EVALUATING PEPFAR: IS SUSTAINABILITY FAR-FETCHED?

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EVALUATING PEPFAR: IS SUSTAINABILITY FAR-FETCHED?

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Abstract

The United States President's Emergency Plan for AIDS Relief (PEPFAR) represents the largest and most direct measure of foreign aid to address the HIV/AIDS epidemic. The distribution of PEPFAR funding over time can provide insights into HIV prevention, treatment and care through the evaluation of related HIV/AIDS outcomes. Given the state of the current global economy and change in U.S. administration, I test the hypothesis whether increased allocations for HIV specific funding through PEPFAR will have significant favorable effects on the number of people living with HIV, AIDS related deaths and HIV prevalence. Using World Bank open data, I find that there is no significant effect on being a PEPFAR recipient country and having favorable outcomes in the number of people living with HIV and HIV Prevalence. However, I conclude that increased funding to recipient countries is associated with a statistically significant decrease in AIDS related deaths in phase two of PEPFAR. This finding highlights the need for better evidence of PEPFAR effectiveness on more than just AIDS related deaths and supports PEPFAR's emphasis on sustainability and more broadly the demand in global health to causally attribute outcomes to programs.

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1. Introduction

Foreign aid is defined as financial flows, technical assistance, and commodities in the form of grants or subsidized loans (Development Assistance Committee, OECD), geared towards achieving four overarching economic and development objectives including the strengthening of health systems and improvement of health outcomes (Radelet, 2006). Development aid has mostly been in the form of bilateral assistance from one nation to another. Indirect donations or multilateral assistance is aid that is pooled together from different sources; the most notable multilateral donors include UNICEF, the World Bank, and various United Nations agencies. When assessing the impact of aid, literature shows divergences in impact of aid on overall growth, when growth is measured on a broad overarching level. (Burnside and Dollar, 2000). However, contrary to the macro analyses where there are discrepancies in the efficacy of overall aid, studies on the micro level indicate that aid targeted to HIV/AIDS improves related health outcomes. Nunnenkamp and Öhler found conclusive evidence on significant reductions in AIDS-related deaths as a result of US bi-lateral aid, in particular they found that targeted US aid was more effective than aid from other sources (Nunnenkamp and Öhler, 2010). It would be worthwhile to expand on their analysis and determine the effect of a specific US assistance program such as PEPFAR on select HIV outcomes.

Since implementation in 2002, PEPFAR has been re-authorized under the Obama administration and sustained through an economic recession. The positive correlation of aid and health outcomes may lead one to believe that there would be a decrease in disease burden indicators such as prevalence and the number of people living with HIV. However, PEPFAR

may have ambiguous effects on these outcomes. On one hand prevalence would rise due to increased testing and the number of people living with HIV would increase as more access to treatment helps elongate life expectancy. On the other hand, these numbers would decrease because of improvement in prevention, care and treatment. Thus this allows for an experiment to determine the effect of PEPFAR allocations on HIV/AIDS related outcomes. Currently the US Government does not make data on costs and program specific funds publically available and therefore it is not possible to directly measure the effects of PEPFAR funding on related health outcomes. So, similar to Nunnenkamp and Öhler I will measure the effect of being a PEPFAR recipient country during phase one and phase two of the policy on the number of people living with HIV, AIDS related deaths and HIV prevalence. I will be testing the hypothesis that treatment countries that received an increase in US bi-lateral funding as a result of PEPFAR show favorable effects in the number of people living with HIV, AIDS related deaths and HIV prevalence. I use a difference in differences (DDD) regression model controlling for US Bi-lateral funding, control of corruption, public health expenditures, and the logarithm of population and GDP per capita, on three dependent variables; the number of people living with HIV, AIDS related deaths and HIV prevalence. The finding of this study provides empirical evidence that there is a significant reduction of AIDS related deaths only. This finding supports PEPFAR's emphasis on sustainability and more broadly the demand in global health to causally attribute outcomes to programs, to equip public health practitioners and policy makers with evidence to design effective programs.

The remainder of the paper will detail my findings and adhere to the following structure; Section 2 will elaborate on the Implementation, Organization and Mechanisms of PEPFAR, Section 3 will review the literature on Qualitative and Quantitative Evaluations of

PEPFAR. Section 4 will explain the hypothesis of the effects of resource allocation on and the number of people living with HIV, AIDS related deaths and HIV prevalence. Section 5 will describe the variables being tested and analyze the supporting tables and figures. Lastly, sections 6 and 7 will discuss the results and implications of my findings.

