African Journal of Emerging Issues
Peer reviewed | Double blind | Interdisciplinary

African Journal of Emerging Issues
(AJOEI)
Online ISSN: 2663 - 9335
Available at: https://ajoeijournals.org

ECONOMICS

PER CAPITA INCOME, PUBLIC HEALTH EXPENDITURE, MATERNAL CARE UTILIZATION AND THEIR EFFECTS ON INFANT MORTALITY RATE IN KENYA

[*1]Beatrice Nduta & [2]Isaac Kimunio

[1]Student, School of Business, Economics and Tourism, Kenyatta University

[2]Lecturer, School of Business, Economics and Tourism, Kenyatta University

***Email of the Corresponding Author: thuknduta@gmail.com**

Publication Date: May 2024

ABSTRACT

Purpose of the Study: The study aimed to determine the effects of per capita income, public health expenditure, and maternal care utilization on the infant mortality rate in Kenya.

Problem Statement: Despite significant strides in reducing the infant mortality rate, many families in Kenya still face challenges in accessing high-quality medical care due to factors such as distance to healthcare facilities, lack of transportation, and poverty.

Methodology: The research utilized time series data from the World Bank database spanning from 1991 to 2020. The Autoregressive Distributed Lag Model (ARDL) is estimated using the STATA software tool. The Grossman Health Capital Model is applied in the study. Key components include the dependent variable (infant mortality rate) and factors such as public health spending, per capita income, and maternal care utilization. The mother's educational level serves as the control variable.

Results: Contrary to other studies, this research finds no correlation between maternal care utilization (i.e., births attended by trained medical professionals and pregnant women who utilize prenatal care) and infant mortality. However, public health expenditure and per capita income show statistically significant positive effects on infant mortality rates, diverging from existing literature.

Conclusion and Policy Recommendation: Policies aimed at improving the efficiency of public health spending and the distribution of per capita income, while addressing barriers to maternal care access, are essential for achieving faster reductions in infant mortality in Kenya.

Keywords: *Per Capita Income, Public Health Expenditure, Maternal Care Utilization, Infant Mortality Rate*

INTRODUCTION

Infant mortality has long been a concern for public health professionals, policymakers, and social scientists (Wang & Wu, 2020). It serves as a crucial indicator of a country's healthcare infrastructure, socioeconomic conditions, and overall well-being. The World Health Organization defines infant mortality as the mortality rate of infants under one year old, typically represented as a rate per 1,000 live births (WHO, 2021). A high infant mortality rate signifies not only a loss of life at its most vulnerable stage but also systemic failures in healthcare access, quality of prenatal and postnatal care, and broader social inequalities (UNICEF, 2019). Infant mortality rates often inversely correlate with factors such as per capita income, educational attainment, and healthcare spending (Mackenbach et al., 019). Managing infant mortality is vital due to several compelling reasons. Each instance of an infant's death is a profound human tragedy that deeply affects families and communities emotionally, with lasting consequences (Harris, 2018). At a societal level, high rates of infant mortality have significant implications, including a reduced workforce and increased long-term healthcare expenditure (Aizer & Currie, 2014).

Efforts to decrease infant mortality rates can lead to improvements in overall public health and provide economic benefits by enhancing productivity and reducing healthcare costs (Raghupathi & Raghupathi, 2020). Further, reducing infant mortality is strongly associated with achieving broader developmental objectives, such as education and gender equality (Schellekens, 2021). Given its extensive implications for both individual families and society, infant mortality remains a priority for research and policy intervention. It is essential to examine various determinants of infant mortality, such as per capita income, public health expenditure, and maternal care utilization, especially in developing countries where the rates are often alarmingly high. This section provides a brief background to the study, highlights the main research problem, objectives, questions, and the significance of determining the factors affecting infant mortality rates in Kenya.

