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THE NEW DIRECTION FOR HEALTH AID?: EXAMINING AID EFFECTIVENESS IN
RELATION TO HORIZONTAL AND VERTICAL DELIVERY OF HEALTH SERVICES

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ABSTRACT

Health foreign assistance continues to be used as a tool for development despite the widespread contention over the most effective method of aid delivery and implementation. As the proportion of health related aid continues to grow, it is critical to examine the current practices of health delivery and sector channeling as they relate to health improvements. This study examines the association between the sectors health official development assistance is funded though in relation to infant mortality and maternal mortality for 141 developing countries from 1990-2014. This study provides evidence to support that the channel health aid is funded through influences health improvements.

Keywords: *health aid; official development assistance; maternal mortality; infant mortality; health systems delivery*

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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Introduction

"It will take a massive effort to move society from corporate domination, in which industry's rights to pollute and damage health and the environment supersede the public's right to live, work, and play in safety. This is a political fight. The science is already there, showing that people's health is at risk. To win, we will need to keep building the movement, networking with one another, planning, strategizing, and moving forward. Our children's futures, and those of their unborn children, are at stake."
         -Lois Gibbs, Executive Director of the Center for Health, Environment & Justice (CHEJ)

As funding for foreign development assistance has grown exponentially since the establishment of the Millennium Development Goals in 2000, improvements in targeted health outcomes remain stagnant and marginal at best. In Sub-Saharan Africa, a region that annually receives a large share of official development assistance (ODA), health has declined since the 1990s and on average 10.6 million children and 529,000 mothers die annually due to many avoidable causes (Godal 2005). This lack of progress has contributed to the international re-evaluation of the best practice for aid delivery and implementation. The root of foreign health assistance is grounded in a disease specific approach, referred to as "vertical delivery," focusing on target interventions that produce quick results. Although this approach served as the standard model of health delivery for decades, it has recently faced a large amount of criticism for favoring the objectives of the donor. The strategies outlined in the Paris Declaration on Aid Effectiveness (2005) suggests a ideological shift towards incorporating more "horizontal" programs designed to strengthen health systems and coordinate all in-country delivery services. This rise in health assistance in conjunction with greater attention to streamlining aid to the appropriate areas makes

it timely to investigate the corresponding relationships between delivery systems, health outcomes, and the sectors aid is channeled through.

This paper investigates two primary questions, (1) is there a relationship between health aid and health improvements? (2) If so, can funding aid through certain sectors impact health outcomes differently? The first question is pertinent to the expansive debate on foreign aid effectiveness. Most empirical research in this area is dominated by studies that have found mixed results examining the impact of foreign aid on growth. Even with health capturing an increasing proportion of official development assistance, there are relatively few studies that analyze its influence on the recipient country's health indicators. Utilizing previous models of research, I first examine the influence of overall health aid on the health outcomes infant mortality rate and maternal mortality rate respectively for 141 countries from 1995-2014. The second research question looks to explore if the sector aid is channeled through influences the level of effectiveness. For the purpose of this study effectiveness is defined as associated improvements in health outcomes. Using the classifications defined by the Organization for Economic Co-operation and Development (OECD), aid sectors are broken up into the following channels: public sector (bilateral aid), NGOs & civil society (private sector aid), and multilateral aid. Vertical and horizontal delivery methods are not constrained by sector, but the associated characteristics of each system tend to influence the public sector to implement horizontal programs, while NGOs & civil society and multilateral aid agencies favor vertical initiatives. Examining the relative impact aid makes depending on the sector demonstrates if the ideology behind vertical and horizontal delivery translates into practice.

Supporting the recent reorientation in aid effectiveness policy, this paper makes a strong case that channeling health aid through the public sector improves health indicators influenced

by infrastructure and/or a long term provision of curative care. It suggests that while aid funding to civil society organizations plays a role in some associated health improvements, public sector funding is crucial for furthering the mission to achieve universal health care through the building of sustainable health systems. Furthermore, it supports the ineffectiveness of multilateral aid and lack of improvements in HIV as a result of the donor driven framework favoring disease specific targeting and vertical delivery systems.

To provide a context for the current conceptualization of health aid implementation, my thesis begins with a section outlining previous studies that examine the impact of aid in improving health. Next, I provide a background in the historical significance and structural characteristics behind horizontal and vertical delivery, before deriving seven hypotheses substantiated by theory. I then delve into the data and research design used in this study, before presenting my statistical analysis and discussion of the findings. To conclude I discuss the implications of this study, limitations, and future areas of research.

