Cross-sectional Study

The factors associated with under-five mortality in Ethiopia

Getahun Dejene Yemane

Department of Statistics, Biostatistics, College of Natural and Computational Science, Mizan-Tepi University, Ethiopia

A B S T R A C T

Background: Under-five mortality refers to the likelihood of dying between the ages of birth and five. The number of children under the age of five who die each year continues to climb worldwide. Over the previous few decades, the industry has made great progress in reducing mortality among children under the age of five. The study aims to identify the factors associated with under-five mortality in Ethiopia.

Subject and method: Community-based Cross-sectional data came from Ethiopia's Mini Demographic and Health Survey 2019. In two stages, the 2019 EMDHS sample was stratified and selected. 8855 women of reproductive age were interviewed using a nationally representative Woman (ages 15 to 49) and 5753 children were included. Ethiopia's under-five mortality served as the study's dependent (response) or outcome variable. Binary logistic regression was used to see if there is an association between the dependent and independent variables. All variables with a p-value of less than 0.25 in the bivariate analysis were chosen for the multivariable logistic regression to compensate for putative confounders. Significant predictors were defined as factors with a p-value of less than 0.05.

Results: A total of 5753 under-5 mortality were enrolled in this study. 339 (5.9%) of under-five Mortality have been declared lifeless before reaching the age of five. There were 1328(23.1%) and 4425(76.1%) with 72 (5.42%) and 267 (6.02%) of under-five mortality occurring in urban and rural respectively. Under-five mortality in the Afar region was 2.280 times more likely Compared to Children born in Tigray Region (AOR = 2.280 95% CI = 1.137–4.568, P = .020). Under-five Mortality in Rural residences was 1.908 times more likely as Compared to Urban Residence (AOR = 1.908, 95% CI = 1.257–4.539, P = .035). Under-five mortality in Poorer index Households was 0.343 times Less likely as compared to children born in the poorest index Household (AOR = 0.343,95% CI = 0.128–0.910, P =). Under-five mortality in the public sector was 1.763 times less likely than among children born at Home (AOR = 1.763, 95% CI = 1.252–2.482, P = .033). Under-five Mortality of second multiple births was 2.389 times more likely Compared to Single birth (AOR = 2.389, 95% CI = 1.257–4.539, P = .008).

Conclusion: This study found that the prevalence of under-five mortality, is 5.9% (59/1000) or 59 death per one thousand live children in Ethiopia. The under-five mortality rate is rapidly declining, and access to and utilization of health care is improving. Region, residence, level of education, wealth index, Place of Delivery and multiple births have all been statistically significant factors of under-five mortality in Ethiopia. The government and all stockholders should be given attention to maternal and infant health care to reduce under-five mortality.

1. Background

Under-five mortality refers to the risk of dying between birth and age five. Under-five mortality is one of the most important components of the population, hence demographers are very interested in tracking the trend and incidence of under-five death. Every year, around 9.7 million newborns and children under the age of five die, with large variations in under-5 Mortality rates and trends among local and international locations [1].

The global number of under-five mortality remains high, the sector has made remarkable progress in the recent few decades in reducing under-five mortality. The global under-5 mortality rate decreased by 59%, from 93 deaths per 1000 live births in 1990 to 39 in 2018. At the same time, mortality amongst children aged five to fourteen years dropped by 53%, from 15 to 7 fatalities per thousand children [2]. Despite recent progress, over five million children under the age of five died in 2019 [3].

Sub-Saharan African countries have the highest rate of mortality

among children under the age of five on the planet. In 2016, the area had a seventy-nine deaths per thousand births rate for children under the age of five. This procedure resulted in one out of every thirteen babies dying before their fifth birthday. It is 15% more than the implied proportion of 1 in every 100 80 9 in developed countries, or a twenty-fold increase above the one-out-of-250% rate in Australia and New Zealand. A child born in the most notable mortality kingdom has a 60-fold higher risk of death than a child born in the least notable mortality kingdom [4].

The under-five mortality rate in Ethiopia was 67 deaths per 1000 live births, according to the Ethiopian Demographic and Health Survey 2016 this means that one out of every fifteen Ethiopian children dies before reaching the age of five. Under-five mortality in the country fell from 166 deaths per 1000 live births in 2000 to 67 deaths per 1000 live births in 2016, a 60% decrease in under-five mortality over 16 years [5].

