Evaluating The Impact Of Foreign Aid On Stunting Prevalence In Sub-Saharan Africa: An Empirical Analysis Using World Bank Data From 1960-2020.

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ABSTRACT

This study explores the relationship between foreign aid and stunting prevalence among children under five in Sub-Saharan Africa (SSA) using a longitudinal dataset from the World Bank's World Development Indicators (1960-2020). Integrating Human Capital Theory and Dependency Theory, this analysis investigates how net official development assistance (ODA) impacts stunting, a critical marker of child health and development, in the context of socioeconomic and environmental factors. The average prevalence rate of stunting in SSA is 36.14% ranging between 7.8% in Seychelles and 56.1% in Burundi. The fixed and random effects regression models were employed to examine the data, with a focus on understanding the effects of foreign aid (net ODA), GDP per capita, literacy rates, access to sanitation, and water services on child nutrition outcomes. Findings reveal that while foreign aid exhibits a negative association with stunting prevalence, this relationship is statistically insignificant. In contrast, higher GDP per capita and literacy rates are significantly associated with reductions in stunting prevalence. These results highlight the importance of aligning foreign aid strategies with local economic development and education initiatives to maximize health outcomes. This study calls for a strategic re-evaluation of foreign aid policy to promote sustainable, self-sufficient growth within SSA, addressing both immediate health needs and long-term development goals.

INTRODUCTION

Stunting, a form of chronic malnutrition that severely restricts a child's physical and cognitive development, is a pervasive health challenge in Sub-Saharan Africa (SSA). Stunting, characterized by a height-for-age ratio below two standard deviations of the WHO Child Growth Standards median, has far-reaching implications, including reduced educational attainment, diminished productivity, and increased susceptibility to chronic health issues in adulthood (De Onis et al., 2013). In SSA, stunting remains alarmingly high, with more than 30% of children under five affected as of recent reports, despite decades of foreign aid directed towards health and nutrition interventions (World Health Organization, 2019).

Foreign aid has been a central instrument in SSA's health and development sectors, with billions of dollars channeled toward alleviating malnutrition and related health issues. However, the effectiveness of foreign aid in directly addressing stunting remains underexamined. This study aims to assess the impact of foreign aid on reducing stunting, focusing on whether aid improves health outcomes or inadvertently fosters dependency, thus stalling long-term development. By applying Human Capital Theory and Dependency Theory, this analysis contextualizes foreign aid's role in either bolstering human capital or perpetuating aid reliance, offering a balanced perspective on its impact on stunting prevalence.

2. LITERATURE REVIEW

2.1 Foreign Aid and Health Outcomes

Historically, foreign aid has been a cornerstone in the fight against global health challenges, especially in developing countries where aid can provide essential funding for infrastructure, healthcare, and food security initiatives. In SSA, health-specific aid has contributed to significant improvements in combating infectious diseases, increasing immunization coverage, and enhancing maternal health services. Research

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by Burnside and Dollar (1993) underscores that foreign aid, when implemented with strong governance and economic policies, can drive health and economic improvements. Similarly, targeted interventions like those funded by the Global Fund for AIDS, Tuberculosis, and Malaria have reduced mortality rates and improved healthcare access (Mishra & Newhouse, 2009).

Nevertheless, critics argue that foreign aid often falls short due to administrative inefficiencies, corruption, and the tendency to prioritize donor interests over local needs (Yamagata, 2008; Rose-Ackerman, 2009). This perspective is further supported by studies that highlight the complex dynamics between donors and recipients, where conditionalities attached to aid may inadvertently hinder the achievement of sustainable health outcomes by imposing restrictions that may not align with the recipient country's priorities (Deaton, 2013).

2.2 Stunting and Its Determinants in Sub-Saharan Africa

Stunting in SSA is influenced by a confluence of factors, including maternal health, socioeconomic conditions, environmental factors, and inadequate healthcare infrastructure. High stunting prevalence is often a reflection of persistent poverty, food insecurity, and limited access to healthcare and education (Black et al., 2008). Countries such as Burundi and Niger continue to report stunting rates exceeding 40%, highlighting the significant public health challenge posed by chronic malnutrition (UNICEF, 2023).

