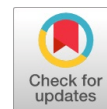


Examination of the Effectiveness of United States Foreign Aid on Human Development in United Nations Least Developed Countries: An Empirical Study

Chad D. Tyson, Juritsa Ford



Abstract: *The aim of this article is to examine the effectiveness of United States (U.S.) foreign aid on human development in United Nations (U.N.) Least Developed Countries (LDCs). Research Design and Methods: Research of peer reviewed studies on effectiveness of U.S. foreign aid support to U.N. LDCs were conducted using ProQuest and Google Scholar databases. A select literature review of keywords is offered to elucidate understanding of current perspectives. The study approach is based on empirical evidence. This study employs a set of multivariate linear regression models to examine the effects of U.S. foreign aid on health, education, and social services on the Human Development Index (HDI) in LDCs from 2000 to 2020. Findings: The findings show that U.S. foreign aid for health sectors significantly impacted HDI in LDCs for the time period under review. Evidence Limitation/Implications: An important limitation is highlighted by the need for increased research on other variables identified per the HDI. Discussion: The results of this study suggest that U.S. foreign aid has had a positive effect on the achievement of human development goals in the health sectors of LDCs. Past research has linked improved human development outcomes with increased economic development which contributes to the sustainable development of a society. The significance of these findings warrants further research regarding the contribution of U.S. foreign aid to positive human development outcomes and economic growth. Contribution and Value: This article extends contribution and value to LDCs growth and sustainability by providing empirical evidence of the effect of U.S. foreign aid on the U.N. LDCs.*

Keywords: *Empirical, Human Development, Human Development Index, Least Developed Countries, U.S. Foreign Aid.*

I. INTRODUCTION

A significant portion of U.S. foreign aid is donated to the world's least developed countries (LDCs). Within the past 20 years there has been a gradual shift in the focus of foreign aid from economic development towards sustainable development to include human development.

Manuscript received on 03 October 2022 | Revised Manuscript received on 11 October 2022 | Manuscript Accepted on 15 November 2022 | Manuscript published on 30 November 2022.

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During the early 2000s, United Nation (UN) member countries adopted the Millennium Development Goals (MDGs), the precursor to the 2030 Sustainable Development Goals (SDGs). The goals place human development at the center of global development in an attempt to improve lives and decrease suffering (Sachs, 2012, [35] [37]). The greater focus on human development has created opportunities for expanded research about the effectiveness and impact of foreign aid (Asongu, 2016, [5]). The aim of this article is to examine the effect of U.S. foreign aid on U.N. LDCs identified by their HDI experiences over the past two decades. The researchers postulate that economic growth and sustainability, measured by the annual growth rate in the real gross domestic product (GDP), is positively related to HDI. The motivation driving the current research is that over the past two decades, LDCs have been subjected to a triennial review by the Committee for Development (CDP), which determines their graduation status into developed country category (UN Economic and Social Affairs, 2021, [43]).

The question of “does foreign aid work?” is no longer the central problem in foreign aid studies but rather “when or how well does foreign aid work?” (Riddell, 2008, [33]; Riddell, 2014, [34]; Glennie & Sumner, 2014, [17]). Specifically, how country-level factors are affected by foreign aid and by what magnitude? The effectiveness of foreign aid on economic development in developing countries has been the focus of many studies over the past 60 years (Asatullaeva, Aghdam, Ahmad, & Tashpulatova, 2021, [3]). U.S. economic development aid efforts in Europe and Asia after World War II and during the Cold War are well documented (Runde, 2020, [36]; Hjertholm & White, 2000, [20]). Seventy percent of the current top 15 U.S. trading partners were once recipients of U.S. foreign aid (Runde, 2020, [36]). The United Kingdom, Germany, Taiwan and South Korea are examples of countries that have benefited from U.S. foreign aid for economic development.

The U.S. through its Agency for International Development (USAID) is the largest single monetary donor of official development aid (ODA), providing over \$40 billion annually over the past ten years (U.S. Foreign Assistance, 2022, [42]). Its two-fold purpose is to “further U.S. national interest while improving lives in the developing world” (U.S. AID, 2022, p.1, [41]). A major part of USAID’s effort is focused on improving the economic and social progress of people living in developing countries.

