Determinants of Under-Five Mortality in Abim District, Uganda.

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ABSTRACT

The study on the determinants of under-five mortality in Abim district, Karamoja region, Uganda, was to examine how maternal age at first birth, maternal age, previous birth interval, maternal education, maternal occupation, paternal occupation, latrine use, and source of drinking water affects on under-five mortality prevalence by Okello (2015). The respondents for this study were mothers in the reproductive age of 15-55 years selected by purposive sampling. A logistic regression model was used for a dummy (1=death, 0=survival) and the independent variables.

The odds of the logistic estimates revealed that under-five mortality was significantly high at 95% confidence level among mothers who had first birth below 20 years of age, maternal age at birth of less than 20 years, previous birth interval of less than 2 years, and households that use borehole water. Other factors like maternal education, maternal/paternal occupation and latrine/toilet use were insignificantly related to under-five mortality. Hence it was recommended that campaign against early marriage and teenage pregnancy be explicitly done, mothers be encouraged to exclusively breastfeed for at least 2 years, mothers be sensitized about the advantages of family planning, personal hygiene and good sanitation be continuously practiced if under-five mortality in the Abim District is to be controlled.

(Key words: maternal age, maternal education, maternal occupation, water source, latrine use and under-five mortality)

INTRODUCTION

According to UDHS(2011), the under-five mortality ratio reduced by a half from 180 per 1,000 live births in 1995 to 90 per 1000 live births in 2011 with the Kampala region having the lowest rate (65 per 1000 live births) and the Karamoja region having the highest rate (153 per 1000 live births) in the previous five years. The key predictors noted for the above rates were: too short birth interval of less than 24 months after the previous birth, too young mothers of less than 18 years and a high birth order or parity of four or more children.

The Karamoja region has the highest under-five mortality rate (72 per 1000 live births) relative to the lowest in Kampala region (19 per 1000 live births) in the previous five years in Uganda. The key factors influencing childhood mortality in Uganda as a whole include: too short birth interval of less than 24 months after the previous birth, too young mothers of less than 18 years and a high birth order or parity of four or more children (MoH, 2013).

The Abim district is one of the seven districts of Karamoja region and in Uganda mortality statistics is reported only up to regional level, this inadequacy makes it difficult to explain the determinants of under-five mortality at district level. However leading causes of morbidity like malaria (81%), pneumonia (11%), and latrine coverage (41%) at district level can give a shadow of mortality and its causes(UBOS, 2014).

A number of development partners and non-governmental organizations such as UNFPA, WHO, WFP, UNICEF, KDDS, malaria consortium have projects directed towards health and nutrition supplements to children to reduce child mortality in the region alongside Government

projects like the Karamoja action plan for food security, PRDP and national programs like free immunization, free treated mosquito nets and establishment of village health teams (OCHA, 2009) have not been sufficient enough in reducing under-five mortality and therefore this study sought to examine factors that determine under-five mortality despite the stated interventions in the district and region.

MATERIALS AND METHODS

Logistic Regression Model

The general form of logistic equation with several Maternal, socioeconomic and environmental factors is given as:

$$\text{Logit}(P) = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7$$

Where P: - denote the probability of the risk of under-five mortality and P is dichotomous that have a value 0 or 1.

$b_0 \ldots b_7$: - is the coefficient of the independent variables.

$X_1 \ldots X_7$: - denote the Maternal, socioeconomic and environmental factors of under-five mortality.

Based on the theoretical and previous literature discussed previously, the model for the empirical analyses is classified to three parts. The models consist of maternal factors, socioeconomic factors and environmental factors.

The first model consists of maternal factors while the second model incorporates socioeconomic factors and the third incorporates environmental factors.

So the models in this study are:

Model (I): Under-five mortality = (Maternal Age at first birth, Maternal Age at birth, previous birth interval).

Model (II): Under-five mortality = (**Model I** and Maternal education, maternal occupation, paternal occupation).

Model (III): Under-five mortality = (**Model II**, source of drinking water and Latrine/toilet facility use).

This method of analysis includes factors one at a time selected on theoretical basis.

RESULTS AND DISCUSSIONS

Logistic Estimates of Maternal Factors and Under-Five Mortality

The logistic coefficients and the odd ratios of maternal age at first birth, maternal age at birth and previous birth interval are given in Table 1 following Model I.

Logistic Estimates of Socio-Economic Factors and Under-Five Mortality

The logistic coefficients and the odd ratios of maternal education, maternal occupation and paternal occupation are given in Table 2 following Model II that is controlling for maternal factors.

