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# Population Growth, Economic Development, and their Impact on Death Rate in Kenya (1960-2024)

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**ABSTRACT**

This paper is an exploration of the Kenyan death rate, aiming to determine the contribution of population and GDP per capita. Using a multiple linear regression model, the result is statistically significant. The results have shown that the larger the population, the higher the death rate ($B_1 = 0.0075$, $p < .001$), and the greater the GDP per capita, the lower the death rate ($B_2 = -46.25$, $p < .001$. The overall model is highly significant, with an R-squared value of 0.95, indicating that population and GDP per capita together explain 95% of the variation in death rates, leaving about 5% to be explained by other factors not present in the model. These findings indicate that although high economic growth could lead to better health outcomes and reduced mortality, the pressure of an increasing population could pose challenges to the health systems of the population. The paper confirms policy recommendations to enhance the infrastructure in health care, control population explosion, voluntary family planning, and economic development that is inclusive and translates to practical health gains to the people.

**Keywords:** Death rate, Kenya, public health, regression analysis, population, GDP per capita.

## 1.0 Introduction

The health of a country's population is one of the key indicators of development and the well-being of its citizens. Mortality rates are especially sensitive indicators of the adequacy of health policy, the resilience of the healthcare system, and the general state of the socio-economic situation (World Health Organization [WHO], 2021). In third-world nations such as Kenya, the drivers of mortality are important in the design of specific interventions and efficient allocation of resources.

There have been major demographic and economic transformations in Kenya over the last few decades. Although some health indicators have improved, the country is still struggling with problems of infectious diseases, maternal and child deaths, and a new burden of non-communicable diseases (Kenya National Bureau of Statistics [KNBS], 2019). Population growth increases the demand for social services, which introduces a challenge in the health sector, that is, the strain on limited available resources (Bloom et al. 2010). An increasing GDP per capita, which is an indicator of an increasing average economic well-being, is linked to lower mortality rates. Higher income facilitates access to good healthcare, food, and improved living conditions (Preston, 1975).

This paper seeks to empirically analyze the association between the rate of death, total population, and GDP per capita in Kenya. This research attempts to make a contribution to the existing body of literature and policy debates on public health and economic planning by quantifying such relationships.

### *1.1 Background of the study.*

Over the past three decades, Kenya has experienced a lot of demographic and economic transformation.

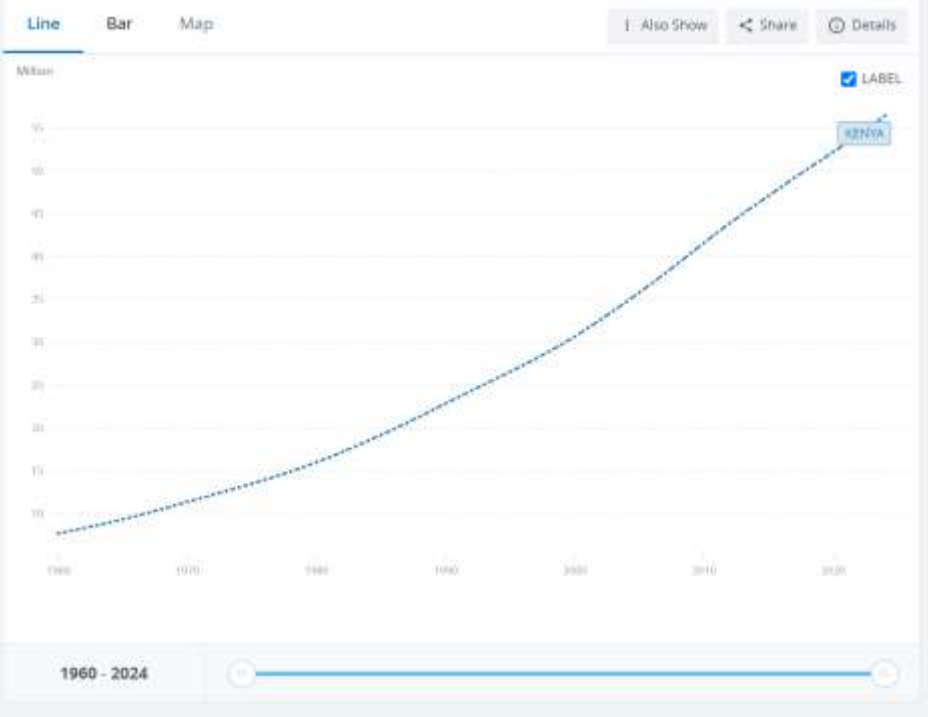


*Figure 1 Kenya's Population growth, source World Bank, 2025*

From the above figure, Kenya's population has been increasing steadily due to high fertility rates and falling infant mortality, but that increase has caused enormous strains on healthcare, housing, and infrastructure (Kenya National Bureau of Statistics [KNBS], 2023).