2. Background

2.1 The US Leadership Against HIV/AIDS, Tuberculosis and Malaria Act of 2003

From the onset of the epidemic, the United States Government (USG) has largely funded HIV/AIDS prevention and treatment programs, accounting for 49 percent of all contributions by 1998 (USAID et al., 1999). In 1999, the Clinton Administration contributed $100 million through implementation of the 'Leadership and Investment in Fighting an Epidemic Initiative', directed to HIV/AIDS prevention, treatment, capacity and infrastructure development (USAID et al., 1999). The next administration sought to expand USG contributions and in 2003 President Bush requested the U.S. Congress to authorize $15 billion for existing bilateral commitments and new programs in target countries with the greatest burden of HIV/AIDS. Congress granted the authorization for $15 billion over a 5-year span through the United States Leadership Against HIV/AIDS, Tuberculosis, and Malaria Act of 2003 to address the urgent and severe crisis of HIV/AIDS globally (USAID et al., 1999). The mandate emphasized rapid scale up of HIV services and interventions for prevention, care and treatment in the countries most affected by the HIV pandemic, resulting in PEPFAR becoming the largest bi-lateral investment towards combating a single disease (OGAC, 2009a). PEPFAR specified the allocation of majority of its budget to HIV/AIDS prevention and treatment in 15 focus countries that account for over 50 percent of the global burden of

disease. Although, the determining conditions for the selection of the focus countries are not explicitly stated, they are dependent on the burden of disease and PEPFAR recipient country's commitment to fighting HIV/AIDS and the willingness of the recipient country to partner with the Unites States (About PEPFAR, 2015).

2.2. PEPFAR Funding Process

The first phase of the initiative spanned fiscal years 2004 through 2008 (OGAC, 2009a) and in 2009 Congress reauthorized PEPFAR for an additional 5 years (FYs 2009-2013), increasing the funding for Phase two from $15 million to $39 billion for bi-lateral HIV/AIDS programs and the Global Fund (Institute of Medicine, 2013). Although, Congress could disburse up to $39 billion for FYs 2009-2013, PEPFAR's annual budget is still dependent on the annual federal budget process (Institute of Medicine, 2013). Each year the Global AIDs Coordinator requests an amount of funding specific to each recipient country, the requests are then included in the President's budget proposal and Congress reviews each one. Congress then determines the final allocation, spending plan and budget measures that grant authority to the appropriate USG agencies for disbursement (Heniff, 2008; OMB, 2011). This process allows Congress to appropriate more or less than what is authorized, which can lead to inconsistencies in funding depending on the year and the Congressional agenda.

2.3. PEPFAR Organization and Implementation

In order to implement the largest global health program in history in a short amount of time, the operational structure of PEPFAR incorporated a whole-of-government approach, which meant the utilization of USG agencies from different sectors including the US Center

of Disease of Control, US Department of Defense and the Food and Drug Administration (Simonds, 2012). The organizational hierarchy starts at the Office for Global Aids Coordinator (OGAC) in the Department of State, an appointment at the level of an Ambassador who reports directly to the Secretary of State. The OGAC is responsible for the management at the headquarters in Washington DC and at the PEPFAR recipient country level, where PEPFAR operates under the additional oversight of the U.S. ambassador of the country (Institute of Medicine, 2013). The OGAC coordinates a U.S. mission team specific to each country, made up of representatives of all implementing departments and agencies (Institute of Medicine, 2013). The members of the mission teams work with implementing partners, other multi-lateral organizations, partner country government and non-governmental entities to implement programs and services that direct resources towards HIV/AIDS more efficiently (Institute of Medicine, 2013).

Phase I (2004-2008) - Emergency Response

The interagency structure set PEPFAR at an advantage compared to multi-lateral organizations and single-agency development assistance programs; first, in the critical role that the interagency approach played in achieving initial rapid scale-up of services and the value of having multiple agencies with diverse capacities and expertise working together to contribute to the country program (Dietrich, 2007). Second, half of all PEPFAR funds are directed solely to treatment and prevention (PEPFAR Funding, 2015). Lastly, the implementation strategies reflect the conservative administration under which PEPFAR was founded by following the model of Uganda's highly regarded 'ABC' program: 'Abstinence, Be faithful to your partner, use a Condom' to expand programs addressing sexual transmission; also enforcing a more relaxed Mexico City Policy, a condition that stipulated

recipient countries will not use federal funds to neither perform nor actively promote abortion as a method of family planning. The rule would be relaxed for groups fighting AIDS, as long as they kept AIDS funds separate from other funds (United States GAO, 2006**.**)

