors were represented by dummy variables (Cameron and Trivedi, 1998).

Let, Y_1, Y_2, \dots, Y_n be dependent random response variables with Y_i denote the number of under-five child mortality for i^{th} mother within a given time or exposure (number of children) with mean parameter λ_i and X_i denote a vector of explanatory variables for the i^{th} mother. Poisson regression model has Poisson distribution with the conditional mean μ_i

$(Y_i \sim \text{Poisson}(\lambda_i), i = 1, 2, \dots, n)$ on a given vector X_i for case i . Then the Poisson equation of the model with rate parameter λ_i (Cameron and Trivedi, 1998; Cullagh and J.A Nelder, 1989) is given by:

$$p(Y_i = y_i) = \frac{e^{-\lambda_i} \lambda_i^{y_i}}{y_i!}, \lambda_i > 0 \text{ and } y_i = 0, 1, 2, \dots$$

Where:- mean and variance are equal, $E(Y_i) = \text{Var}(Y_i) = \lambda_i$. Equality of the mean with the variance is the equi-dispersion property of the Poisson model.

The mean of the response variable λ_i related with the linear predictor through the link function. Let X be $n \times (k + 1)$ matrix of explanatory variables. The relationship between Y_i and i^{th} row vector of X , linked by $g(\lambda_i)$, is the canonical link function given by (Cameron and Trivedi, 1998). $E(Y_i) = \lambda_i = N_i \exp(X_i' \beta)$

Where:- $X_i = (x_{i0}, x_{i1}, \dots, x_{ik})'$ is the i^{th} row of covariate matrix, ($x_{i0} = 1$), $\beta = (\beta_0, \beta_1, \dots, \beta_k)'$ is unknown $(k+1)$ dimensional vector of regression parameters and N_i is an exposure variable (number of children a mother had) whereas its $\ln(N_i)$ give as the offset variable. The log of the mean λ_i assumed a linear function of the independent variables, that is,

$$\ln(\lambda_i) = \ln(N_i) + \beta_0 + \sum_{i=1}^k \beta_i X_i$$

Dispersion and model adequacy test

To check over-dispersion and compare adequacy of the Poisson model over negative binomial model, deviance test, Pearson test and dispersion index were used. The Overall test of regression model fit and individual test were done using deviance statistics, log likelihood ratio statistic and t-test as stated by (Cullagh and J.A Nelder, 1989).

RESULTS

Distribution of under-five child mortality

The percentage and the pattern of under five-child mortality per mother of the sampled mothers experienced during the past thirteen years (2004/5 to 2017/8) in Figure 1. About 341(76.5%) of the mother had not encountered under five-child mortality, whereas 105 (23.5%) of mothers experienced at least one under-five child death (19.1%, 3.5% and 0.9% of these mothers experienced one, two and three under-five child death, respectively). The patterns of under-five child death showed highly skewed to the right with excess zeros and mean 0.29.

Under five-child mortality vs HEP Service

Based on the HEP utilization of the households, 92.4% of those who utilized HEP did not face under five-child mortality and 7.5% (4.9%, 2.2% and 0.5% of them faced one, two and three under five-child mortality, respectively) of them encountered under five-child mortality. Of those who did not utilize HEP, 65.3% of them did not face under five child mortality and 34.7% (29.0%, 4.6% and 1.1% of them faced one, two and three under five-child mortality, respectively) of them encountered at least one under five-child mortality. Those who did not utilize HEP were more likely to face under five-child mortality than those who utilize it as shown in Figure 2.

Figure 3 showed that 89.7% of those who were modeled in HEP did not face under five-child mortality and 10.2% (8.4%, 1.9% and 0.0% of them faced one, two and three under five-child mortality, respectively) of them encountered under five-child mortality. While 65.3% of those who did not model in HEP did not face under 5 child mortality and 30.7% (24.8%, 4.5% and 1.4% of them faced one, two and three under five-child mortality,

respectively) of them encountered at least one under five-child mortality. Mothers who were from model in HEP household were less likely to face under five-child mortality than those who were not model.

Under five child death per mother vs Demographic and Socioeconomic character

Table 1 showed that frequency distribution of under-five child mortality per mother and percentage across the different demographic and socioeconomic characteristics. The percentage of under-five child mortality runs between 7.28 in Gebro to 42.86 in Becho Wajitu kebeles. Whereas based on age, under-five child mortality was the highest (27.33%) for those mothers who aged (35-49) and the lowest (7.85%) for those who aged 25-34.

Based on education level, mothers who had no education experienced the highest percentage (31.56%) and these who had secondary and above education, experienced the lowest (6.12%) under five-child mortality. Similarly, mothers who gave their first birth before age 20 were more likely in experiencing under five-child mortality (29.39%) than those who gave their first birth after age 20 (12.43%).