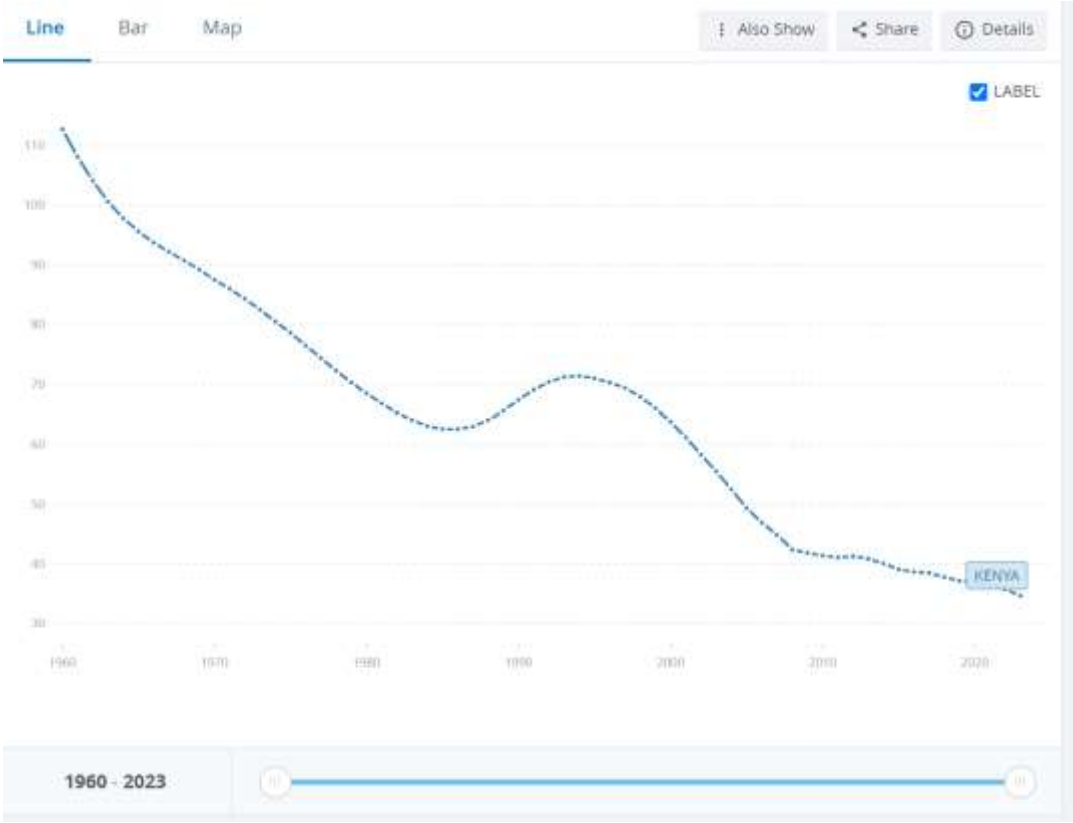


*Figure 2: Infant Mortality rate, source World Bank, 2025*

Figure 2 shows the declining infant mortality rates primarily associated with the prevention and management of key medical and social risk factors. The leading causes of infant death include preterm birth and low birth weight, sudden infant death syndrome (SIDS), congenital anomalies (birth defects), maternal complications of pregnancy, and accidents (unintentional injuries). The decline in the infant mortality rate can be attributed to the targeted interventions, such as access to quality prenatal and postnatal care, including midwife-led continuity care, essential newborn care practices, such as

thermal protection (skin-to-skin contact), early and exclusive breastfeeding, and timely vaccination. Generally, a combination of medical care, public health measures, and addressing social inequalities will reduce infant mortality.