Phase II (2009-2013) - Sustainability

In 2008, a change of administration and a looming U.S. recession generated debates on whether it would be a wise investment to increase PEPFAR funds. (Walensky and Kuritzkes, 2010). On one side of the debate, the advisors of the Obama administration's Global Health Initiative recommend funding the Mother and Child Health Campaign (MCHC) at the expense of future funding increases for PEPFAR with the claim that MCHC will have greater spillover effects in addressing more of the developing world's public health concerns (Denny, 2008). On the other side, antiretroviral therapy (ART) coverage rose from 7% in 2003 to 42% in 2008 (Holmes, 2009) and the total number of people living with HIV/AIDS in 2008 was 20% higher than that of 2000, compounded with 2.7 million new infections (UNAIDS and WHO, 2009). Irrespective of the argument, factors such as a National recession, a shift in administrative initiatives and a rate of infection exceeding the rate at which treatment is administered, all emphasize that the sustainability of PEPFAR's treatment and prevention programs and thus better health outcomes are dependent on continued funding (Van Damme, Kober, Laga)

3. Literature Review

3.1 Aggregate Aid on Health Outcomes

If one were to analyze the effect of aid on overall health outcomes, there exists the same discrepancy as the effect aggregate aid has on overall growth. Some studies conclude

that aggregate aid inflows have no significant impact on health outcomes in recipient countries. For example, Boone finds that aggregate aid has no significant impact on any development outcome specifically maternal and child mortality (Boone, 1996). Other researchers have found positive and significant effects and have noted that aggregate aid significantly decreases infant mortality and overall benefits human welfare at lower income levels, while also stimulating domestic spending on health (Gomanee, Girma, and Morrissey 2005).

Another study, investigates the relationship between foreign aid, globalization and health with the aim of measuring the interaction between foreign aid and globalization and their influence on health in developing countries. Welander analyzed globalization in three dimensions; economic globalization, social globalization and political globalization, she concluded that the correlation between aid and health is negative at high levels of overall globalization. However, overall globalization is positive for health at low levels of aid (Welander, 2012).

3.2 PEPFAR Evaluation

Although the number of new infections has declined, the UN is far from the lofty goal of eradication of HIV/AIDS, transitioning from the Millennium Development Goals to the Sustainable Development Goals, goal number three aims to end the epidemics of AIDS, neglected tropical diseases and other communicable diseases by 2030. (UN Sustainable Development Goals, 2015). The US Leadership Against HIV/AIDS, Tuberculosis, and Malaria Act of 2003 mandated a short-term evaluation to be completed by the Institute of Medicine in 2007; however, despite the substantial financial commitment and the critical role

PEPFAR plays abroad to achieve this goal, quantitative evaluation of the program's outcomes are rare (Sepúlveda et al, 2007). The assessment found that within two years of implementation PEPFAR supported the expansion of HIV/AIDS activities, but it scrutinized PEPFAR's ability to meet its targets for delivery of prevention, treatment and care services in the focus countries. The report however did not evaluate health-related outcomes such as the HIV incidence, prevalence or deaths (Sepúlveda et al, 2007).

3.3 Emerging Quantitative Literature

A 2010 paper by Öhler and Nunnenkamp uses a difference -in-differences regression to identify the effect of development aid on the number of AIDS- related deaths of adults and children and the number of people living with HIV. The authors did not find that development aid reduced the number of people living with HIV, by preventing new infections. They did however find that aid, specifically United States bi-lateral assistance had a significant effect on reducing AIDS-related deaths (Öhler and Nunnenkamp, 2010).

The Bendavid and Bhattacharya study is the only quantitative analysis of PEPFAR on HIV/AIDS outcomes. The authors perform a before and after comparison of sub-Saharan countries from 1997-2002 prior to PEPFAR implementation and 2004-2007 after phase I of PEPFAR. They found a significant difference and reduction in AIDS related deaths after PEPFAR implementation. However, the study fails to control for other factors such as a scale up in funding from other donors including the Global Fund likely biasing their estimation (Bendavid and Bhattacharya, 2009).

The current approach is now even more narrowed, evaluating evidence based interventions such as Antiretroviral therapies (ART) on HIV. Bendavid et al. investigated

specifically generic ARTs and cost savings in PEPFAR treatment programs. They looked at ART types and volumes, drug expenditures, proportion of generic purchasing across years and countries and cost savings from generic purchasing (Bendavid et al., 2010). Concluding, that in PEPFAR supported programs generic ARTs was associated with significant cost savings and an increase in ART purchases (Bendavid et al., 2010). A key limitation to their study and any quantitative PEPFAR analysis to date is that the US government does not make publically available data on country and program specific fund allocations, like ART purchases.