Similarly, based on source of drinking water, those households who use non-piped source of drinking water had experienced higher percentages of under five-child mortality (29.19%) than those who had used piped source of drinking water (8.87%). Likewise, those who delivered their recent child at home faced higher percentage of under five-child mortality (27.49%) than those who delivered at health centers (8.11%).

Lastly, Mother whose occupation was farming faced higher percentages of under five-child mortality (28.32%) while Housewife and others faced and 13.76% and 17.33% under five-child mortality, respectively.

Effects of HEP on under-five child mortality: A propensity Score Analysis

Effects of Health Extension program on under five-child mortality per mothers estimated using neighbor (5) matching algorithm and presented in Table 2. On average, being a model in the HEP reduce under-five child mortality per mothers by 0.1571 relative to those who are not model and HEP utilization also reduce under five child mortality per mother by 0.2984.

Determinants of under-five child mortality: A Poisson regression analysis

Goodness of fit and test for over dispersion

Table 3 showed that Poisson and negative binomial goodness of fit and over dispersion test. The AIC and BIC values for the Poisson regression model is smaller than the negative binomial model which indicates that the Poisson regression model is better than the negative binomial model for this data set. In addition, using the formal statistical test of dispersion parameter, $H_0: \alpha = 0$ vs $H_1: \alpha > 0$ indicates that the null hypothesis is not rejected because p-value $0.12 > 0.05$ and conclude that the Poisson regression model better fits this data.

Determinants of under-five child mortality: A Poisson regression

The Poisson regression result revealed that Kebeles, mother's education level, mother age at first birth, being model family, HEP utilization, Source of drinking water and place of child delivery were significantly affected under-five child mortality per mother at 5% level of significance as shown in Table 4 and interpreted in terms of its incidence rate ratios.

Place of residence (kebeles) such as Ada'a Melke, Dembi Birjje, Makefta Jiru, Becho Wajitu, Beyo Nono, Weglo Mikael and Keraba were significantly affected under five-child mortality per mother at 5% level of significance as shown in Table 4. The expected rate ratio of under- five child mortality per mother for mothers who were living in Ada'a Melke, Dembi

Birjie, Makefta Jiru, Becho Wajitu, Beyo Nono, Weglo Mikael and Keraba were 3.99, 2.63, 2.97, 4.68, 3.95, 2.72 and 5.72 time higher than those who were living in Gebro kebele, respectively, holding other variables constant.

The expected rate ratios of under-five child mortality per mother for those mothers who aged less than 20 years old at their first childbirth were 1.87 times higher as compared to those who aged greater than 20 years at their first childbirth, holding all other factors constant.

The expected rate ratios of under-five child mortality per mother for those mothers who had primary education compared to who had no education 0.586(1-.414) times less as compared to those who had no education, holding all other factors constant.

The expected rate ratios of under-five child mortality per mother for those mothers who were not a model were 1.79 times higher as compared to those who were model in HEP, holding all other factors constant. As compared with those mothers who did not utilize to utilize HEP, the expected rate ratios of under five-child mortality per mother was 2.25 times higher, holding all other factors constant.

The expected rate ratio of under-five child mortality per mother for those mothers who used non-piped water for drinking was 2.36 times higher than those who used piped water for drinking, holding other factors constant.

The expected rate ratio of under-five child mortality per mother for those mothers who delivered their recent child at home was 2.48 times higher than those who delivered at health centers, holding other factors constant.

Discussion

In this study, propensity score analysis and Poisson regression were used to investigate and identify the effect of HEP and risk factors of under-five child mortality in the district. The result confirms that HEP significantly reduce under five-child death, and the risk factors identified and discussed as below:

Health extension program (HEP) service reduce under five child mortality effectively in the district which is in line with study (Amare, 2013; Banteyerga, 2011) which assess impact of health extension service on child, maternal mortality and child health indicators in Tigray region and improving health through community involvement. HEP reduce the under-five child mortality by enhancing community's child health indicators service use and effective community participation in the basic and preventive approach of community involvement.

Studies showed that place of residence is another determinant of under-five child mortality per mother, those who live around urban and suburban is less likely to experience under-five child mortality than those who in rural area. In this study, those who lived in different kebeles of the district had different rate/risk /of under five-child mortalities, which is in line with previous studies of (Adedini, 2013; Bedada, 2017; Bedane and Asena, 2016; Gebretsadik and Gabreyohannes, 2016; Lamichhane et al., 2017; Schoeps et al., 2011) that place of residence influence under five child mortality.