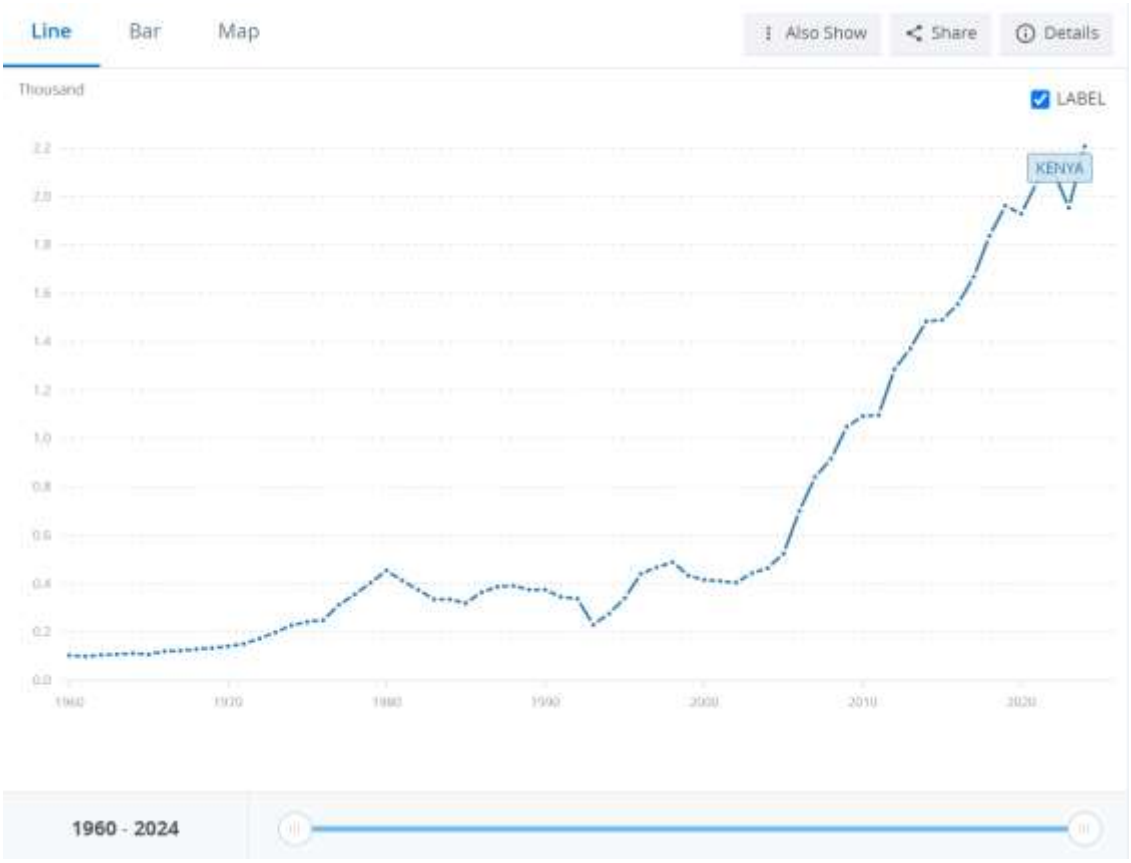


*Figure 3: Kenya's GDP per capita (current US$), source World Bank, 2025*

Figure 3 shows how the economy has grown, although there have been periods of stagnation and inequality in per capita income growth. Population pressure and unstable economic performance have presented a dual challenge that has impacted the mortality outcomes. As an illustration, in the late 1990s and early 2000s, Kenya experienced high death rates due to the HIV/AIDS epidemic, whereas in the 2010s, healthcare infrastructure and economic growth progress helped to decrease the death rates (Odhiambo, 2020). It will be an eye-opener because the analysis will determine the extent to which population increase and GDP/capita change together affect mortality rates in Kenya.

## 2.0 Literature Review

### *2.1 Theoretical Literature Review*

#### *2.1.1 Grossman Model*

The model was developed by Michael Grossman (1972). Grossman postulates that health is a capital stock rather than a simple consumption good. Health deteriorates over time, due to factors like age, accidents, and illness. However, an individual can invest in his health stock to maintain its level through medical care, exercise, and proper diet, among other ways. Grossman models health production as:

$H_t = f(M_t, E_t, L_t, Z_t)$

$H_t$ = Health stock at time t

$M_t$ = Medical care

$E_t$ = Education (Improves the efficiency of producing health)

$L_t$ = Lifestyle choices (nutrition, exercise, smoking, etc)

$Z_t$ = Other goods and services that indirectly affect health.