Though Ethiopia has made progress in reducing under-five mortality over the last two decades, the rate remains high, necessitating greater efforts and appropriate measures to reach the Sustainable Development Goals (SDGs), which aim to reduce under-five mortality to at least 25 deaths per 1000 live births by 2030, they must be implemented. According to some published articles, no one has conducted studies on the determinants of under-five mortality in Ethiopia using the 2019 EMDHS. It is critical to identify the determinant factors linked to under-five mortality to inform policymakers on how to provide relevant alternative interventions or strengthen existing interventions to bring under-five mortality down to the projected level. As a result, the goal of this study was to identify factors associated with under-five mortality in Ethiopia.

2. Study design

Community-based Cross-sectional data came from Ethiopia's Mini Demographic and Health Survey 2019. The Ethiopian Public Health Institute (EPHI) worked with the Central Statistical Agency (CSA) and the Federal Ministry of Health (FMoH) to conduct the 2019 Ethiopia Mini Demographic and Health Survey (2019 EMDHS), which was coordinated by the Technical Working Group (TWG) from March 21 to June 28, 2019.

3. Population and sample

In two stages, the 2019 EMDHS sample was stratified and selected. There were 21 sampling strata in each region, which were divided into urban and rural areas. In two steps, EA samples were picked individually in each stratum. At each of the lower administrative levels, implicit stratification and proportional allocation were achieved by sorting the sampling frame within each sampling stratum before sample selection, according to administrative units at different levels, and selecting a probability proportional to size at the first stage of sampling. 8855 women of reproductive age were interviewed using a nationally representative sample (ages 15 to 49) and 5753 children were included. Background factors, fertility determinants, marriage, and the awareness of respondents were all thoroughly examined.

4. Study variable

4.1. Dependent variable

In Ethiopia, the dependent variable is the Mortality of those under the age of five.

$$Y_i = \begin{cases} 0 \; if \; a \; child \; is \; a \; live \\ 1 \; if \; a \; child \; is \; Died \end{cases}$$

4.2. Independent variables

Various demographic, socioeconomic, biological, and environmental aspects have been studied earlier and were included as predictor variables: mother's current age, mother's education level, family gender, mother's work status, contraception, family wealth index, family size, child's gender, birth order, birth type, types of Birth, place of residence, place of birth, toilet facilities, and drinking water source were all included as predictors [6,7].

4.3. Inclusion and exclusion criteria

All children die in this five years before a survey and in Ethiopia nationalities of families were included. Excluded children whose Families were not permissible to give information were excluded. **Operational Definition**.

Under-five mortality is the probability of dying between birth and under the age of five.

Contraceptive: Contraception, often known as birth control, is a method of preventing pregnancy.

4.4. Study instrument

For the 2019 EMDHS, five questionnaires were used: the Household Questionnaire, the Woman's Questionnaire, the Anthropometry Questionnaire, the Health Facility Questionnaire, and the Fieldworker's Questionnaire. These surveys were altered from the DHS Program's standard questionnaires to represent the Ethiopian population and health challenges. All eligible women aged 15 to 49 were asked to complete the Woman's Questionnaire. Respondents' background characteristics, reproduction, contraception, pregnancy and postnatal care, child nutrition, childhood immunisations, and health facility information were all covered in the study.

4.5. Data analysis

The data was analyzed using SPSS version 26 statistical software (IBM SPSS Statistics). Descriptive statistics such as frequencies and percentages were used to summarize the sample's background characteristics. Binary logistic regression was used to see if there is an association between the dependent and independent variables. All variables with a p-value of less than 0.25 in the bivariate analysis were chosen for the multivariable logistic regression to compensate for putative confounders. Significant predictors were defined as factors with a p-value of less than 0.05.

4.6. Research ethics

Ethics approval and consent to participate in Ethical clearance for the 2019 EMDHS was provided by the Ethiopian Health and Nutrition Research Center (EHNRI) Review Board, the National Research Ethics Review Committee (NRERC) at the Ministry of Science and Technology, the Institutional Review Board of Inner City Fund (ICF) International, and the Centers for Disease Control and Prevention (CDC). The requirement for obtaining informed consent was waived by Ethiopian Health and Nutrition Research Center (EHNRI) Review Board, but the data were kept anonymous and confidential. This study was conducted by the Helsinki Declaration. The work has reported according to STROCSS criteria [8]

Researchregistry8019 (https://www.researchregistry.com/browse-the-registry#home).