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These improvements are generally measured by economic growth, reduced poverty and better living standards. The social impacts derived from these improvements are important to building resiliency and self-reliance within developing countries (DFID, 2008, [12]). Several past empirical studies from developing countries examined export-led growth hypothesis (Arteaga, Cardozo & Diniz, 2020, [2]; Malhotra & Kumari, 2016, [23]; Bbaale & Mutenyo, 2011, [8]). The current article pursues foundational research questions addressing hypotheses focused on other variables such as human development factors, apart from socio-economic factors. Additionally, studies have shown that human development factors such as health and education have positive effects on economic growth and development (Ranis, 2004, [32]). This research examines the relationship between U.S. foreign aid and human development factors in LDCs thereby contributing to the body of knowledge regarding the effectiveness of foreign aid. The article is structured encompassing the introduction, a review of relevant literature, design and methodology, followed by the discussion and conclusion.

II. LITERATURE REVIEW

A. Empirical Studies

Empirical research about the effectiveness and impact of foreign aid in LDCs has garnered mixed results over the past twenty years. William Easterly argued that the absence of feedback and accountability has rendered aid ineffective in most poor countries (Easterly, 2006, [13]). Whereas, Abhijit Banerjee argued, “aid has much to contribute, but the lack of analysis about which programs really work causes considerable waste and inefficiency...” (Banerjee, 2007, p. 2, [6]). Recently, a study conducted by Galiani et al (2017, [16]) found “a positive, statistically significant, and economically sizable effect of aid on growth...” (Galiani, Knack, Xu, & Zou, 2017, p.1, [16]). A survey of empirical literature about the effectiveness of foreign aid on poverty reduction conducted by Mahembe and Odhiambo (2019, [22]) found “foreign aid has a positive impact on poverty, as reported by the majority of studies in both the non-monetary and monetary measures of poverty groups” (Mahembe & Odhiambo, 2019, p.1, [22]).

B. Human Development

Human development was first conceptualized by Dr. Mahbub ul Haq from his work on the UN Human Development Report (HDR) in 1990 (Stanton, 2007, [39]; McNeill, 2007, [24]). The HDR produces a summary measure of human development, the Human Development Index (HDI), using factors that include life expectancy at birth, mean years of schooling, expected years of schooling and per capita GNI in terms of U.S. dollars (USD). Dr. Haq argued that current economic measures of human progress did not fully account for the general well-being of a country, defined as the expansion of opportunities, choice and freedom (UNDP, 2022, [43]). Simply stated, the question of “how is the economy doing?” is not enough and must be balanced with “how are the people doing?”.

C. Human Development Index (HDI)

Gomanee *et al.* (2003, [19]) studied the relationship between pro-poor government expenditures and HDI. Using a regression model, they examined the effect of pro-poor social variables such as sanitation and agricultural expenditures on HDI and infant mortality. The study found that pro-poor expenditures improved HDI and the link was stronger in countries with low HDI levels. Fielding (2007, [15]) examined how aid impacted human development indicators that included measures for health, education and fertility. The study found that aid had a substantial positive impact on human development outcomes. Asiama (2009, [4]) looked at how foreign aid impacted human development indicators in 39 Sub-Saharan countries and found that bilateral aid flows did not suggest a significant direct effect on poverty and HDI. Whereas Lohani (2004, [21]) using an ordinary least square regression hypothesized foreign aid had a positive effect on HDI. However, the resulting test showed foreign aid had a negative relationship with HDI while the impacts from foreign direct investment, domestic investment and GDP per capita were positive.

D. Least Developed Countries (LDCs)

The least developed country (LDC) category was established by the United Nations General Assembly in 1971. The UN defines LDCs as “low-income countries confronting severe structural impediments to sustainable development. They are highly vulnerable to economic and environmental shocks and have low levels of human assets” (UN Economic and Social Affairs, 2021, p.3, [43]). The current list of LDCs consists of 46 countries which is reviewed every three years by the Committee for Development (CDP) to determine if the criteria has been met to graduate from the list. LDCs that have met the criteria for graduation have demonstrated the necessary levels of sustainable development to maintain a smooth transition (UN Economic and Social Affairs, 2021, [43]).