4. Theoretical Considerations

4.1 Hypotheses

For over three decades the HIV/AIDS epidemic has resulted in widespread suffering as well as retarded growth in the poorest regions of the World most notably in sub- Sahara Africa. Most recently the Sustainable Development Goals aims to "end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases" by 2030. Since PEPFAR funding represents the most direct measure of investment to address the HIV/AIDS epidemic, the distribution of PEPFAR funding over time can provide insight into HIV prevention, treatment and care through the evaluation of related HIV/AIDS outcomes. Moreover, working to answer the question how can we assess the very complex, multifaceted, large-scale, real-world changes in global health governance, institutional organizations and financing or delivery when they occur against a backdrop of multiple often overlapping public health programs which are funded and implemented by a combination of countries, donors and private voluntary organizations (Yamey and Feacham, 2011). This leads me to test the hypothesis that increased

US Bi-lateral funding for HIV/AIDS through PEPFAR will lead to a higher number of people living with HIV, lower number of AIDS related deaths and a lower prevalence of HIV in recipient countries, while controlling for GDP, population, control of corruption and public health expenditures. Results of significant favorable HIV outcomes are relevant to the sustainability of a grand vision of an AIDS-free generation, especially in evaluating the transition of PEPFAR from an initial emergency response to a sustainable outcomes-based impact assessment system. In the long-term such an evaluation can address additional broader goals of sustainability including country ownership, the strengthening of health systems and development aid programs.

4.2 Conceptual Framework

The conceptual framework of this study will concentrate specifically on data from the initial 12 PEPFAR focus countries within Africa: Botswana, Cote d'Ivoire, Ethiopia, Kenya, Mozambique, Namibia, Nigeria, Rwanda, South Africa, Tanzania, Uganda and Zambia. Similar to the work by Bendavid and Bhattacharya, this analysis will also look at two time periods but rather than assess health outcomes prior to the implementation of PEPFAR (1997–2002) and after the implementation of PEPFAR (2004 and 2007). This paper will analyze outcomes prior to the implementation of PEPFAR (2003), phase I (2004-2008), pre-recession under the Bush administration, the emergency response phase that brought HIV prevention, treatment and care services to millions as well as phase II (2009-2013) under the Obama administration, the sustainability phase where PEPFAR worked with partner countries among other partners to address the epidemic. The key observable independent variable total bi-lateral aid will help account for direct US funding related to PEPFAR investments and goals, hypothesized to have an effect upon the dependent variables of interest: AIDS related deaths,

HIV prevalence, and number of people living with HIV for each regression. Controls to account for governance, demographics, and domestic expenditures will be included as well. Lastly, the data used for this study are from the World Bank open data found in the statistical analysis software *stata,* that encompasses world development indicators, world governance indicators as well as select indicators from other organizations such as UNAIDS and the Organization for Economic Cooperation and Development (OECD).

4.3 Model

The DDD regression is modeled in the following way:

[Dependent variable] = *ß0* + *ß1* *[US bi-lateral aid]* + *ß2* *[treatment dummy]*+ *ßk [other controls]*+ *µ*

Where *ß0* is the constant, *ß1* is the US Bi-lateral aid to the Sub-Saharan countries, *ß2* is the DDD treatment dummy which is an interaction of the 12 countries in the treatment group and the specific phase of PEPFAR implementation (phase one or phase two), *ßk* are the controls that will account for the governance and demographic factors that may influence both the dependent variables and the error term.

5. Data Description

DependentVariables.

The key dependent variables are the number of people living with HIV, AIDS related deaths and HIV prevalence. I selected these variables because these are the outcomes that would most likely be affected by a program that focuses predominantly on prevention and treatment, and they have the most up to date and complete country level data. The data utilized for the key dependent variables is from the UNAIDS dataset, which is comprised of

multiple country level surveys ranging from antenatal clinical surveys to HIV monitoring surveys. The data is gathered annually, with additional subsamples surveyed in select countries. Worldwide the UNAIDS data have been collected since 1990, close to the onset of the HIV/AIDS epidemic. The specificity of the UNAIDS data from prevention to health outcomes as well as the delineation of sub-populations and ages makes this a crucial aspect of this study. A key limitation of the UNAIDS data is that there are missing data for particular years, health outcomes or countries.

Key Independent Variables

The key independent variable of bi-lateral aid utilizes the OECD International Development Statistics. The data collected by the OECD-Development Assistance Committee has country level data on the amount of foreign aid to individual recipient countries from 1960-2014(OECD, 2013). The amount of aid is calculated as the number of grants and loans minus repayments of principal on earlier loans (OECD, 2013).

Control Variables.