Grossman therefore conceptualizes health as both a consumption (health directly provides utility) and an investment good (health increases, allowing more time for work). Utility is derived when a person feels good from being healthy, and output, by a person having the ability to work and earn income.

Over time, the health stock will be modeled as:

$H_{t+1} = H_t(1-\delta) + I_t$

$H_{t+1}$ is the health stock in the next period.

$\delta$ is the depreciation rate of health, which is higher for older individuals.

$I_t$ is the investment in health through good nutrition, healthcare, and income.

This paper is based on the Health Capital Model of Grossman, who views health as a form of consumption and also investment. According to the model, a greater income level helps in maximizing health investments and reducing mortality, and the shortage of resources due to the increase in population enhances the death rates.

### *2.1.2 Demographic Transition Theory*

The theory was developed by Frank W. Notestein (1945). It explains the shift in birth and death rates influenced by economic and social development. Notestein postulates that as countries develop economically, they transition from high fertility and death rates to low fertility and death rates. The demographic structure passes through 5 stages.

Stage 1, High Stationary, is characterized by high birth rates and high death rates. The population grows slowly. It is mainly found in pre-industrial economies.

Stage 2, Early Expanding, features declining death rates, linked to improvements in sanitation, medicine, and food supply. Birth rates remain high, leading to rapid population growth.

Stage 3, Late Expanding, reflects a period where declining birth rates are influenced by increased education, family planning, and shifting social values. With death rates remaining low, the population growth begins to slow down, marking an important transition in demographic patterns.

Stage 4, Low Stationary, has both low birth and death rates. The population either stabilizes or grows very slowly. It is most commonly observed in developed economies.

Stage 5, Declining, occurs when birth rates fall below death rates, leading to a shrinking population.

In Kenya, death rates have been greatly reduced as a result of improved healthcare and a decrease in child mortality. However, population growth remains high due to sustained fertility rates. As Kenya's GDP per capita increases and improvements are made in the health and education sectors, both fertility and death rates are expected to decrease further. This will help stabilize population growth.

### *2.1.3 Preston Curve*

Introduced by Samuel H. Preston (1975), the theory states the empirical relationship between GDP per capita (on the X-axis) and life expectancy (on the Y-axis). The explanation is that as income rises, life expectancy increases. The relationship, however, is nonlinear (Concave)

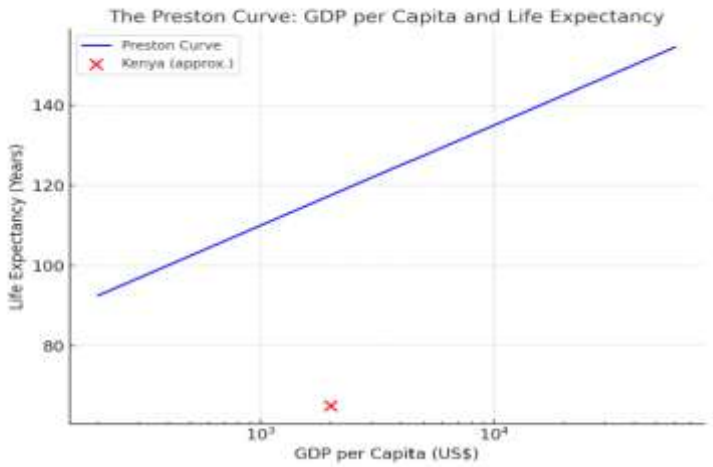


*Figure 4: Preston curve graph: GDP per capita and Life Expectancy*

As income rises, life expectancy also increases. At the lower income levels, a small increase in GDP per capita leads to large improvements in health, but at the higher income levels, the benefit in life expectancy from additional income becomes much smaller.

The Preston Curve is modeled as:

$$LE_t = \alpha + \beta ln(GDPpc_t) + \epsilon_t$$

Where:

$LE_t$ is life expectancy at time t

$GDPpc_t$ is GDP per capita at time t

$ln(GDPpc_t)$ is the log transformation to capture the diminishing returns.

Kenya fits in the steep part of the Preston Curve, where an increase in GDP per Capita still yields a significant death rate reduction.