5. Results

5.1. Socio-demographic characteristic of under-five mortality in Ethiopia

The total population consisting of 8885 children's information was obtained by interviewing face to face their mothers. A total of 5753 children were included in the study with a response rate of 100%. Out of

which, 5753 children have complete measurements and were considered in this study. The current study can observe that a total of 5753 children under five Mortality were 339 (5.7%) of the total under-five age were Mortal before reaching the age of five, while 5414 under-five children were still alive(Fig. 1).

Of the total of 5753 children included in the study, There were 1328 (23.1%) and 4425(76.1%) with 72 (5.42%) and 267 (6.02%) of under-five mortality was occurred in urban and rural respectively. Regarding Mother Education level, there were 3149(54.7%), 1823(31.3%), 480 (8.3%) and 301(5.2%) with 191(6.07%), 122(6.69%), 17(3.54%) and 9 (2.99%) of under-five mortality was occurred, uneducated, Elementary, Secondary and higher school attended women. About the wealth index of households, there were 1964(34.1%), 994(17.3%), 805(14.0), 738 (12.8%) and 1252(21.8%) with 133(6.77%), 60(6.04%), 805(5.59%), 45(5.59%) and 1252(5.11%) of under-five mortality was occurred to the children from poorest, poorer, middle, richer and Richest House household respectively. Concerning multiple births of children, there were 5586(97.1%), 82(1.4%), 82(1.4%) and 3(0.1%) with 295(5.28%), 13(15.98%), 28(34.55) and 3(100%) of under-five Mortality due to single birth, first multiple births, second multiple births and third multiple births respectively. About the sex of a child, there were 2696 (51.6%) and 2784(48.4%) with 195(6.57%) 144(5.17%) of under-five mortality occurring in males and females respectively.

Regarding to Marital Status, there were 31(0.5%),2355(93.1%),41 (0.7%),61(1.1%), 181(3.1%) and 84(1.5%) with 1(3.22%), 308 (13.08%), 2(4.87%), 4(6.56%),22(12.15%) and 2(2.38%) of under-five mortality were occurred with marital Status of Never union, Married, Living with partner, widowed, Divorced and no longer living together respectively. Concerning delivery places, there were 2799(48.7%) Delivered at home, 840(14.6%) delivered at Government hospitals and 1495(26.1%) Delivered at Government health centres with 191 (6.82%) children dying at-home delivery, 480(7.02%) death occurred in a birth Government hospital, and 1495 (3.81%) child death occurred from birth in a Government health center (Table 1).

5.2. Binary logistic regression of under-five mortality in Ethiopia

The resulting binary logistic regression model fits well according to the Hosmer and Lemeshow goodness of fit test (p-value = .589). The final model revealed that characteristics like as mothers' educational status, Region, Types of birth, Wealth index of urban/rural, Family Size, Child with whom live, Wealth index, Marital Status, Sex of Child and Place of delivery were significant predictors in U5M in Ethiopia at a 5% level of significance.

Under-five mortality in the Afar region was 2.280 times more likely Compared to Children born in Tigray Region (AOR = 2.280 95% CI = 1.137–4.568). Under-five mortality in Gambella Region was 2.004 times more likely Compared to children in Tigray Region (AOR = 2.004, 95% CI = 1.089–3.687). Under-five mortality in Dire Dawa city was 3.012 times more likely as compared to children born in Tigray Region (AOR

Fig. 1. Prevalence of under-five mortality in Ethiopia.

Table 1
The Predictors characteristics of under-five mortality in Ethiopia (N = 5753).