Education level of mother's is an important predictor of under-five child mortality, in which under-five child mortality per mother decrease as education level increase. Studies showed that the lower maternal education level, the higher in experiencing under-five child mortality per mother. Educated mothers expected to have a higher awareness in nourishing

and treating with capable health care service for their children than those who had no education. This finding showed, as education level of mothers' increase, the rate of experiencing U5M per mother decrease. Similar findings were found (Alem et al., 2012; Amare, 2013; Angela and Uju, 2015; Ayele and Zewotir, 2016; Bedada, 2017; Gebretsadik and Gabreyohannes, 2016; Guptat, 1990; Muluye and Wencheke, 2012; Shifa et al., 2018) that educated mothers experienced less under-five child mortality than those not educated mothers.

Different studies revealed that mothers' age at first birth was a determinant for under five-child mortality. Children born to young mothers (aged less than 20) are more likely to die before age five than those born to older mothers (aged greater than 20). This finding showed that children born to young mother was more likely to die before age five than those born to older mothers were. , Similar findings by(Ayele and Zewotir, 2016; Bedada, 2017; Bedane and Asena, 2016; Berhie and Yirtaw, 2017; Mondal et al., 2009) obtained that younger mothers experienced more under-five child mortality than older mothers did due to younger mother were less capable in nourishing and treating their child.

Model family in HEP is a family who implement about 75% of primary health care services. Since HEP is a preventive and curative health service, especially for mothers and children, being model in a HEP decrease the rate of under-five child mortality per mothers, as it increase awareness about the basic preventive and curative health services. In this study, those mothers who were model in HEP were less likely in experiencing under-five child mortality than those who were non model in HEP, which is in line with (Amare, 2013; Banteyerga, 2011) finding that being model family in HEP improved the survival of children.

Place of delivery was significantly affect under-five child mortality per mother. Children, born at health centers have less risk of death than those who born at home due the

accessibility of child delivery service at health centers. In this study, those child who delivered at home were more likely to the risk of death than who delivered at health centers and it is in line with previous studies(Buwembo, 2010; Lamichhane et al., 2017; O. et al., 2012).

Utilizing HEP is another predictor of under five-child mortality per mother. HEP implemented to enhance the awareness of health care service for the community, especially for mothers and children. Hence, those who utilized HEP were expected to aware about the risk factors of under five-child death and take safety measures. In this finding, those mothers who did not utilize HEP were more likely to experience under-five child mortality than those who utilized HEP, which is consistent with (Amare, 2013) finding that HEP implementation significantly improved the health status of children in Tigray Region.

Source of drinking water also predictor of under five-child mortality, those who used non-piped drinking water were more likely to experience under-five child mortality than those who used piped water. This is due to non-piped drinking water was more likely to expose to water born disease like diarrhea and others. In this study, the rate of under-five child mortality per mother was higher for those mothers who used non-piped drinking water, which is in line with the previous studies of (Alem et al., 2012; Gebretsadik and Gabreyohannes, 2016; Khan and Timmins, 2008; Muluye and Wencheke, 2012).

Conclusion and Recommendation

The purpose of this study was to investigate effects of Health extension service and under-five child mortality determinants among household in Derra district, Oromia, Ethiopia based on a sample of 446 mothers. The study applied the descriptive and inferential (propensity analysis and Poisson regression) statistics to achieve the objective the study.

The descriptive result revealed that among a sample of 446 mothers, 105 (23.5%) of them faced at least one under five-child mortality in the past thirteen years, and health extension service use and being model in HEP also significantly reduce under five child mortality per mother.

The Poisson regression analysis showed that such as kebeles, Mother Education level, mothers age at their first birth, being model in HEP, Utilizing HEP, place of child delivery, and Source of drinking water were statistically influenced under five-child mortality per mother in the district at the 5 % level of significance. Hence, the government, the regional state and district health offices have to work on a health extension program to enhance the community awareness of basic preventive and promotive health service and to minimize risk factors of under-five child mortality.

Abbreviations

AIC: Akaike Information Criteria, BIC: Bayesian Information Criterion HEP: Health Extension Program, HH: Household, IRR: Incidence Rate Ratio, U5D: Under five-child death

Funding

Not applicable

Availability of Data and Materials

The data set used and/ or analyzed during the current study is available from the corresponding author on reasonable request.

Ethics approval and consent to participate

Upon the proposal approval, formal letter of cooperation submitted to the district health office and the author got permission to do the study. Lastly, the data enumerator collects the data

from the participant by informing the formal consent and getting their willingness to participate in the study.

Consent for publication

Not applicable

Competing Interest

The author declares that there is no competing interest.