At the individual and household levels, maternal education, income, and feeding practices are crucial determinants of stunting. Community-level factors, including water, sanitation, and hygiene (WASH), significantly influence stunting rates, as inadequate access to clean water and sanitation exacerbates malnutrition by increasing infection rates (Wheeler & Von Braun, 2013). Thus, while foreign aid plays a role in supporting health infrastructure, effective interventions must also address these structural determinants to achieve meaningful reductions in stunting.

2.3 Theoretical Framework

This study applies Human Capital Theory and Dependency Theory to assess foreign aid's role in reducing stunting in SSA. The Human Capital Theory posits that investments in health and education enhance individuals' economic productivity. From this perspective, foreign aid directed toward improving child nutrition and health should bolster human capital by facilitating better cognitive and physical development, thus enabling long-term economic growth (Becker, 2009; Schultz, 1961). Empirical evidence supports the notion that early childhood interventions in health and nutrition yield substantial returns in education and productivity, which in turn reduce poverty and support economic development (Hoddinott et al., 2008). The Dependency Theory, conversely,

warns that reliance on foreign aid can foster dependency, discouraging local innovation and self-sufficiency (Amin, 1976; Moyo, 2009). This theory argues that while aid may provide short-term relief, it can impede sustainable development by perpetuating external control over local resources and policies. Dependency Theory thus highlights the potential for foreign aid to undermine local health systems if it is not paired with capacity-building efforts that empower local stakeholders.

Integrating these theories provides a comprehensive framework, capturing both the potential benefits of foreign aid in strengthening human capital and the risks of fostering aid dependency.

3. METHODOLOGY

3.1 Data and Variables

This study employs panel data from the World Bank's World Development Indicators covering 48 countries in SSA from 1960 to 2020. The dependent variable, stunting prevalence, is measured as the percentage of children under five years classified as stunted. The primary independent variable, Net Official Development Assistance (ODA), which refers to the financial assistance provided by the official agencies of member countries of the Development Assistance Committee (DAC), non-DA countries and multilateral institutions; it captures the financial support aimed at promoting economic development in recipient countries.

The GDP per capita was included in the model to control for the overall economic development level as it's a strong determinant of health and nutritional outcomes. Other controlling variables include literacy rate to reflect the role of education in health outcomes; access to drinking water and sanitation, which is an essential indicator of public health infrastructure; and population growth to account to demographic pressures.

3.2 Empirical Approach

To investigate the impact of foreign aid on the prevalence of stunting in SSA, this study employs a multiple regression analysis as its core analytical method. This approach was chosen for its robustness in isolating the effects of a primary variable of interest—in this case, foreign aid—while controlling for other socioeconomic and demographic factors that could influence the outcome. We employed fixed and random effects regression models, with the final model selection guided by the Hausman test. The regression model is formulated as follows:

$$\text{Stunting}_{it} = \beta 0 + \beta_1 \text{ODA}_{it} + \beta_2 \text{GDP}_{it} + \beta_3 \text{POP}_{it} + \beta_4 \text{WATER}_{it} + \beta_1 \text{SANITATION}_{it} + \beta_1 \text{LITERACY}_{it} + \text{\euro}_{it}$$

In this model, Stunting$_{it}$ denotes the prevalence of stunting in country i at time t, while ODA$_{it}$ represents the foreign aid

disbursements received. The control variables include GDP per capita (GDPit), population growth (POPit), access to basic water services (WATERit), basic sanitation services (SANITATIONit) and literacy (LITERACYit).

One critical aspect of the analysis is the assessment of multicollinearity among the predictor variables. The Variance Inflation Factor (VIF) is a key diagnostic tool in this regard. VIF quantifies the extent to which the variance of the estimated regression coefficients is inflated owing to multicollinearity among the predictors. A VIF value exceeding 10 typically indicates a concerning level of collinearity, which can compromise the reliability of model estimates (Hsieh et al., 2003). Consequently, understanding and addressing multicollinearity are essential to ensure that the effects of individual predictors are accurately represented.