The controls in the regression analysis will include the natural logarithm of GDP, population, control of corruption and public health expenditures. These variables are coming from both the World Bank Governance Indicators (WGI) and World Development Indicators (WDI). These controls will take into account the political environment, demographics of and the economic state of the countries analyzed (World Bank, 2015). The WGI reports aggregate and individual governance indicators for 215 economies over the period 1996–2014, for six aspects of governance including: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law and Control of

Corruption. They are reported annually and comprised of 30 individual data sources produced by a variety of survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms (World Bank, 2015). The WDI includes national, regional and global estimates of indicators covering topics from Agriculture & Rural Development Aid Effectiveness to Health. The WDI is updated annually and compiled from years 1960 to 2015.

Descriptive Statistics.

Table 1: Descriptive Statistics-HIV Health Outcomes (2004-2007)

Variables of Interest:	Minimum	Maximum	Mean	Standard Deviation
Number of People living with HIV	1,200	5,800,000	439,266	905,395
AIDS related deaths	100	330,000	30,574	57,097
HIV Prevalence	0.2	27.8	5.78	7.02

Table 2: Descriptive Statistics-HIV Health Outcomes (2008-2013)

Variables of Interest:	Minimum	Maximum	Mean	Standard Deviation
Number of People living with HIV	1,000	6,300,000	472,212	990,701
AIDS related deaths	100	330,000	22,520	48,276
HIV Prevalence	0.2	27.8	5.42	6.91

Among the dependent variables: number of people living with HIV, AIDS related deaths and HIV prevalence; the mean is comparable across the two time periods. HIV prevalence on average decreases from 5.78 to 5.42 and AIDS related deaths decrease by 8,054 whereas, the number of people living with HIV shows an average increase of 32,946 people. Intuitively we anticipate that more funding will result in a lesser number of people living with HIV, however as expected with more funding there is greater access to drugs for retroviral therapy, testing and more resources allocated to prevention and health care personnel. Therefore, the counter-intuitive descriptive statistics for the number of people living with HIV support the previously stated hypothesis.

Table 3: Descriptive Statistics-US Bi-lateral Aid *(current US Dollars in millions)*

Years	Minimum	Maximum	Mean	Standard Deviation
2004-2008	0.01	848.00	93.90	156.00
2009-2013	-0.29	1,290.00	168.00	220.00

The minimum of negative $0.29 million for 2009-2013 is an instance where a country's loan payments are higher than new aid disbursements, and therefore will show a negative number as is seen in 2013 with Sao Tome and Principe. The mean US bi-lateral aid to all 12-focus countries shows an increase in $75.00 million in the second period of analysis. Although we see such an increase, funding towards treatment specifically has actually fallen significantly since 2008 in both absolute dollars and as a portion of total budgets. Perhaps this along with this US Congressional budget appropriations have shown that while appropriations for PEPFAR have fluctuated in recent years, funding has remained essentially flat since 2010 (PEPFAR Dashboards Database, 2015).

6. Regression Results

The regression results recorded in table 4 and table 5 (see Appendix I) show the effect of increased US Bilateral AID to PEPFAR recipient sub-Saharan countries on three dependent variables: people living with HIV, AIDS related deaths and HIV prevalence. All tables are divided by PEPFAR phases, columns (1-3) show results after the first phase of PEPFAR implementation and columns (4-6) show phase two. The tables are further broken down to compare the three dependent variables in each phase. The numbers of people living with HIV are in columns (1) and (3), AIDS related deaths in columns (2) and (4) and lastly the prevalence of HIV in columns (3) and (6). It is important to note that in all tables the coefficient for *US Bilateral aid (Current USD)* is much smaller than the rounding cut off and is denoted as 0.000 across all dependent variables, in both control and treatment groups.

Table 4: Baseline Model

	Phase One			Phase Two		
	(1)	(2)	(3)	(4)	(5)	(6)
	People living with HIV	AIDS deaths	HIV prevalence	People living with HIV	AIDS deaths	HIV prevalence
US Bilateral Aid (Current USD)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Treatment * Phase one	-0.006 (0.027)	0.220*** (0.037)	-0.015 (0.023)			
Treatment * Phase two				0.061 (0.057)	-0.465*** (0.122)	-0.091 (0.062)
Constant	11.600*** (0.267)	8.863*** (0.269)	1.139*** (0.174)	11.601*** (0.267)	8.874*** (0.270)	1.136*** (0.174)
N	738	738	736	738	738	736
R-squared						
Dep Var Mean	11.6	8.84	1.11	11.6	8.84	1.11