E. U.S. Foreign Aid

U.S. foreign aid is of global importance for developing countries. Researchers studying foreign aid have long debated its effectiveness. Boone (1996, [9]) found that aid did not promote economic development because “poverty is not caused by capital shortage and it is not optimal for politicians to adjust distortionary policies when they receive aid flows” (Boone, 1996, pp. 35, [9]). Research conducted by Rajan and Subramanian (2005, [29]; 2008, [31]) found that “aid inflows had systematic adverse effects on a country’s competitiveness...in labor intensive and export sectors” (Rajan & Subramanian, 2005, p. 33, [30]) and “little robust evidence of a positive (or negative) relationship between aid inflows into a country and its economic growth...or that certain forms of aid work better than others” (Rajan & Subramanian, 2008, p. 37, [31]). Whereas, research conducted by Arndt, *et al.* (2015, [1]) found “Aid has over the past 40 years stimulated growth, promoted structural change, improved social indicators, and reduced poverty” (Arndt, Jones, & Tarp, 2015, p. 1, [1]).

Gomanee (2003, [18]) found that aid effectiveness is not conditional to good policies as Collier and Dollar (2002, [10]) argued. Instead, policies influence growth but aid independently contributes to growth.

The review of select literature highlighted the difficulty in measuring the effectiveness and impact of foreign aid on human development. Evidence suggests that foreign aid does have an impact on human development outcomes both directly and indirectly. Literature examining the links between U.S. foreign aid and LDCs is limited, thus the purpose of this study evolves.

III. RESEARCH DESIGN AND METHODS

A set of multivariate linear regression models are used to examine the relationship between U.S. foreign aid and human development factors in LDCs from 2001-2020. The rationale for the use of multivariate linear regression is that it allows for understanding the relationship between multiple independent variables and use of a single dependent variable (HDI). Fundamentally, we examine regression coefficients for each of the independent variables to describe their relationship with the dependent variable identified.

Model 1 uses HDI as the dependent variable and U.S. foreign aid, net ODA received per capita (ODA) and foreign direct investment (FDI) as independent variables. The independent variable U.S. foreign aid consists of total aid for both health and education-social services sectors. The additional explanatory variables with their expanded data set will allow for more robust insights into the relationship between U.S. foreign aid and human development in LDCs.

Model 2 uses HDI as the dependent variable but separates U.S. foreign aid by human development sectors, health and education-social services, and removes the additional explanatory variables in order to examine the effect of each sector.

3.1 Data Sources

a. Dependent Variable

HDI data was gathered from the World Bank (The World Bank, 2022, [40]). The HDI is a summary measurement of average achievement in three key dimensions: health, education and standard of living. The values range from 0 (lowest level of development) to 1 (highest level of development). The health dimension is measured by life expectancy at birth, the education dimension is measured by the mean years of schooling for adults age 25 years plus and expected years of schooling for children of school entering age. The standard of living is measured by gross national income per capita (GNI).

b. Independent Variables

Data for the independent variable, U.S. foreign aid, was gathered from the USG public access information system U.S. Foreign Aid Explorer. The U.S. delivers several different types of foreign aid to LDCs but not all types directly contribute to human development. In order to remove the effects of other types of aid our model only includes U.S. foreign aid for health and education-social services. Based on USAID's stated mission and the substantial amount of foreign aid directed towards HDI indicators in LDCs, we expect to find a positive and

significant relationship between the metric variables in the regression model.

ODA data was gathered from the World Bank (The World Bank, 2022, [40]). Net ODA per capita received is a measure of disbursement flows (net of repayment of principal) that meet the Development Assistance Committee (DAC) definition of ODA and are made to countries and territories on the DAC list of aid recipients; and is calculated by dividing net ODA received by the mid-year population estimate (The World Bank, 2022, [40]). Net ODA represents global aid to LDCs in support of long-term projects aimed at improving economic and human development. Due to the global focus and myriad of international efforts toward human development we expected to find a positive and significant relationship between ODA and HDI in LDCs.