Theory and Advocacy of Health Aid Effectiveness

The research conducted in this paper addresses and expands upon two major points of contention in the international community surrounding global health aid funding. First, does receiving health aid improve health outcomes overtime? Secondly, does funding health aid through certain sectors play a role in influencing health outcomes? The following section provides a framework to understand the theory behind the hypotheses tested in this research model.

The first topic this paper addresses is the impact foreign aid has on recipient countries, specifically regarding the sphere of health. While the relationship between development and foreign assistance has been a longstanding debate in the international arena that dates back to the late 1970s, there is still little consensus between policy makers over aid effectiveness. This is partially because a large amount of literature focuses on the relationship between development assistance and economic growth. Studies by Bornschier, Chase-Dunn, and Robinson (1978), Clemens et al. (2004), and Reddy and Minoiu (2006), Burnside and Dollar (2000) are just four of the many examples that argue foreign assistance to foster economic growth given certain country contexts. Conversely, Rajan and Subramanian (2005), Roodman (2004), and Easterly (2003) suggest a lack of substantial evidence to claim an association between aid and growth. The division in findings suggests that the relationship between the two variables is much too multifaceted to be statistically captured and evaluated. In order to more comprehensively examine the impact of foreign aid on development, recent research is focusing on examining

specific funding areas (health, education, agricultural, food) and the corresponding impact on respective indicators.

Within the health sector there are a relatively small number of studies that empirically test if overall aid, and health aid specifically, impact health outcomes. A study by Bendavid & Bhattachary (2014) found health aid to raise life expectancy and lower the number of deaths of those under five in a cross-country analysis of 140 countries between 1974 and 2010. This study additionally found health aid to improve health outcomes starting 3-5 years following disbursement and that the association between the two to become stronger overtime (Bendavid & Bhattachary 2014). The results of this study imply that health aid is significant in improving health outcomes and that the benefits of such aid strengthen overtime. For instance, health aid received in 1990 improves outcomes more in 1995 than 1993. Mishra & Newhouse (2009) examined the impact of both overall and health specific aid on infant mortality in 118 countries from 1973 to 2004. While the study found the relationship between overall aid and infant mortality insignificant, the doubling per capita of health aid in an average country was associated with a two percent reduction in the infant mortality rate over five years (Mishra & Newhouse 2009). The results of this study substantiate that aid does have an influence on development indicators in the health sector and that aid funded through a specific field has a larger impact on the respective outcome. Similar to Mishra & Newhouse (2009), Banchani & Swiss (2014) examined the overall impact of foreign aid, in addition to aid specifically allocated to the reproductive health sector, on maternal mortality ratio in 106 countries from 1996 to 2010. Analogous to Mishra & Newhouse (2009), Banchani & Swiss (2014) did not find a significant relationship between overall aid and maternal mortality, but aid funded with a reproductive focus resulted in a substantial decrease in maternal mortality. The results of Bendavid & Bhattachary

(2014), Mishra & Newhouse (2009), and Banchani & Swiss (2014) support that health aid improves health overtime, and that more substantial improvements occur over longer periods of time when aid is channeled through a sector related to the indicator (i.e. greater maternal mortality improvements with more reproductive focused aid). Looking to substantiate and expand upon previous research examining the relationship between health aid and health outcomes overtime, the first part of this study tests the following hypotheses:

H1: An increase in health aid lowers the recipient country's infant mortality rate on a five and ten-year lag.

H2: An increase in health aid does not affect the recipient country's maternal mortality on a five-year lag.

H3: An increase in health aid lowers the recipient country's maternal mortality rate on a ten-year lag.

H1 serves to confirm the findings of Mishra & Newhouse (2009), so the data may be used in the second half of this paper to investigate the impact of specific aid sectors on infant mortality. Following Banchani & Swiss (2014), *H2* examines if total health aid, as opposed to overall aid, is still too broad of a channel to substantially impact maternal mortality. Since reproduction and pregnancy is a lengthy process and improvements from aid implementation only begin to occur 3-5 years following disbursement, *H2* predicts five years as not a long enough period to substantial impact maternal mortality. Instead, *H3* predicts improvements in maternal mortality from health aid to be seen 10 years after the aid was initially received.