The outcomes of the basic DDD regression are recorded in table 4. The results for people living with HIV and HIV prevalence differ considerably from the number of AIDS deaths, as the treatment coefficients, *Treatment * Phase one* and *Treatment * Phase two* fail to pass conventional significance levels for both people living with HIV and HIV prevalence. This means that there is no significant evidence to show that bi-lateral aid from the US during both phases of PEPFAR resulted in more favorable outcomes for the treatment group with respect to prevalence and the number of people living with HIV. Additionally, with regard to the number of people living with HIV the sign of the treatment coefficient changes from a negative sign in phase one to a positive sign in phase two. This is in line with the counter-intuitive effects of aid on the number of people living with HIV, where effective prevention services can result in a reduction of those who acquire HIV or increased provision of anti-retroviral therapy treatment as a result of increased aid, can prolong life and lead to a rise in the number of people living with HIV. Conversely for AIDS related deaths, the *Treatment * Phase one* and *Treatment * Phase two* are significant at all levels of significance. Column (2) shows that a focus country receiving PEPFAR funding during phase one of implementation had on average 22.0% more deaths than the control countries or those that were not receiving PEPFAR funding; this increase can be attributed to the fact that the treatment countries have the highest burden of disease worldwide, therefore the number of deaths could still be considerably higher in the PEPFAR recipient countries. Also, noticeable changes in indicators might take some time to materialize. This possibility for a lag effect is evident in the second phase treatment coefficient sign change for AIDS related deaths, showing that

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countries that received funding into the second phase of PEPFAR implementation on average are associated with a 46.5 % decrease in the number of AIDS related deaths compared to the sub-Saharan countries that did not receive PEPFAR funding.

The baseline regression in addition to the four control-variables log GDP, log population, control of corruption and public health expenditures are documented in table 5. Similar to the results in table one, only the *Treatment * Phase one* and *Treatment * Phase two* coefficients for AIDS related deaths show significant results. The *Treatment * Phase one* coefficient in column (2) shows that on average PEPFAR funding in the first phase of implementation is associated with an increase of 22.7% more deaths in the treatment group than in the control group, also like the baseline regression results this unfavorable dynamic changes to an associated decrease in AIDS related deaths by 51.2% in the treatment group than in the control group in the second Phase of PEPFAR implementation. I ran an additional baseline regression for the year 2003 also known as the watershed year, in order to compare the results before and after PEPFAR program implementation. These results found on table 6 (See Appendix II) shows that the number of people living with HIV in the focus countries was 6.3% more than those in the control prior to PEPFAR implementation and were significant at the 10 percent level of significance. Also, similar to the previous two regressions there is no statistically significant findings for HIV prevalence. Most notably, is the outcome for AIDS related deaths pre-PEPFAR and subsequently phase one and phase two. Prior to implementation we see that the 12 treatment countries on average were associated with and 53% more AIDS related deaths than the rest of sub-Saharan Africa. As previously mentioned, this number drops to 22.7% more AIDS related deaths in phase one and then in phase two the

negative sign on the treatment coefficient shows that PEPFAR recipient countries are associated with a 51.2% decrease in AIDS related deaths compared to the control group. When analyzing the effect of the control variables, there is no significant effect of the log population on the three dependent variables. The log GDP, control of corruption and public health expenditure only have significant effects on the number of people living with HIV and AIDS related deaths, with no convincing evidence of an effect on HIV prevalence. Columns (1) and (4) show that in both phase one and phase two the logged GDP per capita is associated with a positive effect on the number of people living with HIV. This may indicate that countries that are relatively wealthier have access to more resources to provide treatment and prevention programs. However the negative association (at the 10 percent level of significance) of the control of corruption coefficient indicates otherwise. Additionally, one would expect that wealthier governments have more funds for domestic health interventions and therefore expect public health expenditure to have a positive impact and increase the number of people living with HIV but the regression results show a negative *Public health expenditure* coefficient that is not significant at conventional levels of significance.

Robustness check

A DDD regression that analyzes the growth rate of each of the three dependent variables was run and found that at various levels of significance the AIDS related deaths, the number of people living with HIV and HIV Prevalence are increasing. This is expected as the treatment countries have the highest disease burden worldwide and therefore as the transition from the MDGs to the SDGs have articulated, it will take many years and much investment to reverse disease spread completely, however the first step to creating an AIDS free generation is slowing the growth rate of the related indicators (this analysis is available upon request).