Variable	Live	Death	Total	Percent	U5M%
Region					
Tigray	440	14	454	7.9	3.08
Affar	617	35	652	11.3	5.37
Amhara	488	23	511	8.9	4.50
Oromia	678	41	719	12.5	5.7
Somalia	580	57	637	11.1	8.95
Benishangul gumuz	485	45	530	9.2	8.49
SNNPRS	633	27	660	11.2	4.09
Gambella	415	35	450	7.8	7.78
Harar	418	29	447	7.8	6.49
Addis Ababa	285	6	291	5.1	2.06
Dire Dawa	375	27	402	7.0	6.72
Place of Residence					
Urban	1256	72	1328	23.1	5.42
Rural	4158	267	4425	76.9	6.03
Education Level					
No education	2958	191	3149	54.7	6.07
Primary	1701	122	1823	31.3	6.69
Secondary	463	17	480	8.3	3.54
Higher	292	9	301	5.2	2.99
Wealth Index					
Poorest	1831	133	1964	34.1	6.77
Poor	934	60	994	17.3	6.04
Middle	760	45	805	14.0	5.59
Richer	701	37	738	12.8	5.01
Richest	1188	64	1252	21.8	5.11
Marital Status					
Never in Union	30	1	31	0.5	3.22
Married	2047	308	2355	93.1	13.08
Living with partner	39	2	41	0.7	4.87
Widowed	57	4	61	1.1	6.56
Divorced	159	22	181	3.1	12.15
No longer living together	82	2	84	1.5	2.38
Types of birth					
Single Birth	5291	295	5586	97.1	5.28
First Multiple	69	13	82	1.4	15.85
Second Multiple	54	28	82	1.4	34.15
Third Multiple	0	3	3	0.1	100
Sex of Child					
Male	2774	195	2969	51.6	6.57
Female	2640	144	2784	48.4	5.17
Place of Delivery					
Respondents of home	2608	191	2799	48.7	6.82
Other home	36	6	42	1.4	14.29
Government hospital	781	59	840	14.6	7.02
Government Health Center	1438	57	1495	26.0	3.81
Government Health post	214	12	226	3.9	5.31
Other public Center	2	0	2	0	0
Private Hospital	133	2	135	2.3	1.48
Private Clinic	19	3	22	0.4	13.64
NGO Health Facility	34	1	35	1.3	2.86
NGO Other Health Facility	3	0	3	0.1	0
Other	66	8	74	1.3	10.81

= 3.012,95% CI = 1.165–7.785). Under-five Mortality in Rural residences was 1.908 times more likely as Compared to Urban Residence (AOR = 1.908, 95% CI = 1.257–4.539). Under-five mortality in Poorer index Households was 0.343 times Less likely as compared to children born in the poorest index Household (AOR = 0.343,95% CI = 0.128–0.910). Under-five mortality those who Separated were 0.165 times less likely as Compared to never union family (AOR = 0.165, 95% CI = 0.037–0.741). Under-five mortality in the urban/rural Poorer index was 3.448 times more likely as compared to children born in the urban/rural poorest index (AOR = 0.448,95% CI = 1.418–8.386). Under-five mortality of the Female Sex was 0.750 times less likely Compared to the Male Sex (AOR = 0.750, 95% CI = 0.594–0.948). Under-five mortality in the public sector was 1.763 times less likely than among children born at Home (AOR = 1.763, 95% CI = 1.252–2.482). Under-five Mortality of second multiple births was 2.389 times more likely Compared to Single birth(AOR = 2.389,95% CI = 1.257–4.539).as well Five mortality of third multiple births was 2.046 times more likely as
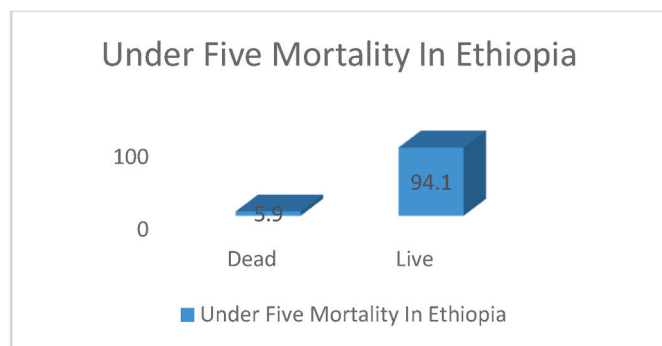
Compared to single birth(AOR = 2.389,95% CI = 1.029–4.065). Odds ratios of Under-five mortality living with Fathers were 3.057 times more likely as compared live with mothers(AOR = 3.057,95% CI = 1.535–6.087). Under-five mortality of child living with other relatives was 3.660 times more likely as compared to living with mothers (AOR = 3.660,95% CI = 1.475–9.087) and under-five mortality living with someone else was 5.050 times more likely as compared to live with mother(OR = 5.050,95% CI = 1.846–13.819) (Table 2).

Table 2
Binary logistic regression analysis of under-five Mortality in Ethiopia.