### *2.2 Empirical Literature Review*

There is similar but varying evidence in the empirical studies across countries of the relations of population and economic growth and mortality:

#### *2.2.1 Population and Death Rate*

Bloom et al (2010) established that a fast rate of population growth has the potential to influence the health outcome of a developing country adversely unless accompanied by investments in health care. Unfavorable fertility rates in sub-Saharan Africa tend to be followed by an increase in mortality because of the overstretched resources (United Nations, 2019). Anyanwu and Erhijakpor (2009) carried out a study in sub-Saharan Africa and discovered that population density may have negative effects on health in that it overstretches the health facilities and sanitation systems. Nevertheless, the correlation is not that straightforward, because a greater population could result in economies of scale in service delivery when the population is properly managed.

#### *2.2.2 GDP per Capita and Mortality*

Preston (1975) established a negative relationship between mortality and GDP per capita powerful relationship between nations. Recently, Deaton (2024) endorsed that the increase in the level of income is associated with better health and increased life expectancy.

#### *2.2.3 Kenyan Research*

Odhiambo (2020) revealed that economic disparity mediates the effect of GDP per capita on health in Kenya. Equally, Mwabu (2009) highlighted that access to healthcare is a key factor in the conversion of economic growth to low mortality. Research has cited poverty, inaccessibility to clean water, and inaccessibility to maternal healthcare as some of the most important contributors to mortality (Mugisha & Zulu, 2004). Nonetheless, macroeconomic econometric studies modeling the effect of population and GDP per capita on the aggregate death rate in Kenya are scarce, a gap this study aims to fill.

In general, there is some literature evidence that population growth raises the risk of mortality in environments with limited resources, whereas GDP per capita decreases mortality by improving living conditions.

## 3.0 Methodology.

The study employs a quantitative research design, using time series data from 1960 to 2024. The secondary data used is obtained from the World Bank. The econometric model is;

$$DR = B_0 + B_1Pop + B_2GDPpc + E$$

Where:

***DR*** *is the Death Rate.*

***Pop*** *is the population*

***GDPpc*** *is the GDP per capita*

***E*** *represents the error term*

$B_0$ *is the intercept*

$B_1$ *and* $B_2$ *are the coefficients for the independent variables' population and GDP per capita, respectively.*

### *3.1 Findings*

Dependent Variable: DEATH_RATE__CRUDE
Method: Least Squares
Date: 09/30/25 Time: 14:40
Sample: 1960 2023
Included observations: 64

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 69229.45 | 6546.005 | 10.57583 | 0.0000 |
| POPULATION | 0.007523 | 0.000438 | 17.19160 | 0.0000 |
| GDP_PER_CAPITA_CURRENT_US... | -46.24917 | 10.82340 | -4.273072 | 0.0001 |

| | | | |
|---|---|---|---|
| R-squared | 0.950554 | Mean dependent var | 241398.6 |
| Adjusted R-squared | 0.948933 | S.D. dependent var | 87324.45 |
| S.E. of regression | 19733.67 | Akaike info criterion | 22.66378 |
| Sum squared resid | 2.38E+10 | Schwarz criterion | 22.76498 |
| Log likelihood | -722.2410 | Hannan-Quinn criter. | 22.70365 |
| F-statistic | 586.3313 | Durbin-Watson stat | 0.204481 |
| Prob(F-statistic) | 0.000000 | | |

The model's R-squared is 0.950554. This means that 95.0554% of the variations in death rate are explained by population and GDP per capita, leaving about 4.9446% to be explained by other factors not included in this model.

The intercept $B_0$ of 69,229.45 predicts that the death rate will be at 69,229.45 when both population and GDP per capita are held constant.

$B_1$ = 0.007523. For every one unit increase in population, the death rate will increase by 0.007523 units, holding GDP per capita constant. The coefficient 0.007523 is statistically significant (P<0.001). This explains the adverse effect that population pressure has on health resources.

$B_2$ = -46.24917. For every one US dollar increase in GDP per capita, the death rate decreases by 46.24917 units, holding population constant. The coefficient is statistically significant (P<0.001). This explains the theory that higher incomes improve health outcomes.