Another fundamental assumption in econometric modelling is homoscedasticity, which refers to the condition in which the variance of the residuals remains constant across all levels of independent variables. To test this assumption, the study employed the Park test, a statistical method designed to evaluate the homoscedasticity of the model. The results of this test are instrumental in determining the appropriateness of the model and ensuring that the inference drawn from the analysis is robust.

4. RESULTS

4.1 Descriptive Statistics

The **Table 1.0** below shows an average stunting prevalence of 36.14% across SSA, with rates varying from a low of 7.8% in Seychelles to a high of 56.1% in Burundi. The Net ODA showed considerable variation, with an average aid inflow of approximately 373 million USD, highlighting significant disparities in foreign aid distribution across SSA. The literacy rate averaged 57.96%, with a minimum of 5.4% and a maximum of 96.2%. A standard deviation of 23.24 indicates significant variability in literacy levels across different regions.

Table 1. Summary of Descriptive Statistics.

| Variable	Obs	Min	Max	Mean	Std. Dev.	Variance	Skewness	Kurtosis
net_oda	2748	-1.45e+07	1.14e+10	3.73e+08	6.40e+08	4.09e+17	4.7778	48.51183
Stunting (%)	347	7.70	69.6	36.13919	10.74128	115.3751	0.2734049	2.985969
Literacy	221	5.40465	96.2	57.96127	23.24196	540.1889	-0.2257284	1.976523
Gpd	2610	32.8760	19849.72	1142.676	2074.002	4301483	4.408577	27.68077
Pop (%)	2880	-16.88063	16.6255	2.52653	1.296847	1.681813	-3.007187	58.25848
water	989	18.6823	99.9958	61.6071	16.80594	282.4396	0.1898237	2.549975
Sanitation	986	2.7939	100	32.4791	21.52207	463.1996	1.141926	4.044196

The gross domestic product (gpd) averages around 1,143 USD, with values ranging from 32.88 to nearly 19,850 USD. A high standard deviation of 2,074 USD indicates considerable economic variability among the regions. Water access averaged 61.61%, with values ranging from 18.68% to nearly 100%. A standard deviation of 16.81 suggests variability in access to water, but the slight right skew indicates that most areas have adequate access, while a few struggle significantly. Sanitation access averages 32.48%, with values ranging from 2.79% to 100%. A standard deviation of 21.52 shows considerable disparities in sanitation access across regions.