STATEMENT OF THE PROBLEM

Despite the current rate of 31.8 fatalities per 1,000 live births, a result of Kenya's success in reducing infant mortality over the past 20 years, the rate in 2022 remains higher than global and regional standards (WHO, 2019; UN IGME, 2022). This rate equates to over 100,000 infant deaths annually, indicating that Kenya is falling short of the Sustainable Development Goal (SDG) target

of achieving a global newborn death rate of 12 per 1,000 live births by 2030 (UNDP, 2022). A significant factor underlying Kenya's challenges with higher-than-expected infant mortality is inadequate health financing to ensure universal access to quality maternal and newborn health services (Barasa et al., 2018). The total health expenditure per capita was $82 in 2019, below the $271 per capita target defined in Kenya's Vision 2030 development plans (Ministry of Health, 2020). Out-of-pocket spending accounted for over a quarter of the total expenditure, imposing financial hardship on households (WHO, 2020). This leads to socioeconomic inequities, where infants from low-income families with limited budgetary allocation to health face a disproportionately higher mortality risk (Mogeni et al., 2019).

Further, an analysis of the key drivers of newborn fatalities in Kenya indicates that the most prevalent causes are preventable or treatable conditions, provided there is adequate access to skilled maternal care and immediate postnatal services (UN IGME, 2022; WHO, 2019). This underscores the critical need to improve health infrastructure and workforce capabilities while also promoting the utilization of essential services among vulnerable communities. Progress across social, economic, and health systems determinants of infant survival must be accelerated to reach the set SDG targets. In addition, previous studies have found associations between socioeconomic factors like household wealth and maternal education and infant mortality in Kenya (Muraya et al., 2021; Akombi et al., 2019). Rural-urban disparities in access to water, sanitation, and health facilities have also been linked to infant mortality differentials (Egede et al., 2017). At the county level, research indicates that higher healthcare spending has reduced infant deaths, though overall health expenditure remains below recommended levels (Njuguna et al., 2017). However, there remains a research gap in concurrently examining the impacts of income, health financing, and maternal healthcare utilization on infant mortality.

RESEARCH OBJECTIVES

The general objective of the study is to assess the determinants of infant mortality in Kenya. The specific objectives are:

i. To determine the effect of per capita income on infant mortality in Kenya.
ii. To determine the effect of public health expenditure on infant mortality in Kenya.
iii. To establish the effect of maternal care utilization on infant mortality in Kenya.

RESEARCH QUESTIONS

i. What is the effect of per capita income on infant mortality rates in Kenya?
ii. How does total and public health expenditure affect trends in infant mortality in Kenya?
iii. Does maternal care utilization significantly influence infant mortality rates in Kenya?

THEORETICAL LITERATURE

The Grossman model, developed by Michael Grossman in the early 1970s, is a component of his comprehensive research on health economics (Grossman, 1972). The model views health as a durable resource that yields the result of time spent in good health (Grossman, 1972a). Individuals acquire health capital through activities such as physical exercise, maintaining a balanced diet, and seeking medical treatment. Similar to any investment, the human body undergoes a depreciation rate due to the natural process of aging and physical deterioration (Grossman, 2000). The Grossman model posits that individuals are rational agents who allocate resources towards their health after conducting a thorough cost-benefit evaluation (Grossman, 1972b). According to Grossman (1999), the desire for good health stems from the satisfaction or joy that 'healthy time' provides. Additionally, the model suggests that there are economic trade-offs involved in both the creation and depreciation of health capital. Decisions may be influenced by factors such as income, education, and healthcare costs (Wagstaff, 1986).

The primary advantage of the Grossman model is its pioneering framework for understanding healthcare demand and health behaviors (Culyer, 1985). Empirical testing and other studies have shown that income, education, and healthcare prices all influence health investment behaviors (Kenkel, 1991; Grossman & Kaestner, 1997). Moreover, the model's conceptualization of health as a form of capital that can depreciate over time has provided important insights into the economics of aging and long-term health investments (Galama & van Kippersluis, 2010). Critics argue that the Grossman model overemphasizes economic factors, neglecting social impacts on health (Lynch, 2000). Furthermore, questions have been raised about the model's assumptions regarding rational behavior and the consistency of depreciation rates. Behavioral economics research suggests that individuals may not always make rational decisions when it comes to investing in their health. Changes in medical technology may also affect the rate at which the value of health capital declines over time (Cutler & Lleras-Muney, 2010).