FDI data was gathered from the World Bank (The World Bank, 2022, [40]). FDI is the net inflows of investment capital needed to purchase a minimum of 10% voting stocks in a business operating in a foreign country. Studies have found that FDI supports the economic development of developing countries. Direct and indirect influences via intermediate growth channels such as local supply chains, employee education/knowledge attainment and supporting industries may show a significant effect on human development (Sharma & Gani, 2004, [38]). A positive relationship between HDI and FDI will support the claim that a spillover effect from FDI may be influencing human development in LDCs in a significant manner (Rismawan, Haryanto, & Handoyo, 2021, [35]; Meyer, 2003, [26]).

3.2 Assumptions

a. Normality

The assumption of normality was assessed by plotting the quantiles of the model residuals against the quantiles of a Chi-square distribution, also called a Q-Q scatterplot (DeCarlo, 1997, [11]). For the assumption of normality to be met, the quantiles of the residuals must not strongly deviate from the theoretical quantiles. Strong deviations could indicate that the parameter estimates are unreliable. Fig. 1 and Fig. 2 presents the Q-Q scatterplots of each model's residuals.

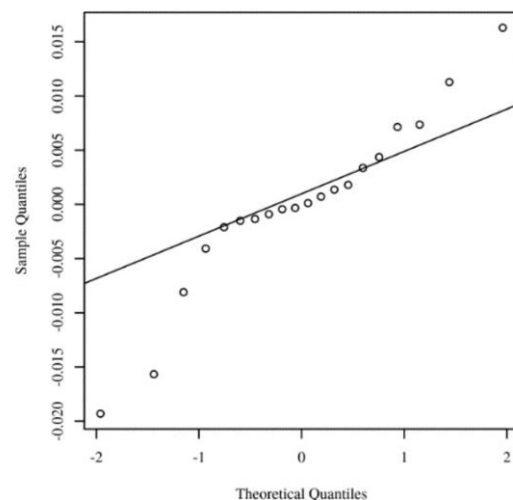


Fig. 1. Model 1 residuals.



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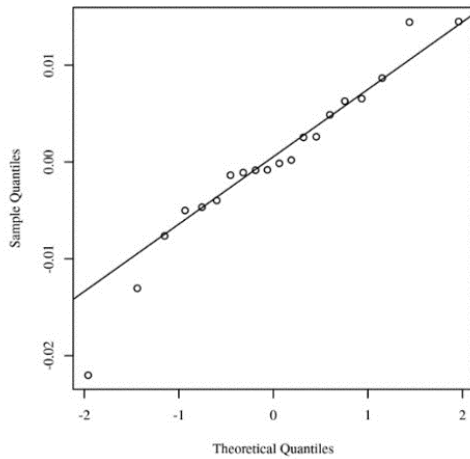


Fig. 2. Model 2 residuals.

b. Homoscedasticity

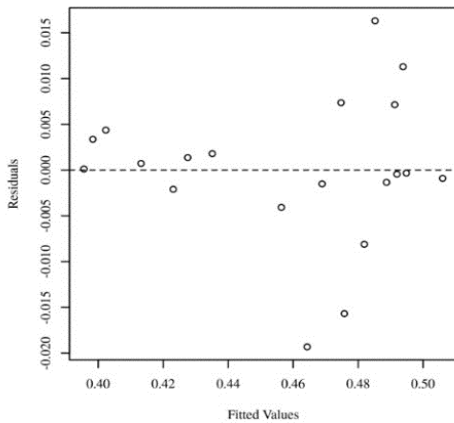


Fig. 3. Model 1 predicted values and residuals.

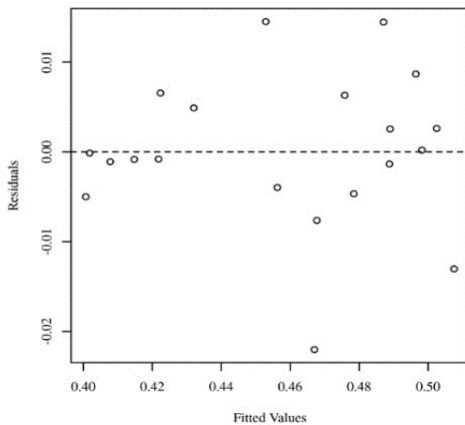


Fig. 4. Model 2 predicted values and residuals.