Logistic Estimates of Environmental Factors and Under-Five Mortality

The estimated logistic coefficients and the odd ratios of drinking water source and latrine/toilet use are given in Table 3 following model III that is controlling maternal and socio-economic factors.

Table 1: The Logistic Estimates of Maternal Factors on Under-five Mortality (MODEL I).

Maternal Factors	β	Odd ratios (OR)	P-Value
Maternal age at first birth (<20)			**0.109**
20-29	-0.934	0.393	0.035
30-39	-21.454	0.000	0.999
Maternal age at birth(<20)			**0.003**
20-29	-1.393	0.248	0.069
30-39	-1.648	0.192	0.001
40+	-2.025	0.132	0.000
Previous birth interval(< year)			**0.005**
2 years	-1.810	0.164	0.003
> 2 years	-1.280	0.278	0.005

Table 2: The Logistic Estimates of Socio-Economic Factors on Under-Five Mortality (MODEL II).

MATERNAL FACTORS	β	Odd Ratios (OR)	P-Value
Maternal age at first birth (<20)			**0.111**
20-29	-0.995	0.370	0.036
30-39	-20.657	0.000	0.999
Maternal age at birth (<20)			**0.012**
20-29	-1.362	0.256	0.093
30-39	-1.570	0.208	0.007
40+	-1.939	0.144	0.001
Previous birth interval (< year)			**0.014**
2 years	-1.726	0.178	0.006
> 2 years	-1.203	0.300	0.013
SOCIO-ECONOMIC FACTORS	**β**	**Odds Ratio (OR)**	**P-Value**
Maternal education (None)			**0.687**
Primary	0.932	2.540	1.000
Secondary	0.361	1.434	1.000
Tertiary	0.812	2.252	1.000
Degree+	1.000	2.719	1.000
Maternal occupation (Peasant)			**0.999**
Civil servant	18.191	7.945E7	0.999
Business	18.423	1.003E8	1.000
Others	-0.582	0.559	0.198

Table 3: The Logistic Estimates of Environmental Factors on Under-Five Mortality (MODEL III).

Maternal Factors	β	Odd ratios (OR)	P-Value
Maternal age at first birth (<20)			**0.158**
20-29	-0.929	0.395	0.055
30-39	-20.442	0.000	0.999
Maternal age at birth (<20)			**0.036**
20-29	-0.965	0.381	0.254
30-39	-1.348	0.260	0.024
40+	-1.768	0.171	0.004
Previous birth interval (< year)			**0.004**
2 years	-2.029	0.131	0.002
> 2 years	-1.416	0.243	0.004
Socio-economic factors	**β**	**Odd ratios (OR)**	**P-Value**
Maternal education (None)			**0.705**
Primary	0.560	1.750	1.000
Secondary	-0.014	0.986	1.000
Tertiary	0.431	1.538	1.000
Degree+	0.758	2.133	0.999
Maternal occupation (Peasant)			**0.999**
Civil servant	18.154	7.657E7	1.000
Business	18.687	1.305E8	0.188
Others	-0.532	0.588	0.379
Paternal occupation (Peasant)			**0.964**
Civil servant	-1.016	0.362	0.038
Business	0.020	1.020	0.511
Others	2.112	8.268	0.945
Environmental factors	**β**	**Odd ratios (OR)**	**P-Value**
Latrine use(No)			**0.014**
Yes	0.028	1.029	
Source of drinking Water			**0.044**
(Surfaced/rain/pond)			
Borehole/spring	1.862	6.439	0.472
Tap/piped	0.602	1.826	0.999
constant	-18.507	0.000	0.999

Discussion of Results

According to Model I above, the significant maternal factors were maternal age at birth and previous birth interval since $p<0.05$ and maternal age at first birth was insignificant ($p>0.05$). It reveals that the odds of under-five mortality reduce with increase in maternal age and previous birth age (Table 1).

The results in Table 2 indicate that maternal education, maternal occupation and paternal occupation were statistically insignificant ($p>0.05$) after controlling for maternal factors. This implies that socio-economic factors were insignificantly related to under-five mortality.

The models consisting of all maternal, socioeconomic and environmental factors are presented in Table 3. Model I consists of maternal factors only while model II includes socio-economic factors and model III incorporates environmental factors.

In Model I (Table 1) the under-five mortality risk ratios for first birth age, maternal age at birth and previous birth interval are in the expected direction. First birth age of 20-29 reduces the risk of under-five mortality by 61%, first birth age of 30+ are likely not to experience under-five mortality though insignificant at 90% or 95% level of significance (p-value>0.1) relative to first birth age of less than 20 years.