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7. Concluding Remarks

The goal of this analysis was to evaluate the effects of US Bilateral funding to PEPFAR recipient countries on three HIV indicator variables. I hypothesized that increased PEPFAR funding leads to significant favorable HIV outcomes in the number of people living with HIV, AIDS related deaths and HIV Prevalence. I implemented a DDD regression analysis to explore the claim that the change in the number of people living with HIV, AIDS related deaths and HIV Prevalence would have been the same in the PEPFAR phase one and phase two time periods had PEPFAR not been implemented. However, in light of the above results, I conclude that increased funding to recipient countries during the first two phases of PEPFAR implementation is associated with a statistically significant decrease in AIDS related deaths in phase two of PEPFAR only. The complete baseline model shows that the effect of being a PEPFAR recipient country on AIDS related deaths is significantly different from zero. Phase One is associated with an increase, Phase Two is associated with a decrease in deaths after 8 years of PEPFAR implementation. This result also holds true for the alternate model specifications. The limitations of my model and my overall analysis are the inability to effectively capture an effect on the number of people living with HIV and HIV prevalence. Firstly, using US Bi-lateral aid as a measure of PEPFAR funding is biased, since the US government does not allow for PEPFAR data to be publically known, I was unable to analyze the amount that was allocated to PEPFAR specifically. Secondly, a cross-country analysis does not account for the country level impact that PEPFAR has had based on the country specific initiatives that have been implemented. Lastly, this model does not evaluate the transfer mechanisms by which PEPFAR funds become prevention and treatment initiatives.

Policy Implications and Future Research

The evidence requirement for policymakers to scale-up global health programs should include three elements: efficacy at the individual level, effectiveness at the population level and sustainability at the host country level - cost and sustainability (Luoto et al., 2013). PEPFAR was approved and implemented based on the efficacy of HIV interventions on an individual level and a population level, however progress is still being made towards sustainability. With the transition from the MHG to the SDG and from Emergency Response to Sustainability, PEPFAR has emphasized an impact action agenda amongst five action items for the Third and subsequent policy phases. By 2018, the US aims to first ensure maximal programmatic focus in the geographic areas of highest disease burden ensuring maximal lives saved and greatest impact on the epidemic through country-level HIV Impact Assessments (HIA) in sub-Saharan countries and then use the HIA data to improve program focus across all countries (United States Department of State, 2013).

Further Quantitative analyses of the impact agenda items and finance mechanisms are important for policy makers to design the most efficient methods for resource allocation and define the best path towards achieving a PEPFAR sustainability and an AIDS free generation, yet there is limited quantitative evaluation on PEPFAR, mostly due to the fact that PEPFAR financial data is not publically made. Future studies should look beyond the linear policy making of aid on outcomes and should be focused on analyzing the mechanisms for financing the most effective treatment methods as determined by prevention research RCTs (Padian et al., 2010).

Humanitarian goals play a significant part in the motivation for large-scale policies like PEPFAR; however, economic and political interests remain a prime factor in U.S. aid programs. Although this study did not find an effect of statistical significance of US Bi-lateral aid on the three select HIV outcomes, the conservative political ideology on AIDS policy that dictate the use of PEPFAR funds could have impacted long-term programmatic sustainability. As mentioned before, PEPFAR was designed to incorporate the model of Uganda's highly regarded **ABC** program: **A**bstinence, **B**e faithful to your partner, use a **C**ondom to expand programs addressing sexual transmission and initially also enforced the Mexico City Policy, a condition that recipient countries will not use federal funds to neither perform nor actively promote abortion as a method of family planning. A comprehensive study analyzing the unintended consequences of the Mexico City Policy on access to health services in sub-Saharan countries, suggest that these effects might confound both the policy's original intent and the effectiveness of population aid, but also limit access to health care services particularly for women and girls, both of whom are the populations most as risk for HIV/AIDS (Bendavid, Avila, Miller, 2011). Although PEPFAR was implemented with a stipulation that the Mexico City Policy would be relaxed for groups fighting AIDS, as long as they kept AIDS funds separate from other funds (United States GAO, 2006**.**), evaluating the change in U.S. administration, political ideology and thus the effects it had on PEPFAR funding and outcomes; allows for a more realistic version of global health policymaking that acknowledges the other influences on policy such as social, electoral, ethical and cultural factors that are often not directly captured in economic analyses but tend to affect program outcomes.