Homoscedasticity was evaluated by plotting the residuals against the predicted values (Bates et al., 2014, [7]; Field, 2017, [14]; Osborne & Waters, 2002, [27]). The assumption of homoscedasticity is met if the points appear randomly distributed with a mean of zero and no apparent curvature. Fig. 3 and Fig. 4 presents the scatterplots of predicted values and model residuals.

c. Multicollinearity

Variance Inflation Factors (VIFs) were calculated to detect the presence of multicollinearity between predictors. High VIFs indicate increased effects of multicollinearity in the model. VIFs greater than 5 are cause for concern,

whereas VIFs of 10 should be considered the maximum upper limit (Menard, 2009, [25]). All predictors in the regression model have VIFs less than 10. Tables 1 and 2 present the VIF for each predictor in the models.

Table 1. Model 1

Variance Inflation Factors for US_Foreign_Aid, ODA_Per_Capita, and FDI

Variable	VIF
US_Foreign_Aid	4.53
ODA_Per_Capita	6.00
FDI	4.87

Table 2. Model 2

Variance Inflation Factors for US_Aid_Health and US_Aid_Education_Social_Services

Variable	VIF
US_Aid_Health	1.02
US_Aid_Education_Social_Services	1.02

d. Outliers

To identify influential points, studentized residuals were calculated, and the absolute values were plotted against the observation numbers (Field, 2017, [14]; Pituch & Stevens, 2015, [28]). Studentized residuals are calculated by dividing the model residuals by the estimated residual standard deviation. An observation with a studentized residual greater than 3.58 in absolute value, the 0.999 quantile of a t distribution with 19 degrees of freedom, was considered to have significant influence on the results of the model. Fig. 5 and Fig. 6 presents the studentized residuals plot of the observations.

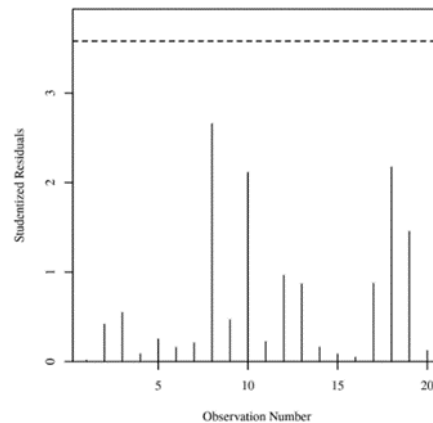


Fig. 5. Model 1 studentized residuals.

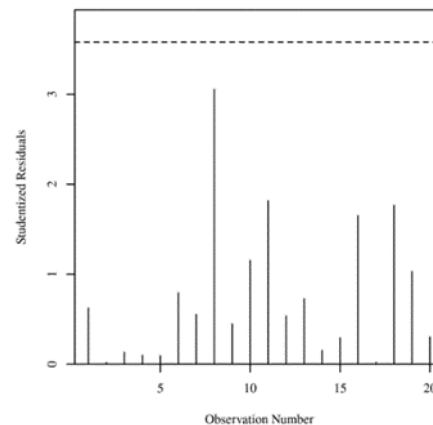


Fig. 6. Model 2 studentized residuals.



3.3 Research Hypotheses

The current posited hypotheses are influenced by research of literature and the aim to examine the relationship between U.S. foreign aid and U.N. LDCs. The hypotheses test whether U.S. foreign aid, ODA, and FDI have a significant relationship with HDI in LDCs, using an acceptable level of significance of .05.

The first hypothesis test seeks to evaluate the relationship between U.S. foreign aid and human development indicators in LDCs. The null hypothesis is that no significant relationship exists between U.S. foreign aid and human development indicators in LDCs. The alternative hypothesis is that a significant relationship exists between U.S. foreign aid and human development indicators in LDCs.

The second hypothesis test seeks to evaluate the relationship between ODA and human development indicators in LDCs. The null hypothesis is that no significant relationship exists between ODA and human development indicators in LDCs. The alternative hypothesis is that a significant relationship exists between ODA and human development indicators in LDCs.

The third hypothesis test seeks to evaluate the relationship between FDI and human development indicators in LDCs. The null hypothesis is that no significant relationship exists between FDI and human development indicators in LDCs. The alternative hypothesis is that there is a significant relationship between FDI and human development indicators in LDCs.