The Grossman model is particularly relevant to current research. For instance, per capita income and budget allocation to the health sector might be considered as variables influencing the 'price' and 'quantity' of health capital, thereby affecting infant mortality rates. By linking economic factors to health outcomes, this can add depth to the research (Grossman, 1972; Wagstaff, 1986).

EMPIRICAL LITERATURE

Effect of Per Capita Income on Infant Mortality

Erdoğan et al. (2013) conducted a study on 25 high-income OECD nations between 1970 and 2007 to examine the correlation between neonatal mortality rate and economic development. The research explored the link between GDP growth and infant mortality rate using panel data analytics. The study found a negative correlation between real per capita GDP and the newborn death rate, indicating that as a nation's per capita income rises, the infant mortality rate falls. The research concluded that a lower infant mortality rate is associated with a stronger economy. This study focused on high-income OECD countries, while the current study focuses on Kenya, which has a different economic and healthcare context. Ude and Ekesiobi (2019) carried out a study to examine the impact of per capita health expenditure on Nigeria's child mortality rate. The research used a multiple regression approach and secondary data spanning from 1980 to 2012. The researchers in Nigeria found that neonatal and newborn mortality rates were not affected by per capita health expenditure. However, the study found that per capita spending on healthcare and education significantly impacts Nigeria's infant mortality rate.

Animashaun (2019) analyzed child mortality rates and GDP per capita across 99 oil-rich countries. To calculate per capita income, the researchers used a dummy variable indicating whether a country was a European colony from the 16th to the 19th century. The research also included oil-price shocks and cross-sectional variance in oil discoveries. Regardless of the criteria used, the research found no statistically significant relationship between income and infant mortality. The research concluded that reducing infant death rates could be achieved through better use of rent funds and initiatives that economically empower women.

Tejada et al. (2019) researched the effects of economic crises on children's health worldwide and in different groups of nations with varying income levels. The study used a fixed effects model to examine the impact of several variables on rates of newborn, infant, and under-five mortality,

including GDP per capita, inflation, unemployment, and misery index data. The research found negative correlations between child mortality rates and GDP per capita, inflation, unemployment, and misery index. This correlation was also observed in subsamples stratified by income, with lower and medium-income nations seeing the most benefits. Additionally, the research found that increases in infant mortality rates are less affected by economic factors when public health expenditure is higher.

Rivero and Acuna (2021) conducted a study to determine the correlation between income and infant mortality. The study examined U.S. data on child mortality from 1975 to 2004 and how income affected it using a two-stage least squares (2SLS) instrumental variable (IV) technique. The research found that for every $1,000 increase in state per capita income, newborn mortality drops by 0.53 occurrences for every 1,000 children of a certain age, and a decrease of 0.87 cases of child mortality for every 1,000 children of that age. The study concluded that income-boosting policies, such as the Earned Income Tax Credit, may be effective in reducing child mortality.

Effect of Public Health Expenditure on Infant Mortality

Barenberg et al. (2017) conducted a study to determine the extent to which India's public health budget affects the country's infant mortality rate (IMR). The researchers utilized a panel data collection that included information on Indian states from 1983–1984 to 2011–2012. The research found that government health spending lowers the IMR. If public health expenditure were to increase by 1% of state GDP, the infant mortality rate (IMR) would drop by around nine per 1,000 live births. Other factors found to lower the IMR include political rivalry, female literacy, and urbanization. This research showed that funding for public health significantly decreased the rate of infant death in India. The research concluded that to effectively decrease infant death rates, the Indian government should enhance expenditure on public health.