Variables	AOR 95% C.I	AOR 95% C.I	P-Value
Region			
Tigray	1	1	.000
Affair	2.263(1.170–4.378)	2.280(1.137–4.568)	.020
Amhara	1.269(0.756–2.131)	1.272(0.717–2.259)	.411
Oromia	1.528(0.862–2.707)	1.721(0.925–3.201)	.086
Somalia	1.191(0.721–1.967)	1.252(.724–2.164)	.421
Benishangul Gumuz	.733(0.455–1.179)	.770(0.447–1.326)	.346
SNNPR	.776(0.473–1.274)	.924(0.527–1.619)	.781
Gambella	1.688(0.975–2.921)	2.004(1.089–3.687)	.025
Harar	.854(0.507–1.438)	.765(0.429–1.361)	.362
Addis Ababa	1.038(0.603–1.785)	1.108(0.623–1.969)	.727
Dire Dawa	3.420(1.393–8.394)	3.012(1.165–7.785)	.023
Residence			
Urban	1	1	
Rural		1.908(1.048–3.473)	.035
Education of mothers			
No education			.041
Elementary	.477(0.242–0.942)	.650(0.298–1.419)	.280
Secondary	.430(0.216–0.855)	.547(0.258–1.158)	.115
Higher	.839(0.369–1.908)	1.129(0.476–2.680)	.782
Wealth index of HH			
Poorest	1	1	.192
Poorer		.343(0.128–0.918)	.033
Middle		.609(0.274–1.356)	.225
Richer		.666(0.337–1.313)	.240
Richest		.890(0.504–1.572)	.688
Wealth index of urban/rural			
Poorest	1	1	.058
Poorer		3.448(1.418–8.386)	.006
Middle		1.795(0.879–3.666)	.108
Richer		1.373(0.763–2.472)	.291
Richest		1.177(0.702–1.973)	.537
Marital Status			
Never in union	1	1	.007
Married	.732(0.064–8.367)	.688(0.058–8.122)	.767
Living with partner	.400(0.098–1.633)	.407(0.097–1.706)	.219
Widowed	.476(0.065–3.503)	.744(0.090–6.152)	.783
Divorced	.348(0.062–1.962)	.533(0.088–3.228)	.494
Separated	.176(0.040–0.768)	.165(0.037–0.741)	.019
Sex of Child			
Male	1	1	
Female		.750(0.594–0.948)	.016
Place of Delivery			
Home			.030
Respondents Home	1.655(0.783–3.498)	1.015(0.421–2.447)	.974
Other Home	1.535(0.507–4.653)	1.204(0.802–1.809)	.370
Public Sector	1.605(0.736–3.500)	1.763(1.252–2.482)	.001
Government Hospital	3.058(1.402–6.671)	1.814(0.926–3.552)	.083
Private Sector	2.162(0.848–5.513)	3.954(0.879–17.782)	.073
Other private Sector	8.061(1.665–39.030)	5.510(0.742–40.901)	.095
NGO	.768(0.185–3.181)	.878(0.366–2.108)	.771
Types of birth			
Single Birth	1	1	.000
1st multiple		1.143(0.607–2.154)	.679
2nd Multiple		2.389(1.257–4.539)	.008
3rd multiple		2.046(1.029–4.065)	.041
4th Multiple		1.137(0.559–2.310)	.723
5th Multiple		1.617(0.681–3.841)	.276
With Child Live			
Respondents	1	1	.013
Fathers		3.057(1.535–6.087)	.001
Other relatives		3.660(1.475–9.081)	.005
Someone else		5.050(1.846–13.819)	.002
Constant		0.106	1.00

6. Discussion

This study aimed to identify factors associated with under-five mortality in Ethiopia based on 2019 Ethiopian Mini Demographic and Health Survey data. To investigate factors linked to under-five mortality, descriptive and binary logistic regression analyses were used. The factors that significantly affect under-five mortality in Ethiopia, according to a study employing a binary logistic regression model, are region, place of residency, mothers' educational level, child's sex, site of delivery, wealth index, and multiple births, as well as child with whom living.

The current study showed that there were regional variation for a case of under-five mortality in Ethiopia. This study is backed up by data from four EDHS surveys done across the country, which show significant regional differences in under-five mortality: lower in Addis Ababa (urban residence) and higher in a heterogeneous population (urban and rural residence) [5,9–11]. The study conducted on the trend of under-five mortality prevailed that significant differences still exist across the administrative regions of the country [12].