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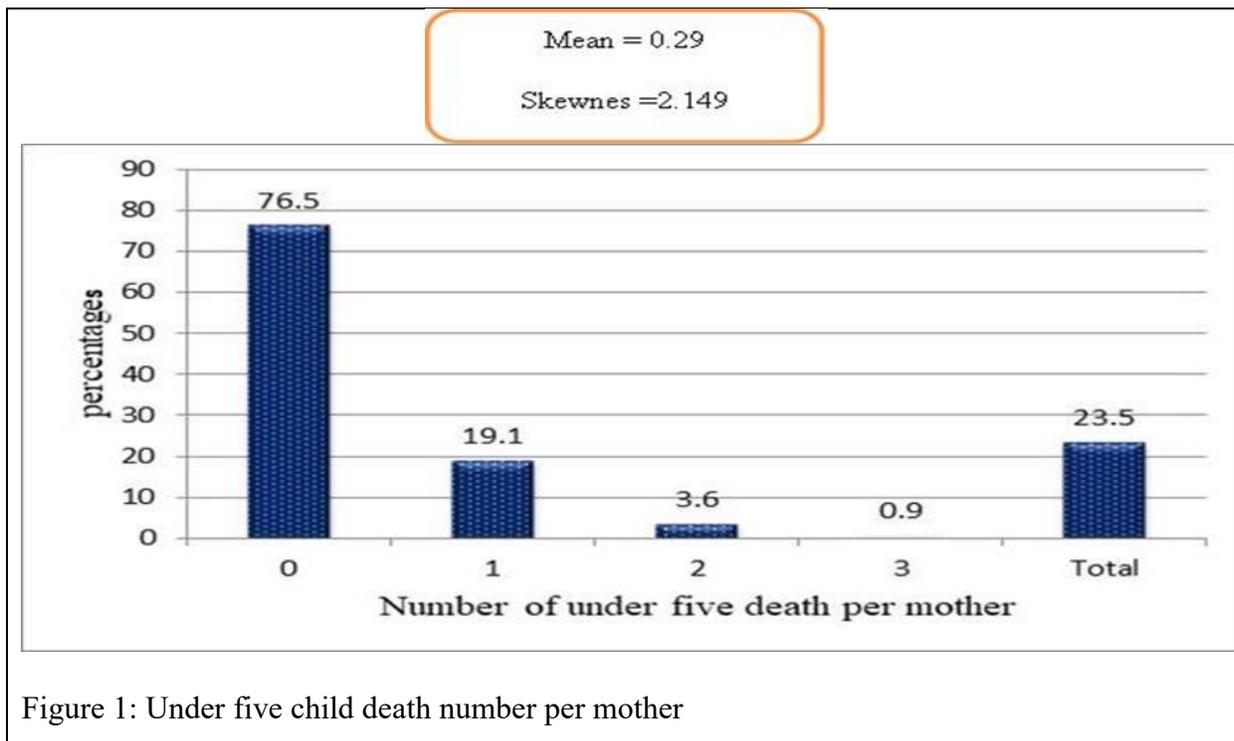
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Figure