Murunga et al. (2019) investigated how Kenya's public health budget affected people's health. The research used an Error Correction Model (ECM) to estimate a health production function for Kenya. Time series data was collected from 1984 to 2015. The rate of infant mortality was used as a health outcome metric. On average, the research indicated that public investment affects health outcomes in Kenya. The study presents a gap in literature since it looked at the effectiveness of public health spending while the current study focused on determinants of infant mortality

including per capita income, public health spending, and maternal care utilization on infant mortality in Kenya. Kiross et al. (2020) conducted a study to evaluate the effect of health care spending on newborn deaths in the sub-Saharan African region. Both separate and complementary health systems expenditures were significantly negatively correlated with newborn and neonatal death. Private health spending was not strongly linked to newborn or neonatal death. The research showed that health-care investment is crucial for decreasing newborn and neonatal mortality in Sub-Saharan African nations.

Dhrifi (2020) examined how public health expenditure affects newborn health, taking institutional quality into consideration. From 1995 to 2015, 93 industrialized and developing nations were analyzed using a two-step system dynamic GMM. Only high-income nations demonstrated positive and substantial effects of healthcare spending on the death rate for infants. Health spending has little effect on infant health in countries with low, moderate, and high incomes. The study also found that lower-middle-class, upper-middle-class, and impoverished nations must spend a particular percentage of GDP on public health to reduce infant mortality. The research also found that institutional quality mediates health spending-infant mortality relationships. According to the study, public health spending is an important factor in reducing infant mortality, but its effectiveness is dependent on income and institutional quality.

Manda et al. (2020) conducted a study to investigate how public health spending impacted health outcomes. The research used a chronological data set extending from 1970 to 2018. Both the short-term and long-term effects were evaluated using the Autoregressive Distributed Lag (ARDL) model correlations between health outcomes and public health expenditures. One indicator of health status was the infant mortality rate. The research found that health outcomes in Kenya are positively and significantly affected by public health expenditure. According to the research, national wealth and the number of hospital beds per 100,000 people are also key predictors of health outcomes in Kenya. The research concluded that the Kenyan government should raise health spending each year. Kenyans should expect better health outcomes as a consequence of this increase in funding for health-related investments in both physical and human capital.

Maternal Care Utilization and Infant Mortality

Kamau (2016) conducted a research study on the factors influencing the use of maternity healthcare services in Kenya. The research utilized data from the 2014 Kenyan Census and Health Survey (KDHS). Prenatal care, in-hospital delivery, and postpartum care were all evaluated using three separate binary logistic regression models. The study showed that antenatal care use was greater in areas with a higher degree of education, wealth index, and media exposure, with the exception of North Eastern and Nyanza. Factors such as urban residency, income quintiles, regions, and secondary education were associated with an increased likelihood of hospital delivery. The likelihood of mothers using postnatal care increased with age, birth order, middle-and upper-class income quintiles, and central locations. The study concluded that investing in female education and programs to improve household wealth status could promote maternal health service usage. Involving religion and improving service delivery in North Eastern and Nyanza regions can also increase utilization. Compared to the current study, this study identified additional factors like religion and regional disparities affecting maternal health service use in Kenya.

Kimanzi (2020) conducted a research study on how antenatal care (ANC), postnatal care, and maternal health services affected the infant mortality rate in Kenya. The study found a significant decrease in newborn death rates among teenage mothers who attended ANC and PNC visits at least once. The study also indicated that infant mortality was higher among teen mothers who had caesarean sections as opposed to those who gave birth naturally. Infant mortality was more often reported by teenage mothers with a primary education, and the research indicated that second-order birth babies had a higher risk of dying in the first year compared to first-borns, when considering socioeconomic characteristics. Compared to the current study on maternal care utilization and infant mortality in Kenya, this study specifically focused on the adolescent mother population and identified unique risk factors like C-section deliveries and second-order births. The current study could build on these findings by examining maternal care utilization and outcomes across a wider maternal age range.

Hastono et al. (2023) conducted a research study on pregnant women's risky behaviors, healthcare use, and factors influencing the incidence of under-five mortality (U5M) in seven developing Asian countries. The research used demographic health survey data and multivariate logistic regression models. Compared to mothers whose children were born at a normal weight and who

had eight or more prenatal care visits, those whose babies were born at a low weight or who did not receive any prenatal care had a U5M that was almost three times greater. U5M in Indonesia was 2.34 times more than the category used as a reference. In addition, prenatal care was identified as a predictor of lower U5M rates in the research. In order to significantly reduce U5M, the research recommended implementing intervention programs that promote prenatal care visits. Compared to the current study, this study examined multiple Asian countries and identified risks like low birth weight and lack of antenatal care associated with higher U5M.