The current study showed that Children in rural areas have a higher chance of dying before reaching the age of five than those in urban areas. In addition, a survival study of under-five mortality in Nigeria revealed a consistent result: site of residency played a major role in the risk of under-five mortality [13]. In many research, there is greater evidence that living in a rural location is a predictor of under-five mortality [14, 15]. As indicated by the prior review, rural disadvantage persists in U5M. Because residing in a rural location has continuously been linked to higher U5M, policies and programs targeted at eliminating rural disadvantage must be reviewed [16–18].This could be linked to inadequate child care practices, a lack of appropriate medical access, a bad transportation system, a lack of community health awareness, and delays in rural families seeking health care.

This study showed that male children were at a higher risk of under-five mortality compared to female children. This finding is in line with the findings of earlier investigations [19,20]. Male child on average, are more likely than female child to die before reaching the age of five, according to research [21–24]. This is likely due to a fundamental genetic advantage that male youngsters are naturally weaker than their female counterparts.

This study showed that the Place of delivery is a major determinant of Under-five mortality. When compared to children born in health institutions, children born at home were more likely to die before reaching the age of five. This outcome is consistent with the prior study's findings [25,26]. This could be because children who are born at home are more vulnerable to infections. This study showed that multiple births were a Major Determinant of Five Mortality Compared to Single birth. This is in line with the findings of prior investigations [27]. This could be explained by the fact that food and other limited resources, as well as the care given to the infant by the mother are shared.

In comparison to illiterate women, educated women have a lower risk of under-five mortality, according to this study. This is because educated mothers are more likely to have a higher income, more health knowledge, and the capacity to make better decisions about their own and their children's health. This is in line with the findings of prior investigations [28]. As parents' educational qualifications improve, so will their children's chances of surviving. As evidenced by previous studies, having a high level of education among mothers has resulted in increased maternal awareness of baby health and hygiene facilities, As a result, the mortality rate of children under the age of five has decreased in sub-Saharan African countries [29], Madagascar [22], Tanzania [30], and Nigeria [31].

6.1. Strength and limitations

The retrospective nature of the EMDHS records is a concern with national dataset. The records are enormous and so can included large

Scope. The nationwide consultant pattern of all deaths is based entirely on family interviews. All of the designated regions are replicated in the examination results. Despite these advantages, certain flaws have been discovered in this design. The 2019 EMDHS delivery records phase begins with questions about the respondent's joy in childbirth. As a result, the 2019 EMDHS became a variable record series mistake (e.g., most effective surviving women elderly 15–49 had been interviewed). As a result, no records for children of women who had died had been discovered. Also, birth histories, particularly in countries like Ethiopia where there is no well-established system for important events recording, may hurt data quality due to memory biases on birth and death dates. This higher-level examination includes elements linked to the father of an infant, which may influence under-5 mortality in Ethiopia. Thus, for the logistic regression version, possible extensions for such investigations include employing designs that include interplay outcomes components in addition to primary impact elements explanatory variables to under-5 mortality. More advanced algorithms, such as multilevel versions, provide more options for analyzing large datasets and determining greater version numbers of regions.

6.2. Implications

Our data imply that, on average, education level is linked to mortality differences in children under-five mortality. Although the place of a child's birth is an essential factor in the child's survival, increased government spending on health could help to mitigate this effect. This conclusion revealed that focusing on the study area's residential area is an essential approach for reducing under-five mortality. More advanced algorithms, such as multilevel version, provide more options for analyzing large datasets and determining greater version numbers of regions.

7. Conclusion

In Ethiopia, under-five mortality is rapidly declining, and access to and utilization of health care is improving. Multivariable Logistic regression showed that Region, place of residence, mothers' educational level, sex of the child, Place of delivery, wealth index and multiple births as well as Child with whom live were found to be significant predictors of under-five mortality. As a result, government policy, nonprofit organizations, and all relevant entities should focus on the key factors of under-five mortality and place a greater priority on reducing under-five mortality, as well as health intervention measures.