After testing the results of previous research that claim health aid leads to health improvements, the second half of this paper evaluates this same impact of health aid in relation to its disbursement through certain sectors. Up until recently there has been a relative disconnect

between ideology and practice regarding health aid funding through specific sectors. The following section provides a background to understand the relationship connecting the ideology behind sector funding to the distribution of aid to health delivery systems. To accomplish this I provide an overview of three distinct yet uniquely intertwined categories, (1) the delivery structures used to fund health systems, (2) the historical influences and preferences in global health funding, (3) and how the two relate to aid given to the public sector, multilateral agencies, and/or NGOs and civil society organizations. The confluence of these three areas is used to predict if funding health aid through specific sectors leads to potentially better or worse health outcomes.

A question that remains at the frontline of foreign assistance today, is what is the most effective way aid can be given to achieve results? Following the launch of eight international development goals, known as the "Millennium Development Goals" (MDGs), there was a dramatic increase in foreign aid funding. In 2002, health specific ODA grew by 2.5% of total amount received, increasing the annual average health aid flow to that of US$6.4 billion (Piva & Dodd 2009). However, as aid funding increased the outcomes produced by recipient countries were not representative. Five years into the launch of MDGs, only three out of ten regions were on track to reduce maternal mortality by three quarters in time for 2015, and prospects were low for any region to halt and reverse the spread of HIV (United Nations Statistics Division 2005). The large upscale of aid and overwhelming lack of progress lead to the 2005 International Forum on Aid Effectiveness. At this forum 90 nations acknowledged the need for a policy change because although health aid continued to rise there was little substantial indication of health improvement occuring. This concern for effective aid allocation prompted the WHO, OECD, and the WB to launch two agreements, The Paris Declaration on Aid Effectiveness (2005) and the

Accra Agenda for Action (2008). The Paris Declaration seeks to make aid more effective

through the five principles of ownership, harmonization, alignment, managing by results, and

mutual accountability (Beracochea 2015). These five principles are intended to give recipient

nations more control over aid flow while making donors align their assistance with in-country

systems and institutions (Unger et al 2010). This policy also acknowledged that the

implementation of development aid needs to be considered on country-scale, ensuring that all

projects are coordinated with one another under the national health plan (Beracochea 2015). The

Paris Declaration on Aid Effectiveness is the recent international standard model to achieve the

development of sustainable systems through the use of foreign assistance. The implementation

for this policy marks a milestone for the global community, which has historically advocated a

neo-liberalist approach to the provision of health services. It additionally exemplifies a transition

away from vertical health system delivery as the ideal model for funding health assistance.

Health services are funded through two modes of delivery: vertical and horizontal

programs. Horizontal delivery, also known as "integrated programs," focus on providing general

services to target the prevention and care of broad health problems (Elzinga 2005). Conversely,

vertical programs are donor driven and operate outside of the recipient country's public health

system with the intention of targeting a specific health intervention (usually focused on disease

control). The top-down nature of vertical delivery is easier to manage on an international level

and does not require the involvement of in-country bureaucratic institutions (Msuya 2004). Since

many of these programs are self-sufficient and do not require bureaucratic involvement, they are

typically funded by non-governmental organizations (NGOs), multilateral agencies, and a

breadth of institutions in the civil societal sector (Msuya 2004). Prior to the late 1970s health

foreign assistance was primarily funded through vertical programs that targeted disease control

in colonies. Colonial powers implemented these programs as a cost efficient way to control the mass spread of disease in their colonies without requiring the implementation of a cohesive health system. Following the successful eradication of small pox in 1979 these donor-driven disease-specific programs became the model for international health assistance.

It was not until 1978 at the WHO's Alma-Ata conference that the first international policy was introduced supporting the idea of universal access to health services, as opposed health aid policies focused solely on disease control. The Primary Health Care (PHC) model advocated for the public provision of health services and community participation to achieve health goals (Beracochea 2015). This socialist nature of this model faced massive opposition from U.S. based multinational companies that went so far as influencing the U.S. government to withhold WHO funding in 1985. Shortly after, the Rockefeller Foundation and United Nation Children's Fund (UNICEF) (both U.S. based organizations) promoted an alternative PHC model that only focused on the control of five specific diseases. While the WHO's original PHC plan generated costs equivalent to the model solely focused on disease, the model proposed by the Rockefeller Foundation and UNICEF kept curative care on the free market as a private good. Supporting the interests of the private sector, the U.S. government and World Bank endorsed this disease focused alternative plan to the PHC sparking an era in which the international community advocated for neo-liberal health aid delivery (Unger et al 2010).