RESEARCH METHODOLOGY

The study utilized secondary data for the period spanning 1991 to 2020 from the World Bank database to ensure consistency. Several diagnostic tests were conducted, including the Skewness and Kurtosis test to assess whether the error term was normally distributed, the Wooldridge test to determine if the error terms in the regression model were correlated over time, the Breusch-Pagan test to evaluate whether the variance of errors was consistent across all levels of the predictor variables, the Augmented Dickey-Fuller unit root test to assess whether the variables in the model were stationary, and the VIF (Variance Inflation Factor) test to check for excessive collinearity between the predictor variables. The study was grounded on the Grossman model, and the estimation technique employed was the Autoregressive Distributed Lag Model (ARDL) using the STATA software tool. The key components comprised the dependent variable, which was the rate of infant mortality, the factors, which included public health spending, per capita income, and usage of maternity care, and the control variable, which was the mother's educational level.

FINDINGS AND DISCUSSION

The variables were utilized to achieve the objectives of the study and provide insights into the factors influencing infant mortality in Kenya. This was done after ensuring the validity of the regression model through appropriate diagnostic tests. The results, which illustrate the relationship between these variables, are presented in Table 1.

Table 1: Regression Results

Mortality rate	lags	Coef.	Std. Err.	t	P>t
Current health expenditure	-	0.9791799	0.3196761	3.06	0.008
Births attended by skilled health staff	-	0.0062958	0.0442476	0.14	0.889
	L1.	-0.0160152	0.061828	-0.26	0.799
	L2.	-0.1060912	0.0605435	1.75	0.100
Pregnant women receiving prenatal care	-	-0.0277347	0.0140198	-1.98	0.067
Literacy rate, adult female	-	-0.0258082	0 .0182951	-1.41	0.179
	L1.	-0.0343829	0 0169494	-2.03	0.061
	L2.	-0.0529836	0 .0163804	-3.23	0.006
Adjusted net national income per capita	-	0 .0025678	0 .0169913	0.15	0.882
	L1.	0 .0437355	0 .0201151	2.17	0.046
_cons	-	-4.272907	3.409393	-1.25	0.229
Number of observations		28			
F (12, 15)		3916.38			
P-value		0.0000			
R-squared		0.9997			
Adj R-squared		0.9994			
Root MSE		0.3268			

The data shows that with all other factors held constant, the new-born death rate increases by 0.9791799 units for every one unit increase in current health spending. This indicates that increasing health spending does not currently lower infant death rates in Kenya. The t-value of 3.06 and the corresponding p-value of 0.008 suggest a significant relationship between current health spending and mortality rate at the 5% level of significance. This contradicts previous research, suggesting that current health spending has a significant positive impact on the new-born death rate. When other variables are held constant, a one-unit increase in births attended by skilled health staff results in a 0.0062958 unit increase in the infant mortality rate in the current period (lag 0), a 0.0160152 unit decrease at one period ago (lag 1), and a 0.1060912 unit decrease at two periods ago (lag 2). However, the effect is statistically insignificant at the 5% level. There is a

0.0277347 unit decrease in the infant mortality rate for every one unit increase in pregnant women receiving prenatal care, assuming all other variables remain constant. Both the t-value (-1.98 at the 5% significance level) and the p-value (0.067) show that the impact is not statistically significant.