The **Fig 1.0** above presents the average stunting prevalence rate in sub-Saharan Africa from 1985 to 2022. From 1985 to 2020, the prevalence of stunting in sub-Saharan Africa fluctuated significantly. Initially, the rate was 32.6% in 1985 and peaked at 51.3% in 2002, highlighting the pressing need for intervention owing to high malnutrition rates. Although the rates remained high throughout the 1990s, there was a gradual decline starting in the early 2000s, dropping to 29.5% by 2012. The downward trend continued, reaching 26.9% in 2017 before concluding at 29.8% in 2020. This overall decrease indicates ongoing efforts to improve nutrition and child health in the region, although challenges persist in ensuring that all children reach full growth potential.
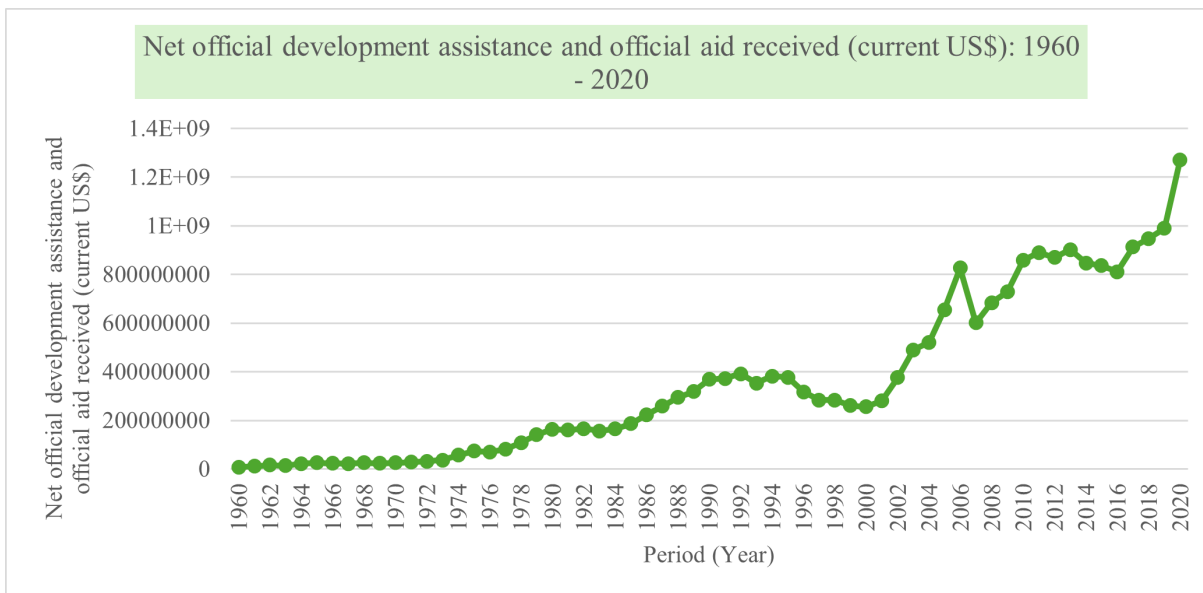
According to **Fig 2.0** above, the net official development assistance (ODA) trend from 1960 to 2020 shows a significant transformation in international support for development. In 1960, the ODA was approximately $7.5 million, and it experienced a gradual rise throughout the 1960s and 1970s, reaching over $73.6 million in 1975. This growth can be attributed to the growing global recognition of developmental needs, especially in postcolonial countries.

In the 1980s and the 1990s, ODA levels fluctuated, but remained relatively high, exceeding $300 million by the mid-1990s. However, there was a decline in the late 1990s, with the ODA dropping to approximately $260 million by 2000. The 2000s witnessed a revival in aid due to renewed global commitments to address poverty and achieve Millennium Development Goals.

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Figure 1. Trend of Average Stunting Prevalence in Sub-Sahara Africa Countries.
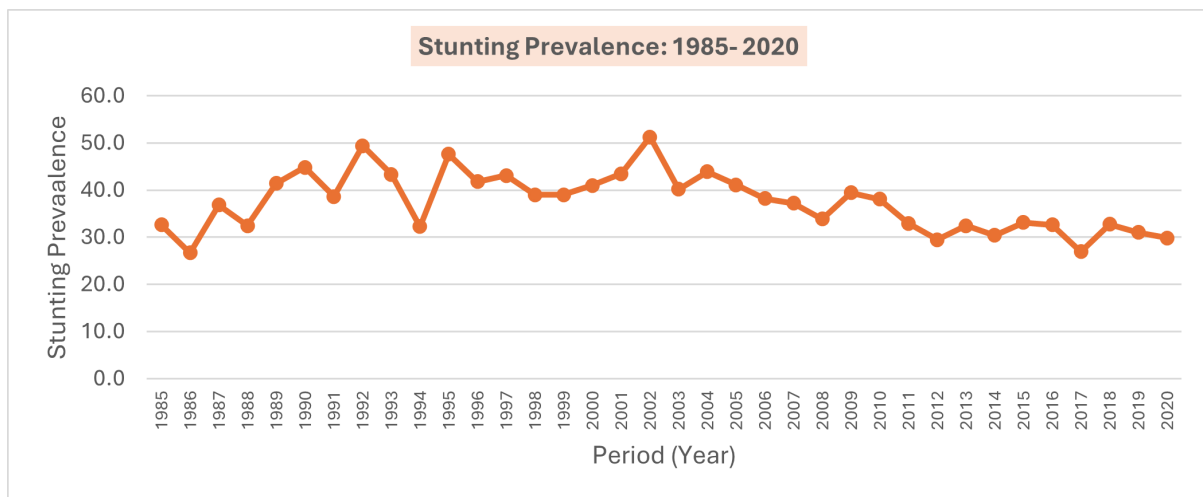
Figure 2. Trend of Net ODA received by Sub-Sahara Africa Countries.