Ethical approval

Ethics approval and consent to participate in Ethical clearance for the 2019 EMDHS was provided by the Ethiopian Health and Nutrition Research Center (EHNRI) Review Board, the National Research Ethics Review Committee (NRERC) at the Ministry of Science and Technology, the Institutional Review Board of Inner City Fund (ICF) International, and the Centers for Disease Control and Prevention (CDC). The requirement for obtaining informed consent was waived by Ethiopian Health and Nutrition Research Center (EHNRI) Review Board, but the data were kept anonymous and confidential. This study was conducted by the Helsinki Declaration. The work has reported according to STROCSS criteria [8] to utilize the data. Permission was granted on the condition that the data be used only for this research topic and that the findings be published in a peer-reviewed journal.

Sources of funding

Author contribution

GD: The author conceived the study, wrote the abstract to get permission from EMDHS 2019, facilitated data extraction and process, data analysis and interpretation, drafted the first manuscript, and write up the final manuscript.

Research registration number

Name of the registry: Getahun Dejene Yemane (The Factors Associated with Under-five Mortality in Ethiopia).

Unique Identifying number or registration ID: researchregistry8019.

Hyperlink to your specific registration (must be publicly accessible and will be checked). (https://www.researchregistry.com/browse-the-registry#home):

Guarantor

Getahun Dejene Yemane.
Email: getahundejene9@gmail.com/getahundejene@mtu.edu.et.

Consent

Not Applicable.

Declaration of competing interest

The author(s) declared no potential Computing of interest to the research, authorship, and/or publication of this article.

Acknowledgement

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2022.104063.

Abbreviation

AOR	Adjusted Odd Ratio
CI	Confidence Interval
CSA	Central Statistical Agency
EMDHS	Ethiopian Mini Demographic and Health Survey
EPHI	Ethiopian Public Health Institute
FMoH	Federal Ministry of Health
SDG	Sustainable and Development Goals
SNNPRS	South nations Nationalities and peoples of Regional State
TWG	Technical Working Group
U5CM	under-five child mortality
UN	United Nation

References

[1] UNICEF, The State of the World's Children 2006: Excluded and Invisible, Unicef, 2005.

[2] F.L. Kitila, R.M. Petros, G.H. Jima, T. Desalegn, A. Sorsa, I.Y. Massey, et al., Under-five mortality and associated factors in southeastern Ethiopia, PLoS One 16 (2021), e0257045.

[3] H. Wang, K.M. Abbas, M. Abbasifard, M. Abbasi-Kangevari, H. Abbastabar, F. Abd-Allah, et al., Global age-sex-specific fertility, mortality, healthy life expectancy (HALE), and population estimates in 204 countries and territories, 1950–2019: a comprehensive demographic analysis for the Global Burden of Disease Study 2019, Lancet 396 (2020) 1160–1203.

[4] D. You, G. Jones, T. Wardlaw, United Nations Inter-agency Group for Child Mortality Estimation, Levels Trends Child Mortal Estim Dev by UN Inter-Agency Gr Child Mortal Estim, 2010, 2011.

[5] I. Csa, Central Statistical Agency (CSA)[Ethiopia] and ICF, Ethiop Demogr Heal Surv Addis Ababa, Ethiop Calverton, Maryland, USA, 2016.

[6] B.S. Megersa, O.A. Ojengbede, A. Deckert, O.I. Fawole, Factors associated with induced abortion among women of reproductive age attending selected health facilities in Addis Ababa, Ethiopia: a case control study, BMC Wom. Health 20 (2020) 1–11.

[7] K.M. Kebede, A.S. Belay, A.A. Shetano, Prevalence and determinants of unintended pregnancy in Ethiopia: narrative synthesis and meta-analysis, Heliyon 7 (2021), e07869, https://doi.org/10.1016/j.heliyon.2021.e07869.

[8] G. Mathew, R. Agha, J. Albrecht, P. Goel, I. Mukherjee, P. Pai, et al., STROCSS 2021: strengthening the reporting of the cohort, cross-sectional and case-control studies in surgery, Int. J. Surg. 96 (2021), 106165, https://doi.org/10.1016/j.ijsu.2021.106165.

[9] O.R.C. Macro, Central Statistical Agency Addis Ababa, Ethiopia, Cent Stat Agency Addis Ababa, Ethiopia, 2006.

[10] Central statistical Agency [Ethiopia], ICF International. Ethiopia Demographic and Health Survey, 2012, pp. 1–452, 2011.

[11] Central Statistical Agency, Ethiopia DHS 2000, 2001, pp. 1–299.