In addition, holding all else constant, a one-unit increase in the literacy rate among adult females results in a decrease in the infant mortality rate in the current period, lag 1, and lag 2. However, the effect is statistically insignificant at the 5% significance level for lag 0 and lag 1, but significant at the 5% level for lag 2. Lastly, a one-unit increase in adjusted net national income per capita results in a 0.0025678 unit increase in the infant mortality rate in the current period (lag 0), and a 0.0437355 unit increase in lag 1. This association is not significant at the 5% level of significance. Therefore, at a 5% level of significance, current health expenditure, adjusted net national income per capita at lag 1, and literacy rate among adult females at lag 2 have statistically significant effects on the infant mortality rate, while the effects of pregnant women receiving prenatal care, and births attended by skilled health staff are insignificant. The F-statistic (3916.38) and p-value (0.0000) values indicate that the overall model is statistically significant, meaning it explains the relationship between the variables better than random chance. The very high R-squared (0.9997) and Adjusted R-squared (0.9994) values suggest the model explains a very large proportion of the variation in the infant mortality rate. The Root MSE (0.3268) represents the standard deviation of the residuals (errors) in the model, with a lower value indicating a better fit.

CONCLUSION

The regression results indicate that per capita income and public health expenditure have a significant impact on infant mortality rates in Kenya. However, the effects of maternal care utilization are statistically insignificant. In addition, current health spending has a positive and statistically significant influence on the new-born mortality rate, contradicting previous research. The effect of per capita income on infant mortality rates is also significant, but it deviates from some studies that found a negative relationship between income and infant mortality rates. The study also reveals contrasting effects of maternal care utilization indicators on infant mortality rates in Kenya. While skilled birth attendance and prenatal care are generally considered determinants of lower infant mortality rates, the study found these factors to have an insignificant effect on mortality rate in Kenya. These findings suggest that while economic factors play a role, other factors such as the quality and frequency of prenatal care visits, access to skilled healthcare

providers, and other contextual factors specific to the Kenyan healthcare system may be more influential in determining infant mortality rates.

RECOMMENDATIONS

This study emphasizes the need for sustained investment in public health and improved income distribution to combat infant mortality in Kenya. Policymakers should increase healthcare expenditure, particularly in underserved areas, and implement policies that promote economic growth and improve healthcare access. The study also recommends enhancing the quality and accessibility of prenatal care services, and addressing socio-cultural barriers to healthcare utilization. These strategies provide a clear path towards reducing infant mortality in Kenya.

REFERENCES

Akombi, B. J., Agho, K. E., Renzaho, A. M., Hall, J. J., & Merom, D. R. (2019). Trends in socioeconomic inequalities in child undernutrition: Evidence from Nigeria Demographic and Health Survey (2003–2013). *PloS one*, *14*(2), e0211883. https://doi.org/10.1371/journal.pone.0211883

Animashaun, J. O. (2019). Income and Child Mortality in Oil-Rich Countries: Evidence from Oil-Price shocks and European Colonial Experience.

Barenberg, A. J., Basu, D., & Soylu, C. (2017). The effect of public health expenditure on infant mortality: evidence from a panel of Indian states, 1983–1984 to 2011–2012. *The Journal of Development Studies*, *53*(10), 1765-1784. https://doi.org/10.1080/00220388.2016.1241384

Cutler, D. M., & Lleras-Muney, A. (2010). Understanding differences in health behaviors by education. *Journal of health economics*, *29*(1), 1-28. https://doi.org/10.1016/j.jhealeco.2009.10.003

Dhrifi, A. (2020). Public health expenditure and child mortality: does institutional quality matter? *Journal of the Knowledge Economy*, *11*(2), 692-706. https://doi.org/10.1007/s13132-018-0567-4

Egede, L. E., Voronca, D., Walker, R. J., & Thomas, C. (2017). Rural-urban differences in trends in the wealth index in kenya: 1993-2009. *Annals of Global Health*, *83*(2), 248-258. https://doi.org/10.1016/j.aogh.2017.04.001

Erdoğan, E., Ener, M., & Arıca, F. (2013). The strategic role of infant mortality in the process of economic growth: an application for high income OECD countries. *Procedia-Social and Behavioral Sciences*, *99*, 19-25. https://doi.org/10.1016/j.sbspro.2013.10.467

Grossman, M., Kaestner, R., & Markowitz, S. (2004). Get high and get stupid: The effect of alcohol and marijuana use on teen sexual behavior. *Review of Economics of the Household*, *2*(4), 413-441. https://doi.org/10.1007/s11150-004-5655-5

Harris, N. B. (2018). *The deepest well: Healing the long-term effects of childhood adversity*. Houghton Mifflin Harcourt.