4.2 Econometric Analysis

According to **Table 2.0** above, the net official development assistance (foreign aid) displays a negative value for both the random and fixed effects models, suggesting a potential inverse relationship with stunting. In the fixed effects model, a 1% increase in net official development assistance would result in a 0.22 unit decrease in the prevalence of stunting. This is comparable to the random effects model, in which a 1% increase in foreign aid would lead to a 0.59 unit decrease in the prevalence of stunting. However, the results from both models were not statistically significant ($p > 0.05$), indicating that foreign aid did not substantially impact the prevalence of stunting in sub-Saharan African countries.

The coefficient of -3.3849 in the fixed-effects model indicates a negative relationship between GPD per capita and stunting; however, this result was not statistically significant ($p = 0.141$). In contrast, the random effects model demonstrates a stronger negative correlation, with a coefficient of -5.5658 and a significant p-value of 0.000, suggesting that a higher GDP per capita is associated with lower stunting rates. A 1% increase in GDP per capita is estimated to result in a 5.6 unit decrease in the prevalence of stunting in sub-Saharan Africa.

The fixed effects model yielded a coefficient of 0.1292 for literacy among the adult population, which was not statistically significant ($p = 0.474$). However, the random effects model indicates a positive association, with a coefficient of 0.1381 and a significant p-value of 0.024. This suggests that increased literacy rates contribute to reducing stunting, highlighting the potential impact of education on children's nutrition.

The coefficient of population growth in the fixed model is 1.2217, indicating no significant effect on stunting ($p = 0.444$). The

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random effects model presents a negative coefficient of -0.2082, but it is also not significant (p-value = 0.835), suggesting that population growth does not substantially influence stunting rates.

The fixed effects model shows a coefficient of 0.0106 for access to basic water services, showing no significant relationship (p = 0.949). Conversely, the random effects model reveals a negative coefficient of -0.1795 with a significant p-value of 0.027, suggesting that improved water access is associated with lower stunting rates and underscoring its importance for public health.

The fixed effects model indicates a significant negative relationship, with a coefficient of -0.5123 and a p-value of 0.003, suggesting that better sanitation contributes to reduced stunting. However, in the random effects model, the coefficient shifts to 0.8165, and the relationship is no longer significant (p-value = 0.304), indicating that the effect of sanitation on stunting may vary across different models.

The evaluation of the model's overall fit was conducted using R-squared values. The fixed effects model exhibited an R-squared value of 0.6218 within countries, which suggests a strong ability to explain variations in stunting rates. In contrast, the R-squared values for the random effects model were lower for within-country variation (0.5155), but higher for between-country variation (0.656). The fixed effects model displayed an overall R-squared value of 0.2811, whereas the random effects model showed a higher overall fit of 0.566.

The Hausman test's outcome demonstrated a statistically significant result (chi2(5) = 13.06, p = 0.0421), implying that the fixed-effects model may be more suitable for this analysis than the random-effects model. Additionally, the Breusch-Pagan test lent further supports the fixed effects model by uncovering heteroscedasticity issues with the random effects model (chi2(1) = 11.18, p-value = 0.0004).

The finding of a Mean Variance Inflation Factor (VIF) value of 1.77 suggests that the multicollinearity issue among the independent variables is not a major factor in this analysis.

Table 2. Panel Regression Models.