Maternal age at birth of 20-29 reduces the risk of under-five mortality by 75%; 30-39 reduces the risk by 81% and 40+ reduces the risk by 87% relative to maternal age of less than 20 years statistically significant at 90% level.

The previous birth interval of 2 years reduces the risk of under-five mortality by 84%, above 2 years reduces the risk by 72% relative to birth interval of less than 1 year which is statistically significant at 90 % and 95% confidence levels ($p<0.1, 0.05$).

Model II extends Model I through the addition of socioeconomic factors including maternal education, paternal and maternal occupation (Table 2). The probability of under-five mortality is high among younger mothers and those with birth interval of less than 2 years. The relationship of first birth age, maternal age and under-five mortality is not altered in the presence of maternal and socioeconomic variables. Model II presented in Table 2 also shows the effect of socioeconomic variables after controlling for maternal variables. It was revealed that socioeconomic factors do not have a significant effect on under-five mortality ($p>0.1$).

Model III adds controls for two household amenities, namely water source and toilet/latrine facilities (Table 3). The results revealed that under-five mortality was significantly high among households that use borehole water ($p<0.05$) and insignificantly high among households that use latrine ($p>0.05$).

CONCLUSIONS

The odd ratios of logistic estimates revealed that under-five mortality was significantly high at 95% confidence level among mothers who had first birth below 20 years of age, maternal age at birth of less than 20 years, previous birth interval of less than 2 years and households that use borehole water. Other factors like maternal education, maternal/paternal occupation, and latrine/toilet use were insignificantly related to under-five mortality. Hence, it was recommended that campaign against early marriage and teenage pregnancy be explicitly done, mothers be encouraged to exclusively breastfeed for at least two (2) years, mothers be sensitized about the advantages of family planning, personal hygiene, and good sanitation be continuously practiced.

REFERENCES

1. Adetunji, J. 2000. "Trends in Under-5 Mortality Rates and the HIV/AIDS Epidemic". *Bulletin of the World Health Organization*.

2. Ahmad, O.B., A.D. Lopez, and M. Inoue. 2000. "The Decline in Child Mortality: A Reappraisal". *Bulletin of World Health Organization*.

3. Allen, K. and R. Gideon. 2013. "The Effects of Household Characteristics on Child Mortality in Uganda". Makerere University, Kampala, Uganda Institute of Statistics and Applied Economics.

4. Anton, D., F. John, and R. Alexander. 2011. "Demography and Economic Growth in Uganda". Poverty Reduction and Economic Management Unit, Africa Region. World Bank. No.63165-UG, pp 33-34.

5. Assefa, N., A. Gebeyehu, B. Terefe, G. Tesfayi, and R. Pearson. 2013. "An Analysis of the Trends, Differentials and Key Proximate Determinants of Infant and Under-five Mortality in Ethiopia". *Journal of Applied Sciences*. 1(2):23-34.

6. Cornelia, K. 2010. "Determinants of Infant and Under-Five Mortality-Case of Jordan". Department of Economics and Social Affairs, United Nations.

7. Curtis, S.L and J.W. McDonald. 2012. "Birth Spacing and Infant Mortality in Brazil". *Journal of Biosocial Science*.

8. Davanzo, J. 2010."A Household Survey of Child Mortality Determinants in Malaysia". *Population and Development Review*. 10: 307-322.

9. Fantahun, M., Y. Berhane, S. Wall, and U. Högberg. 2007. "Crucial Factors for Child Survival in Ethiopia". *Women's Involvement in Household Decision-Making and Strengthening Social Capital*.

10. Gloria, M. and G. Gebrenegus. 2003. "Inequalities in Child Mortality in Mozambique: Differentials by Parental Socio-Economic Position". Center for Health Equity Studies, Stockholm University, Sweden. *Journal of Social Science and Medicine*. 53:2259-2262.

11. Hamner, L., R. Lensink, and H. White. 2003. "Infant and Child Mortality in Developing Countries: Analyzing the Data for Robust Determinants". *Journal of Development Studies*.

12. Hill, K., J. Bicego, and M. Mahy. 2001. "Childhood Mortality in Kenya: An Examination of Trends and Determinants in the Late 1980s to mid-1990s".

13. Hisham, E.M. 2008. "Socio-Economic Determinants of Infant Mortality in Kenya". *Published Journal*. Volume 2.

14. Hong, R., A. Mohamed, S. Rutstein, and S. Ruilin. 2009. "Childhood Mortality in Rwanda Levels, Trends, and Differentials": *Further Analysis of the Rwanda Demographic and Health Surveys Data*. ORC Macro: Calverton, MD.