The regression results depicted that in both phases of PEPFAR, control of corruption was associated with a decrease in the number of people living with HIV and a way to reduce corruption would be to engage more with the private sector. The chronic nature of HIV in terms of those living with HIV as a result of anti-retroviral therapies and the magnitude of the pandemic as seen by the AIDS related deaths results above will steer PEPFAR sustainability initiatives towards increasing collaboration with other organizations, countries and the private sectors of disease burdened countries in the development of different financing mechanisms beyond bi-lateral aid. One area to explore would be the pubic private partnerships (PPP) that are part of PEPFARs partnership action agenda through FY 2018. PEPFAR has seen success in PPP in Uganda for example with the Health Initiative for the Private Sector Project, which is a partnership with more than 100 Ugandan private companies and clinics for guaranteed vital health services for company employees, dependents and members of the immediate community. The goal of this program is an expansion of access to health resources including prevention and treatment (Holmes et al. 2012). Data collected from such a program can be utilized to see if favorable HIV outcomes are the end result, as was shown in the results above where GDP had significant effect on the number of people living with HIV. It would be worthwhile to conduct analyses on whether the results from Ugandan PPP initiatives can be externally valid for other disease-burdened countries with higher GDPs thus a larger private sector like Nigeria for example.

Increased public health expenditures ranging from health systems strengthening, to treatment and counseling are correlated with less AIDS related deaths. This result is in accordance with PEPFARs current efforts to gather multiple streams of resources and financing models in to bolster National programs and expenses. Many PEPFAR recipient

countries including Rwanda and Côte-d'Ivoire, have received support to National government health ministries in pioneering the use of performance-based financing (Holmes, 2012). In this way PEPFAR will be able to assist countries in focusing their approach from outputs to outcomes, with the ultimate goal of sustainability and linking funding to outcomes. Existing examples include providing additional funding in proportion to government, region, and facility performances that meet preset benchmarks, like the number of people on ARTs (Holmes,2012).

The second and subsequent phases of PEPFAR are characterized by an increased emphasis on sustainability; programs must demonstrate value and impact to be prioritized within complex and resource-constrained environments (Padian et al, 2011). This study hopes to contribute to the evidence that PEPFAR funding is associated with favorable effects on HIV outcomes and that in order to achieve sustainability PEPFAR will have to incorporate evaluation methods that result in increased efficiency by making data on PEPFAR funding more transparent and maximizing synergies with other programs, countries and sectors for investment in the long term.

8. Appendix – I

Table 5: Baseline with controls

	Phase One			Phase Two		
	(1)	(2)	(3)	(4)	(5)	(6)
	People living with HIV	AIDS deaths	HIV prevalence	People living with HIV	AIDS deaths	HIV prevalence
US bilateral AID (Current USD)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Treatment * Phase one	-0.027 (0.021)	0.227*** (0.037)	-0.008 (0.022)			
Log GDP	0.222** (0.086)	0.103 (0.122)	0.002 (0.105)	0.227** (0.090)	0.182 (0.113)	0.012 (0.110)
Log population	0.740 (0.809)	0.231 (1.128)	-0.520 (1.147)	0.735 (0.809)	0.138 (0.983)	-0.531 (1.143)
Control of corruption	-0.121* (0.072)	-0.213 (0.144)	-0.052 (0.093)	-0.119* (0.070)	-0.169 (0.123)	-0.047 (0.093)
Public health expenditure	-0.010 (0.022)	-0.075** (0.032)	-0.038 (0.027)	-0.009 (0.022)	-0.073** (0.029)	-0.037 (0.026)
Treatment * Phase two				-0.042 (0.064)	-0.512*** (0.108)	-0.075 (0.070)
Constant	7.166** (3.134)	7.331* (4.253)	3.248 (4.446)	7.146** (3.132)	7.229* (3.656)	3.223 (4.423)
N	615	615	614	615	615	614
R-squared	.259	.128	.0632	.26	.21	.0696
Dep Var Mean	11.6	8.84	1.1	11.6	8.84	1.1
* p<0.10	** p<0.05	*** p<0.01				

Appendix – II

Table 6: Baseline model with Pre-PEPFAR treatment dummy

	Pre-PEPFAR (FY 2003)		
	(1)	(2)	(3)
	People living with HIV	AIDS deaths	HIV prevalence
US bilateral AID (Current USD)	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Treatment * FY 2003	0.063*	0.341***	0.055
	(0.035)	(0.069)	(0.042)
Log GDP	0.224**	0.124	0.004
	(0.087)	(0.119)	(0.106)
Log population	0.727	0.138	-0.530
	(0.811)	(1.125)	(1.148)
Control of corruption	-0.120*	-0.198	-0.051
	(0.071)	(0.145)	(0.093)
Public health expenditure	-0.009	-0.077**	-0.038
	(0.022)	(0.032)	(0.027)
Constant	7.196**	7.593*	3.272
	(3.138)	(4.235)	(4.445)
N	615	615	614
R-squared	.259	.117	.0644
Dep Var Mean	11.6	8.84	1.1
* p<0.10	** p<0.05	*** p<0.01	

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