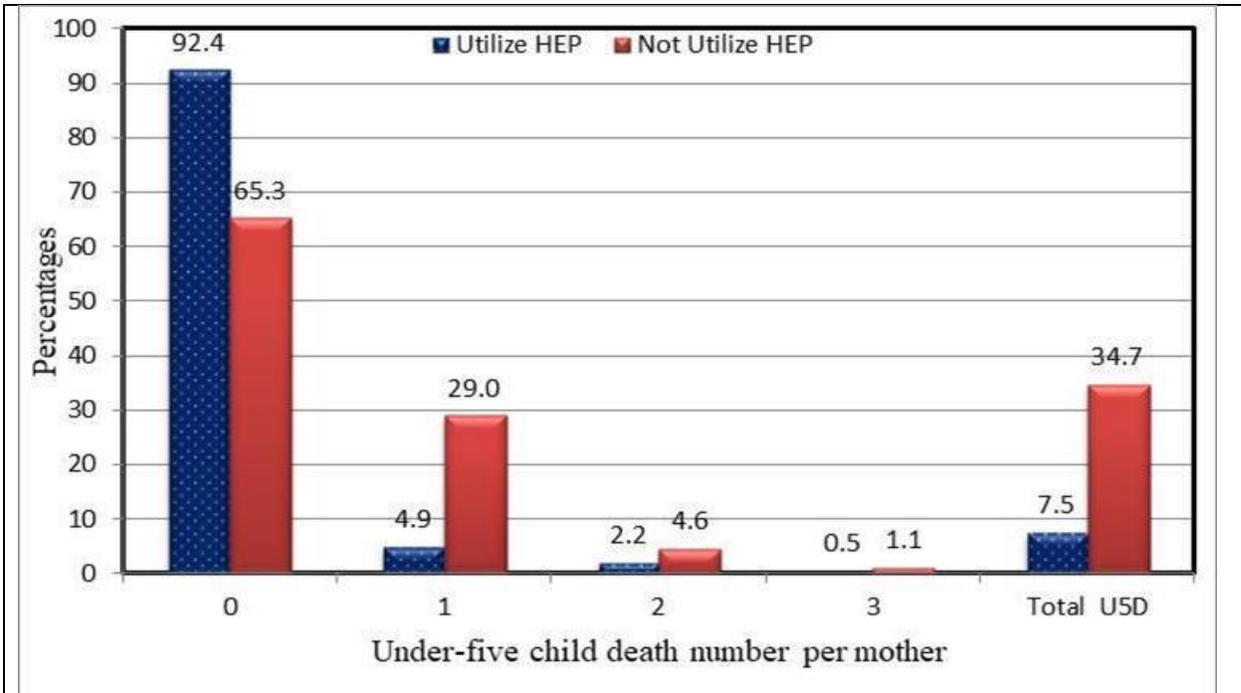


Figure 2: Under five child mortality per mother over HEP utilization

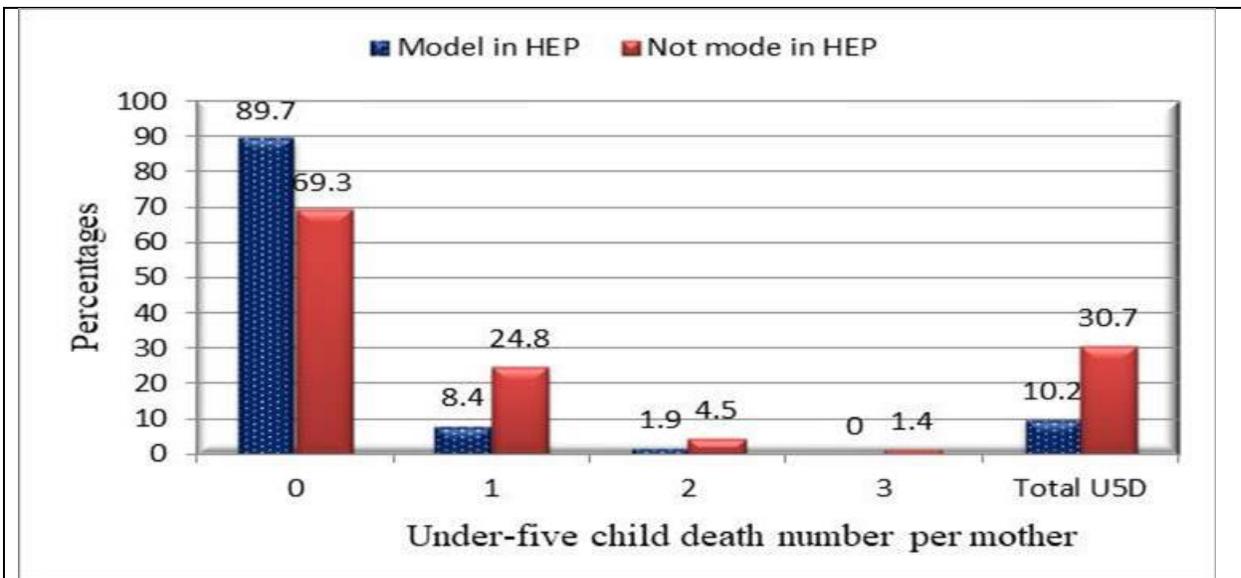


Figure 3: Under five child mortality per mother over Being model

Tables

Table 1: Descriptive results of the number of under-five child mortality

Variables	Categories	Frequency of U5 mortality				% of U5D per mother
		0	1	2	3	
Kebeles	Kabi Gololcha	61	8	1	0	12.86
	Ada'a Melke	39	6	2	1	18.75
	Dembi Birjie	28	14	0	0	33.33
	Makefta Jiru	48	9	7	0	25.00
	Becho Wajitu	19	7	3	1	36.67
	Beyo Nono	20	14	0	1	42.86
	Weglo Mikael	27	10	1	0	27.03
	Keraba	24	11	2	0	35.14
	Gebro	51	3	0	1	7.28
	Cheka	24	3	0	0	11.11
Mother age	15-24	47	3	1	0	7.85
	25-34	185	54	4	2	24.49
	35-49	109	28	11	2	27.33
Mother education	No education	206	75	16	4	31.56
	Primary	89	7	0	0	7.29
	2 ^{ndary} & above	46	3	0	0	6.12
Mother age at first birth	< 20year	207	66	16	4	29.35
	> 20 year	134	19	0	0	12.43
Drinking water	Piped water	113	11	0	0	8.87
	Non piped water	228	74	16	4	29.19
Mother Occupation	Farmer	205	68	10	3	28.32
	Housewife	94	12	3	0	13.76
	Others	43	5	3	1	17.31
Place of delivery	At Home	239	77	15	4	27.46
	At health center	102	8	1	0	8.11