Igme, U. (2020). Levels and Trends in Child mortality; 2021.

Kamau, L. M. (2016). *Determinants for utilization of free maternal services in Kenya* (Doctoral dissertation, University of Nairobi).

Kimanzi, S. (2020). *Maternal Health Care Services and Infant Mortality in Kenya* (Doctoral dissertation, University of Nairobi).

Kiross, G. T., Chojenta, C., Barker, D., & Loxton, D. (2020). The effects of health expenditure on infant mortality in sub-Saharan Africa: evidence from panel data analysis. *Health economics review*, *10*, 1-9. https://doi.org/10.1186/s13561-020-00262-3

Mackenbach, J. P., Valverde, J. R., Bopp, M., Brønnum-Hansen, H., Deboosere, P., Kalediene, R., ... & Nusselder, W. J. (2019). Determinants of inequalities in life expectancy: an international comparative study of eight risk factors. *The Lancet Public Health*, *4*(10), e529-e537. https://doi.org/10.1016/S2468-2667(19)30147-1

Manda, D. K., Mugo, M. G., & Murunga, J. (2020). Health expenditures and health outcomes in Kenya. https://doi.org/10.19044/esj.2020.v16n22p95

Mogeni, R., Mokua, J. A., Mwaliko, E., & Tonui, P. (2019). Predictors of contraceptive implant uptake in the immediate postpartum period: a cross-sectional study. *The European Journal of Contraception & Reproductive Health Care*, *24*(6), 438-443. https://doi.org/10.1080/13625187.2019.1670344

Muraya, K., Ogutu, M., Mwadhi, M., Mikusa, J., Okinyi, M., Magawi, C., ... & Molyneux, S. (2021). Applying a gender lens to understand pathways through care for acutely ill young children in Kenyan urban informal settlements. *International Journal for Equity in Health*, *20*, 1-15. https://doi.org/10.1186/s12939-020-01349-3

Murunga, J., Mogeni, E. G., & Kimolo, D. N. (2019). Public health spending and health outcomes in Kenya. https://doi.org/10.19044/esj.2019.v15n1p125

Njuguna, J., Kamau, N., & Muruka, C. (2017). Impact of free delivery policy on utilization of maternal health services in county referral hospitals in Kenya. *BMC health services research*, *17*(1), 1-6. https://doi.org/10.1186/s12913-017-2376-z

Ivero, C., & Acuna, P. (2021). RETRACTED: Income Shocks and Child Mortality Rates: Evidence from Fluctuations in Oil Prices. *Economics*, *9*(1), 69-83. https://doi.org/10.2478/eoik-2021-0002

Tejada, C. A. O., Triaca, L. M., Liermann, N. H., Ewerling, F., & Costa, J. C. (2019). Economic crises, child mortality and the protective role of public health expenditure. *Ciencia & saude coletiva*, *24*, 4395-4404. https://doi.org/10.1590/1413-812320182412.25082019

Ude, D. K., & Ekesiobi, C. S. (2019). Effect of per capita health spending on child mortality in Nigeria. *International Journal of Innovative Research and Development*, *3*(9), 1-4.

UNICEF. (2021). The state of food security and nutrition in the world 2021: transforming food systems for food security, improved nutrition and affordable healthy diets for all.

Wagstaff, A. (1986). The demand for health: some new empirical evidence. *Journal of Health economics*, *5*(3), 195-233. https://doi.org/10.1016/0167-6296(86)90015-9

Wang, H., Huang, J., & Yang, Q. (2019). Assessing the financial sustainability of the pension plan in China: The role of fertility policy adjustment and retirement delay. *Sustainability*, *11*(3), 883. https://doi.org/10.3390/su11030883

World Health Organization. (2021). United Nations Children's Fund, World Bank Group. *Nurturing care for early childhood development: a framework for helping children survive and thrive to transform health and human potential*.