	Fixed Effect Model			Random Effect Model		
	Coef.	z	P-value	Coef.	z	P-value
Dependent						
- stunting						
Independent						
- lnnet_oda	-0.2196	-0.19	0.847	-0.5850	-0.89	0.371
Control Variables						
-lngdp_per_capita	-3.3849	-1.51	0.141	-5.5658	-4.34	0.000*
- literacy	0.1292	0.73	0.474	0.1381	2.25	0.024*
- pop	1.2217	0.78	0.444	-0.2082	-0.21	0.835
- water	0.0106	0.06	0.949	-0.1795	-2.22	0.027*
-sanitation	-0.5123	-3.24	0.003*	0.8165	-1.03	0.304
cons	66.2008	3.18	0.003*	90.9195	6.63	0.000*
R-Square within country	0.6218			0.5155		
R-Square between country	0.2341			0.656		
R-Square Overall	0.2811			0.566		
Hausman test	chi2(5) = 13.06, P-value = 0.0421*					
Breusch-Pagan test	chi2(1) = 11.18, P-value = 0.0004**					
Mean Variance Inflating Factor	1.77					

5. CONCLUSION

This dissertation examined the complex relationships between net official development assistance (ODA), economic factors, literacy, and stunting prevalence in sub-Saharan Africa. These findings contribute significantly to our understanding of how these variables interact and affect child nutrition in a region where malnutrition remains a critical challenge.

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5.1. Key Findings and Theoretical Implications

The study's results indicated that although net Official Development Assistance (ODA) has been substantial in sub-Saharan Africa, its impact on reducing stunting rates was not statistically significant in either the fixed- or random-effects models. This finding is consistent with the growing body of literature that questions the effectiveness of foreign aid in achieving tangible health outcomes, particularly in the context of malnutrition (Burnside & Dollar, 1993; Easterly, 2003). These results suggest that, although foreign aid is essential for funding development initiatives, its effectiveness may be hindered by various factors, including misallocation, lack of alignment with local needs, and insufficient integration into broader health and nutrition strategies.

In contrast, the random-effects model revealed a significant negative relationship between GDP per capita and stunting rates, highlighting the critical role of economic development in combating malnutrition and improving child health outcomes. This aligns with theoretical frameworks that posit economic growth as a foundational element for enhancing living standards and access to essential services (Hoddinott & Kinsey, 2001). Additionally, the positive association between literacy rates and stunting underscores the importance of education as a determinant of health, suggesting that higher literacy levels may empower caregivers with knowledge and resources to improve nutrition for their children.

5.2. Implications for Policy and Practice

These findings have significant implications for policies and practices in Sub-Saharan Africa. Initially, they emphasized the need for policymakers to reconsider their approaches in distributing and utilizing foreign aid. Instead of employing a single strategy, the efficient allocation of resources must consider the unique socioeconomic and cultural context of each nation (Riddell, 2014). Policymakers should prioritize initiatives that provide financial assistance, bolster local capacities, and encourage community engagement in programme design and implementation.

Furthermore, the substantial influence of GDP per capita on stunting prevalence underscores that fostering economic growth should be the primary objective of national development strategies. By investing in infrastructure, healthcare, and job creation, an enabling environment that decreases the likelihood of stunting and promotes overall child well-being can be created. Additionally, these findings illustrate a crucial connection between education and health. Policymakers should develop targeted programs that integrate educational initiatives with health interventions, particularly in the realm of nutrition education for caregivers, to maximize the positive effects of increased literacy on child

health outcomes (Alderman et al., 2006).

5.3. Limitations and Future Research

Although this study provides valuable insights, it is essential to recognize its limitations. Although reliable, the data utilized for analysis may contain gaps and inconsistencies, particularly in the reporting of net ODA and stunting rates across various countries and years (UNICEF, 2019). These data limitations could affect the robustness of the findings and their generalizability to other contexts. Moreover, the analytical approaches employed, although appropriate for this study, could be improved by incorporating qualitative methods that explore the underlying social and cultural factors that influence nutrition and health outcomes.

Future research could build on these findings by employing longitudinal data to examine the trends and causal relationships among foreign aid, economic development, literacy, and stunting over time. A mixed-methods approach could provide a more comprehensive understanding of the factors that contribute to stunting and how they vary across different contexts within Sub-Saharan Africa. Additionally, examining the role of other mediating variables, such as healthcare access, maternal education, and food security, could further enrich our understanding of the complex dynamics at play in this critical area of public health.

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