Table 2: Effects of HEP on under-five child mortality using neighbor (5) matching

Outcome (Under-five child death per mom)	ATT				
	Treated	Control	Difference	S.E	T. Test
Being model in HEP	0.12338	0.28052	-0.15714	0.06464	-2.43*
Utilization of HEP	0.38709	0.6854	-0.2984	0.15108	-1.97*

(* significant at 5% level of significance)

Table 3: Goodness of fit between Poisson and negative binomial models

Criteria	Poisson model	Negative binomial model
AIC	515.82	517.69
BIC	581.39	587.399

Likelihood ratio test for dispersion $\alpha = 0$ vs not, $\chi^2 = 1.38$, p -value = 0.12

Table 4: Poisson regression model of under five-child mortality per mother

Variables/categories	IRR	S.E	Z	P values	95% CI of IRR	
					Lower	Upper
Kebeles(Ref: Gebro)						
Kabi Gololcha	1.483	.769	.76	.447	.536	4.102
Ada'a Melke	3.998	2.001	2.77	.006*	1.498	10.66
Dembi Birjie	2.638	1.291	1.98	.047*	1.011	6.888
Makefta Jiru	2.971	1.369	2.36	.018*	1.204	7.330
Becho Wajitu	4.689	2.251	3.21	.001**	1.822	12.01
Beyo Nono	3.956	1.888	2.88	.004**	1.555	10.07
Weglo Mika'el	2.714	1.362	1.99	.047*	1.014	7.258
Keraba	5.729	2.837	3.53	.000**	2.170	15.11
Cheka	2.275	1.64	1.14	.254	.553	9.349
Mage (Ref: >20 years)						
Less than 20 years	1.817	.470	2.31	.0021*	1.094	3.018
MotherEdu(Ref:Not educated)						
Primary	.414	.166	-2.20	.028*	.188	.909
2 ^{ndary} and above	.484	.288	-1.22	.0223	.150	1.557
Model in HEP (Ref: Yes)						
Not model	1.799	.472	2.24	.025*	1.076	3.008
Utilize HEP (Ref: Yes)						
No	2.251	.617	2.96	.003**	1.315	3.853
Source of water (Ref: piped)						
Not Piped	2.362	.807	2.51	.012**	1.208	3.018
Place of del.(Ref: at Health)						
At Home	2.487	.855	2.65	.008*	1.267	4.88
Intercept	.0016	.0010	-9.63	.000**	.0004	.0061
Ln (number of children)	1	offset				

(*, ** significant at 5%, 1% and Ref: is reference category)