15. Hossain, A., S. Nahid, M.H. Ershadul, and B. Wasimul. 2014. "Consequences of Intimate Partner Violence Against Women on Under-Five Mortality in Bangladesh". *Journal of Interpersonal Violence*. 29(8):1402- 1417.

16. Jacoby, H. and L. Wang. 2003. "Environmental Determinants of Child Mortality in Rural China: A Competing Risks Approach". World Bank: Washington, D.C.

17. Jerico, F.P. and A. Timothy. 2011."Measuring Sub National Under-5 Mortality in the Eastern Indonesian District of Ende". *Asia-Pacific Journal of Public Health*. 26(4):367-377.

18. John, L.O. 2013. "Maternal Age at Birth and Child Mortality in Yoruba Society Nigeria, University of Lagos". *Research on Humanities and Social Sciences*. 3(1).

19. Kazembe, L., A. Clarke, and N.B. Kandala. 2012. "Childhood Mortality in Sub-Saharan Africa, Cross-Sectional Insight into Small-Scale Geographical Inequalities from Census Data".

20. Limin, L. 2003. "Determinants of Child Mortality in LDCs: Empirical Findings from Demographic and Health Surveys". *Health Policy*.

21. Macassa, B., et al. 2011. "Inequalities in Child Mortality in Mozambique: Differentials by Parental Socio-Economic Position". *Journal of Social Science and Medicine*. 57(12): 2255-2264.

22. Mesganaw, F. 2008. "Mortality and Survival from Childhood to Old Age in Rural Ethiopia, School of Public Health". UMEA University Medical Dissertations. 1153:490-498.

23. Mosley, W.H. and L.C. Chen. 1984. "An Analytical Framework for the Study of Child Survival in Developing Countries". *Population and Development Review*.

24. Mutunga, C.J. 2004. "Environmental Determinants of Child Mortality in Kenya". Kenya Institute for Public Policy Research and Analysis (KIPPRA), Nairobi, Kenya.

25. Nasejje, J. 2013. "Application of Survival Analysis Methods to Study Under-Five Mortality in Uganda". University of KwaZulu-Natal, School of Mathematics, Statistics and Computer Science.

26. Nestar, L.O. 2009. "The Determinants of Persistent Child Mortality Trend in Uganda". Maastricht University, Maastricht Graduate School of Governance.

27. Nutiye, S. 2009. "Determinants of Infant Mortality in Turkey". School of Social Science of Middle East Technical University.

28. Nuwaha, F., J. Babirye, and N. Ayiga. 2011."Why the Increase in Under Five Mortality in Uganda from 1995 to 2000?". A Retrospective Analysis, BMC Public Health.

29. Rutstein, S.O. 2000. "Factors Associated with Trends in Infant and Child Mortality in Developing Countries during the 1990s". *Bulletin of the World Health Organization*.

30. Rutstein, S.O. 2008. "Further Evidence of the Effects of Preceding Birth Intervals on Neonatal, Infant, and Under-Five-Years Mortality and Nutritional Status in Developing Countries: Evidence from the Demographic and Health Surveys". Demographic and Health Research Division, Macro International: Calverton, MD.

31. Ssengonzi, G.F., R. De Jong, and S.C. Shannon. 2002. "The Effect of Female Migration on Infant and Child Survival in Uganda". *Population Research and Policy Review*.

32. Ssewanyana, S. and S. Younger. 2008. "Infant Mortality in Uganda: Determinants, Trends and the Millennium Development Goals". *Journal of African Economies.*

33. Uddin, H.J., M.O. Ullah, et al. 2009. "Child Mortality in a Developing Country: A Statistical Analysis". *Journal of Applied Quantitative Methods.*

34. Uganda Bureau of Statistics. 2006. *Demographic and Health Survey 2006*. Kampala, Uganda.

35.
Uganda Bureau of Statistics. 2014b..*Uganda National Population and Housing Census: Provisional results, November 2014*. Kampala: Uganda.

36. Unnati, R.S. and S. Arthur. 2012. "Does Family Planning Reduce Infant Mortality? Evidence from Surveillance Data in Matlab, Bangladesh". Working Paper, Tilburg University. Electronic copy available at:http://ssrn.com/abstract=2009853

37. Wang. L. 2002. "Health Outcomes in Poor Countries and Policy Options": *Empirical Findings from Demographic and Health Surveys, World Bank Policy Research*.

38. World Bank. 2011. "An Econometric Analysis for the Determinants of Under-Five Mortality in Uganda". *Uganda Demographic and Economic Growth*.

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