Hence, the fourth hypothesis test seeks to evaluate the relationship between U.S. foreign aid health sector and human development indicators in LDCs. The null hypothesis is that there is no significant relationship between U.S. foreign aid education-social services sector and human development indicators in LDCs. The alternative hypothesis is that there is a significant relationship between U.S. foreign aid education-social services sector and human development indicators in LDCs.

Appropriately, the fifth hypothesis test seeks to evaluate the relationship between U.S. foreign aid education-social services sector and human development indicators in LDCs. The null hypothesis is that there is no significant relationship between U.S. foreign aid education-social services sector and human development indicators in LDCs. The alternative hypothesis states that there is a significant relationship between U.S. foreign aid education-social services sector and human development indicators in LDCs.

This study employs dependent variable data gathered from the USG public access information system U.S. Foreign Aid Explorer (2022, [42]). It employs independent variable data gathered from the World Bank World Development Indicators (The World Bank, 2022, [40]). Based on the level of significance we determine the relationship between the variables, direction as either positive or negative, and the strength of association regarding the nature of consistency and systematics. Further, this multivariate technique uses multiple regression as there are several variables that have multicollinearity. Multiple regression presents as a realistic model because we examine regression coefficients to describe the relationship of the independent variables with the dependent variable.

IV. RESULTS

A. Model 1

The results of Model 1 were significant, $F(3,16) = 109.08, p < .001, R^2 = .95$, indicating that approximately 95.34% of the variance in HDI is explainable by US foreign aid, ODA per capita, and FDI. US foreign aid significantly predicted HDI, $B = 2.35 \times 10^{-11}, t(16) = 6.67, p < .001$. This indicates that on average, a one-unit increase of US foreign aid will increase the value of HDI by 2.35×10^{-11} units. ODA did not significantly predict HDI, $B = 0.0003, t(16) = 1.97, p = .067$. Based on this sample, a one-unit increase in ODA does not have a significant effect on HDI. FDI did not significantly predict HDI, $B = -1.13 \times 10^{-13}, t(16) = -0.24, p = .814$. Based on this sample, a one-unit increase in FDI does not have a significant effect on HDI. Table 3 summarizes the results of the regression model. Table 4 provides the summary statistics.

Table 3. Model 1

Variable	B	SE	95.00% CI	β	t	p
(Intercept)	0.36	0.009	[0.35, 0.38]	0.00	41.32	<.001
US_Foreign_Aid	2.35×10^{-11}	3.52×10^{-12}	$[1.60 \times 10^{-11}, 3.09 \times 10^{-11}]$	0.77	6.67	<.001
ODA_Per_Capita	0.0003	0.0001	[-0.00002, 0.0005]	0.26	1.97	.067
FDI	-1.13×10^{-13}	4.72×10^{-13}	$[-1.11 \times 10^{-12}, 8.88 \times 10^{-13}]$	-0.03	-0.24	.814

Note. Results: $F(3,16) = 109.08, p < .001, R^2 = .95$

Unstandardized Regression Equation: $HD_Index = 0.36 + 2.35 \times 10^{-11} * US_Foreign_Aid + 0.0003 * ODA_Per_Capita - 1.13 \times 10^{-13} * FDI$

Table 4. Model 1 Summary Statistics

Variable	M	SD	n	SE _M	Min	Max	Skewness	Kurtosis
HD_Index	0.46	0.04	20	0.008	0.40	0.51	-0.28	-1.33
US_Foreign_Aid	2.67×10^9	1.22×10^9	20	2.74×10^8	6.12×10^8	4.24×10^9	-0.46	-1.23
ODA_Per_Capita	132.22	38.24	20	8.55	68.92	190.64	-0.20	-1.08
FDI	1.87×10^{10}	9.45×10^9	20	2.11×10^9	5.81×10^9	4.17×10^{10}	0.43	-0.14

Note. [∗] indicates the statistic is undefined due to constant data or an insufficient sample size.