Figures

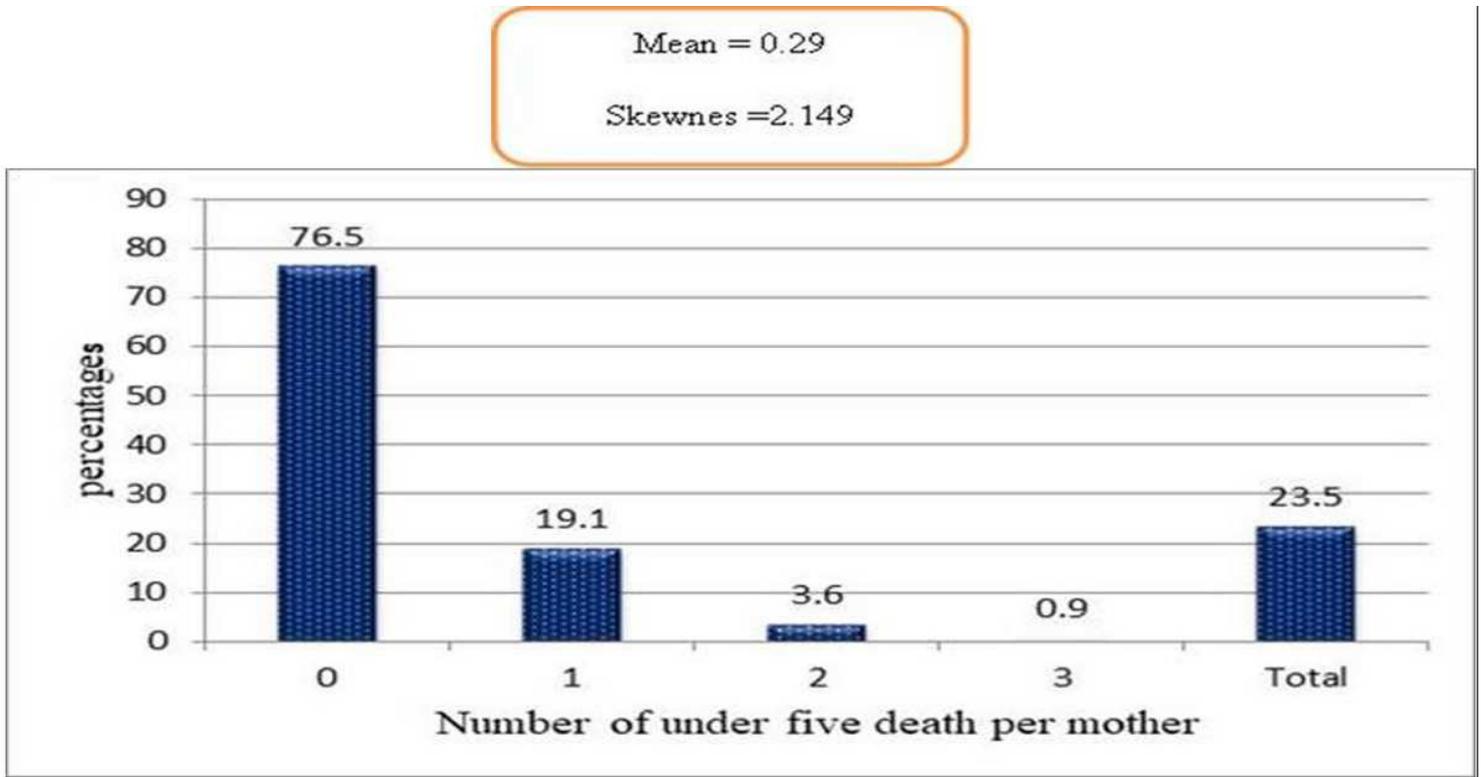


Figure 1

Under five child death number per mother

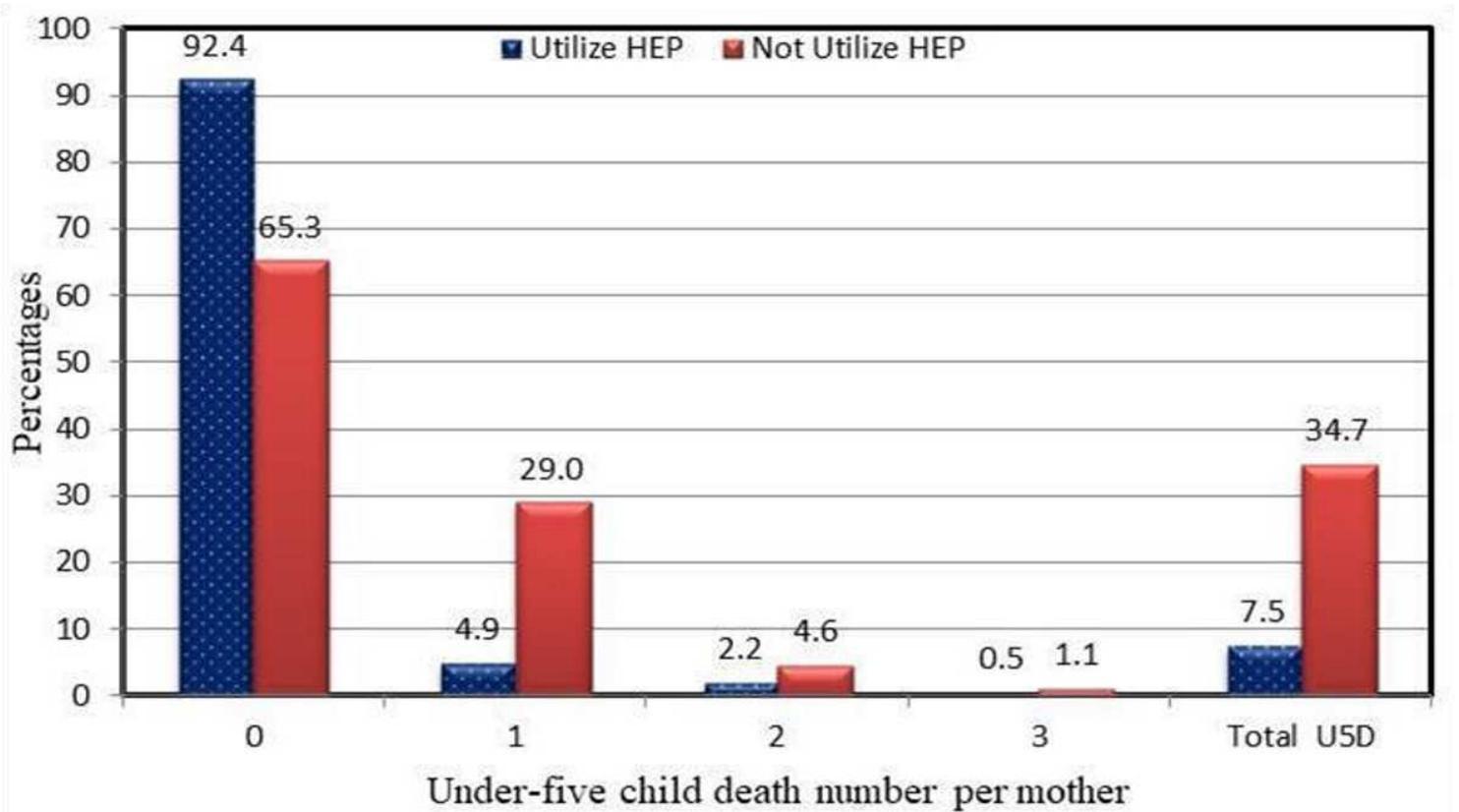


Figure 2