### *3.2 Residuals.*

The Durbin-Watson statistic is 0.204481. DW statistic ranges from 0-4. When the DW statistic = 2(no autocorrelation), if the DW statistic < 2(positive autocorrelation), and if the DW statistic is > 2(negative autocorrelation). The DW Statistic of 0.204481 strongly suggests the presence of positive autocorrelation in the residuals. The DW statistic of 0.204481 violates the OLS assumption that the residuals are uncorrelated, showing that they are indeed correlated across time. This may arise because of unobserved time-varying factors such as epidemics, economic trends, and policy shocks, that are not fully captured by population and GDP per capita.

The strong R- squared (0.950554) and the theoretical alignment that the signs of the coefficients have, provide confidence of the overall results. Future studies however, should apply robust standard errors, dynamic models, and may apply further time-series diagnostic checks, to confirm the validity of these findings.

## 4.0 Policy recommendations.

The following policy recommendations are proposed:

**Strengthen the capacity of the health system**. Due to the positive correlation between population size and the death rate, the Kenyan government ought to focus on investments in healthcare infrastructure, especially in areas with high population growth. This involves developing new facilities, staffing new facilities, and educating and retaining more health care professionals to cope with the patient load.

**Encourage inclusion and pro-health economic expansion.** Policies are needed to make economic growth have a direct impact on increasing household income and public financing of health. This is possible by focusing on specific social protection programs, subsidies on basic health care, and investments in social health programs such as sanitation and immunization.

**Invest in family planning and reproductive health.** To help minimize the stresses of high population growth, the government and NGOs ought to increase the availability of voluntary family planning information and services. By giving individuals power over their own fertility, population growth can be reduced, and health outcomes can be improved for both mothers and children.

**Public health interventions** such as increasing funding for preventive healthcare, immunization, and nutrition programs will directly reduce death rates.

**Address omitted variable bias.** Future studies and policy implementation must include additional influential factors determining mortality (including healthcare spending, education attainment (particularly female literacy), and prevalence rates of diseases) to create a more in-depth picture and more specific interventions.

### *4.1 Conclusion*

The empirical evidence in this paper explains that both population growth and GDP per capita are determinants that had a substantial impact on the death rate in Kenya. Swift population growth leads to higher mortality rates due to the overburdening of healthcare and social services, whereas higher GDP per capita leads to lower mortality rates due to better lifestyles. Results highlight the need to ensure that population policies are aligned with economic development strategies to maintain a sustainable death rate reduction. Investment in healthcare, family planning programs, and inclusive growth should be a priority for policymakers in Kenya to improve health and reduce mortality rates.

**References**

Anyanwu, J. C., & Erhijakpor, A. E. (2009). Health expenditures and health outcomes in Africa. *African Development Review*, *21*(2), 400-433.

Bloom, D. E., Canning, D., & Sevilla, J. (2010). The demographic dividend: A new perspective on the economic consequences of population change. RAND Corporation.

Deaton, A. (2024). The great escape: health, wealth, and the origins of inequality.

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political economy*, *80*(2), 223-255.

Kenya National Bureau of Statistics (KNBS). (2019). Kenya demographic and health survey 2014. KNBS.

Kenya National Bureau of Statistics. (2023). Economic survey 2023. Government of Kenya.

Malthus, T. R. (1798). An essay on the principle of population. J. Johnson.

Ministry of Health (MoH), Kenya. (2018). Kenya health policy 2014-2030. Government of Kenya.

Mugisha, F., & Zulu, E. M. (2004). The influence of water, sanitation, and hygiene on under-five mortality in Kenya. Journal of Biosocial Science, 36(1), 15-42.

Mwabu, G. (2009). The production of child health in Kenya: a structural model of birth weight. *Journal of African Economies*, *18*(2), 212-260.

Odhiambo, N. M. (2020). The dynamics of economic growth and health outcomes in Kenya. International Journal of Sustainable Economy, 12(2), 135-155.

Preston, S. H. (1975). The changing relation between mortality and level of economic development. *Population studies*, *29*(2), 231-248.

Pritchett, L., & Summers, L. H. (1996). Wealthier is healthier. The Journal of Human Resources, 31(4), 841-868.

United Nations. (2019). World population prospects 2019. Department of Economic and Social Affairs, Population Division.

World Bank. (2022). World Development Indicators. The World Bank Group.

World Health Organization (WHO). (2021). World health statistics 2021: Monitoring health for the SDGs. WHO.