B. Model 2

The results of Model 2 were significant, $F(2,17) = 154.38, p < .001, R^2 = .95$, indicating that approximately 94.78% of the variance in HDI is explainable by U.S. foreign aid for the health sector and education-social services. U.S. foreign aid for the health sector significantly predicted HDI, $B = 3.04 \times 10^{-11}, t(17) = 17.37, p < .001$. This indicates that on average, a one-unit increase of U.S. foreign aid for the health sector will increase the value of HDI by 3.04×10^{-11} units. U.S. foreign aid for education-social services did not significantly predict HDI, $B = 2.08 \times 10^{-12}, t(17) = 0.13, p = .900$. Based on this sample, a one-unit increase in U.S. foreign aid for education-social services does not have a significant effect on HDI. Table 5 summarizes the results of the regression model. Table 6 provides the summary statistics.

Table 5. Model 2 Regression

Variable	B	SE	95.00% CI	β	t	p
(Intercept)	0.39	0.009	[0.37, 0.41]	0.00	44.46	<.001
US_Aid_Health	3.04×10^{-11}	1.75×10^{-12}	$[2.67 \times 10^{-11}, 3.41 \times 10^{-11}]$	0.97	17.37	<.001
US_Aid_Education_Social_Services	2.08×10^{-12}	1.63×10^{-11}	$[-3.24 \times 10^{-11}, 3.65 \times 10^{-11}]$	0.007	0.13	.900

Note. Results: $F(2,17) = 154.38, p < .001, R^2 = .95$

Unstandardized Regression Equation: $HD_Index = 0.39 + 3.04 \times 10^{-11} * US_Aid_Health + 2.08 \times 10^{-12} * US_Aid_Education_Social_Services$



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Table 6. Model 2 Statistics

Variable	M	SD	n	SE _V	Min	Max	Skewness	Kurtosis
US_Aid_Health	2.16	1.20	20	2.68	2.74	3.78	-0.31	-1.37
	10^0	10^0		10^0	10^0	10^0		
US_Aid_Education_Social_Services	5.05	1.28	20	2.87	2.97	8.61	0.89	1.14
	10^0	10^0		10^0	10^0	10^0		

Note. “.” indicates the statistic is undefined due to constant data or an insufficient sample size.

V. CONCLUSION AND DISCUSSION

This research used a set of multivariate linear regression models to examine the effects of U.S. foreign aid on human development factors in LDCs. The aim of the study was to examine the effect that U.S. foreign aid had on human development as measured by the HDI in LDCs. The results of Model 1 and 2 were significant with U.S. foreign aid explaining 95% of the variance. Therefore, we reject the null hypothesis. After examining the other independent variables, we see that ODA, FDI and U.S. foreign aid for education-social services did not significantly affect HDI in LDCs, therefore the null hypothesis is accepted. Although a correlation is suggested between U.S. foreign aid and HDI in LDCs, more research investigating causal effects is needed to further determine the nature of the relationships. This research provides foreign aid practitioners and policymakers at the strategic and operational level an important tool in regards to authorization and funding decisions as governing authorities face uncertainty in the current budget environment.

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Appendix 1: Least Developed Countries

List of Least Developed Countries (as of November 2021)

Country	Year of inclusion
Afghanistan	1971
Angola	1994
Bangladesh	1975
Benin	1971
Bhutan	1971
Burkina Faso	1971
Burundi	1971
Cambodia	1991
Central Africa Republic	1975
Chad	1971
Comoros	1977
Congo	1991
Djibouti	1982
Eritrea	1994
Ethiopia	1971
Gambia	1975
Guinea	1971
Guinea-Bissau	1981
Haiti	1971
Kiribati	1986
Laos	1971
Lesotho	1971
Liberia	1990

List of Least Developed Countries (as of November 2021)

Country	Year of inclusion
Madagascar	1991
Malawi	1971
Mali	1971
Mauritania	1986
Mozambique	1988
Myanmar	1987
Nepal	1971
Niger	1971
Rwanda	1971
Sao Tome and Principe	1982
Senegal	2000
Sierra Leone	1982
Solomon Islands	1991
Somalia	1971
South Sudan	2012
Sudan	1971
Tanzania	1971
Timor-Leste	2003
Togo	1982
Tuvalu	1986
Uganda	1971
Yemen	1971
Zambia	1991