[12] E. Gurmu, A.J. Mturi, Trends and determinants of under-five mortality in Ethiopia: could the MDG four be met? South Afr. J. Demogr. 15 (2014) 49–80.

[13] A.I. Wegbom, I.D. Essi, V.A. Kiri, Survival analysis of under-five mortality and its associated determinants in Nigeria: evidence from a survey data, Int. J. Stat. Appl. (2019) 59–66, https://doi.org/10.5923/j.statistics.20190902.03, 2019.

[14] I.N. Abu, I.A. Madu, C.K. Ajaero, The Prevalence and Determinants of Under-five Mortality in Benue State, Nigeria, vol. 5, SAGE Open, 2015, 2158244015611938.

[15] A.G. Demisse, F. Alemu, M.A. Gizaw, Z. Tigabu, Patterns of admission and factors associated with neonatal mortality among neonates admitted to the neonatal intensive care unit of University of Gondar Hospital, Northwest Ethiopia, Pediatr. Health Med. Therapeut. 8 (2017) 57.

[16] K.-H. Nguyen, E. Jimenez-Soto, P. Dayal, A. Hodge, Disparities in child mortality trends: what is the evidence from disadvantaged states in India? The case of Orissa and Madhya Pradesh, Int. J. Equity Health 12 (2013) 1–14.

[17] C.T. Sreeramareddy, H.N. Harsha Kumar, B. Sathian, Time trends and inequalities of under-five mortality in Nepal: a secondary data analysis of four demographic and health surveys between 1996 and 2011, PLoS One 8 (2013), e79818.

[18] L. Chawla, K. Keena, I. Pevec, E. Stanley, Green schoolyards as havens from stress and resources for resilience in childhood and adolescence, Health Place 28 (2014) 1–13.

[19] J. Nasejje, Application of Survival Analysis Methods to Study Under-five Child Mortality in Uganda, 2013.

[20] Y. Getachew, S. Bekele, Survival analysis of under-five mortality of children and its associated risk factors in Ethiopia, J. Biosens. Bioelectron. 7 (2016) 2.

[21] I.G.M.E. Un, Levels & Trends in Child Mortality 2019, United Nations Child Fund, 2019, p. 52.

[22] G. Fink, I. Günther, K. Hill, The effect of water and sanitation on child health: evidence from the demographic and health surveys 1986–2007, Int. J. Epidemiol. 40 (2011) 1196–1204.

[23] M. Makate, C. Makate, Is Poor Sanitation Killing More Children in Rural Zimbabwe? Results of Propensity Score Matching Method, 2016.

[24] D. Bedada, Determinant of under-five child mortality in Ethiopia, Am. J. Theor. Appl. Stat. 6 (2017) 198, https://doi.org/10.11648/j.ajtas.20170604.15.

[25] Buwembo P. Factors Associated with Under-5 Mortality in South Africa: Trends 1997-2002 2010.

[26] B.T. Woldeamanuel, Socioeconomic, demographic, and environmental determinants of under-5 mortality in Ethiopia: evidence from Ethiopian demographic and health survey, 2016, Child Dev. Res. 2019 (2019).

[27] A.E. Anane, Impact of Feed-The-Future Program on Malnutrition Among Children in the Northern Region of Ghana, 2020.

[28] León J, Benavides M, Alarcón F, Erausquin MG, Salas A. Transmisión intergeneracional de la educación: los efectos directos e indirectos de la educación materna en el desarrollo infantil en una región de la selva peruana 2020.

[29] S. Yaya, O.A. Uthman, F. Okonofua, G. Bishwajit, Decomposing the rural-urban gap in the factors of under-five mortality in sub-Saharan Africa? Evidence from 35 countries, BMC Publ. Health 19 (2019) 1–10.

[30] C. Nattey, H. Masanja, K. Klipstein-Grobusch, Relationship between household socio-economic status and under-five mortality in Rufiji DSS, Tanzania, Glob. Health Action 6 (2013), 19278, https://doi.org/10.3402/gha.v6i0.19278.

[31] J.O. Akinyemi, C.O. Odimegwu, O.O. Banjo, B.M. Gbadebo, Clustering of infant deaths among Nigerian women: investigation of temporal patterns using dynamic random-effects model, Genus 75 (2019), https://doi.org/10.1186/s41118-019-0058-x.