Under five child mortality per mother over HEP utilization

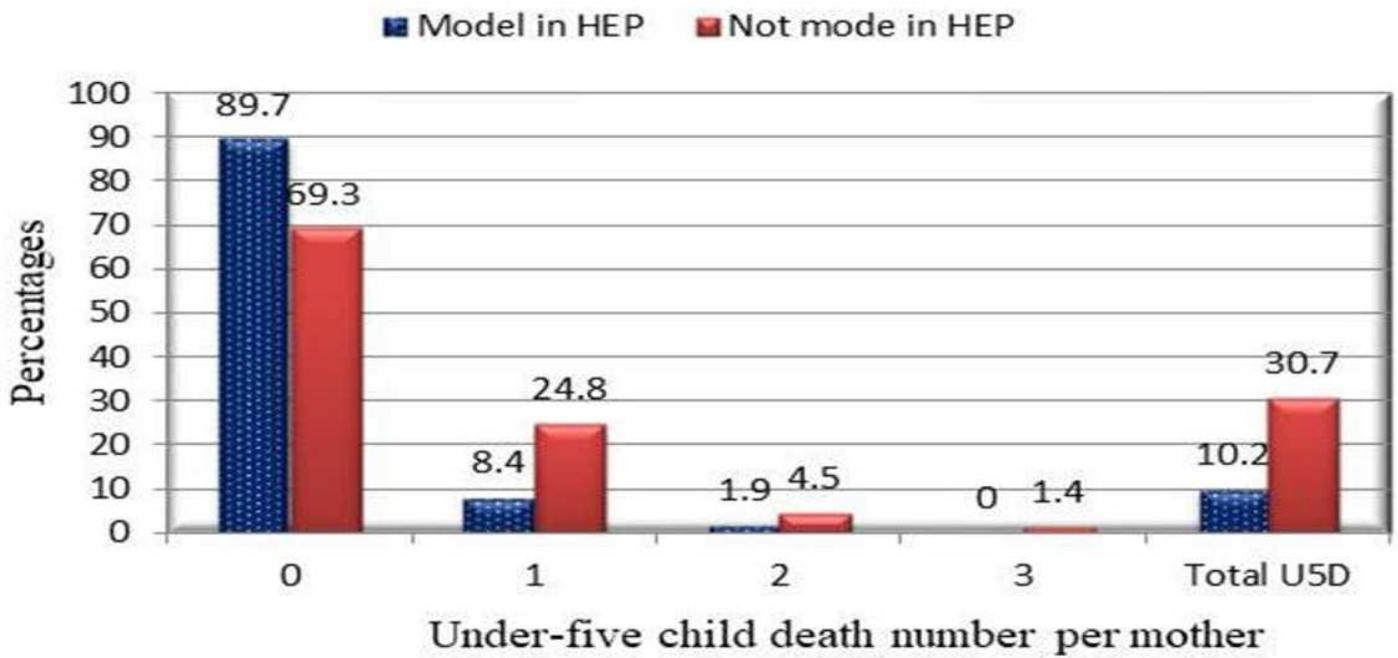


Figure 3

Under five child mortality per mother over Being model