Neo-liberalism is an economic approach that favors a free market, promoting the provision of resources through the private sector instead of the government. Critics of this policy supporting health care as a "human right," see the neo-liberal method of financing health care as structure of supply and demand based on the costumer's willingness to pay. The neoliberal approach split foreign health assistance into two major categories (1) health care and (2) disease

control. It encouraged the private sector to provide general curative care and the public sector to focus on public health and disease control services (Unger et al 2010). Policies favoring the private sector at large were justified under the notion that services provided by the government were "plagued by bureaucracy." The formation of this market structure can be easily summarized in a report published by the United Nations Research for Social Development (UNRISD):

> "What is not in doubt is the scale of the policy pressures over the last two decades from, particularly, multilateral donors to commercialize health care. The WB has been particularly influential in promoting the concept of health care as largely private good, hence deliverable through the market, all the while downplaying the well-understood perverse incentives structures in health care markets" (Unger et all 2010).

Providing health services in this manner contradicts the structural design behind health delivery models. Private sector funding is most effective through vertical programs that target specific health interventions. Attempting to provide curative care through this same method is unreasonable and requires government regulation of all private sector activities. Already weak or developing governments now needed to spend more money allocated for health expenditures increasing their bureaucratic capacity (Unger et al 2010). The promotion of such policies was detrimental to many developing nations who did not have the administrative support for such regulatory capability, and wasted public financing building overhead. The cost of overhead strained weak governments from providing any public health services, contributing to the idea of public sector as inefficient and lengthy. While vertical delivery was proven to be very successful in delivering short-term solutions, programs have the potential to be "expensive to run and divert resources and attention from regular basic services" (Msuya 2004). Critics also argue that the implementation of vertical delivery programs allow countries without an existing sustainable infrastructure to postpone major health reform. Overtime, these policies contributed to the

fragmentation and commodification health care, dividing the public sector and the private sector rather than aid improving health systems.

The recent policy change to improve the efficiency of aid allocation demonstrates a shift to integrate existing vertical delivery programs with horizontal. In line with the goals outlined by the Paris Declaration, horizontal programs work to strengthen existing health systems and develop integrated services. A notable example of horizontal delivery is the African Program for Onchocerciasis Control (APOC) launched in 1995. APOC set up systems integrated in public health infrastructure to distribute Mectizan®, a drug used to eradicate onchocerciasis, in countries where the demand was present (Msuya 2004). The success of this program was attributed to its support when partnering with local communities, assimilation of private sector funding and public sector implementation, in addition to its ability to adapt to local circumstances from in-country support. Although APOC focused on one specific disease, it accomplished the primary objective of horizontal delivery programs to increase comprehensive care through the strengthening existing health systems. In countries where the health infrastructure is functionally sound these programs have proven to be cost-effective and sustainable over a long period of time (Msuya 2004). However, for nations with limited resource horizontal delivery has the potential to be difficult to manage and regulate, leading to their misuse and exploitation. Much of the success of horizontal delivery is attributed to the engagement of the public sector. The assimilation with the existing government infrastructure requires the examination of a wide range of health determinants before implementation. Considerations include the demand for health services in relation to geographical region, poverty distribution, existing human and financial resources, sustainability over time, and additional

political factors (Msuya 2004). Additionally, integrating with existing government expenditures and programs allows for greater harmony in development across health systems.

The first hypothesis tested under this paper's second research question, serves to examine the relationship between health outcomes and the ideology of sector financing.

H4: An increase of health aid funded through the public sector lowers infant mortality rate and maternal mortality rate over five years in a more substantial manner than funding through NGOs & Civil Society and multilateral agencies.

The premise behind *H4*, aid given to the public sector increases health improvements over other channels, is derived from concepts articulated in both the Paris Declaration and model for horizontal health system delivery. Although infant mortality improves quickly from slight increases in development, improvements in maternal mortality is associated the capacity building of public health infrastructure. A strong message conveyed in both of these models is that public sector involvement is the most effective method to strengthen existing health systems while promoting an increase in harmony through the alignment of programs. While vertical programs are know to be effective in targeting specific diseases, Beracochea (2015) argues that the principal owner of these programs needs to be the government. Her book advocates for all activities in the health sector to assimilate with the national health plan ensuring that "policies and objectives for each of its vertical health programs and health facilities that deliver horizontal services" (Beracochea 2015). Projects need to involve coordination and involvement of stakeholders at the country level in order to further comprehensive national progress. Small activities, including many projects funded through international NGOs, only focus on accomplishing "project objects," resulting in disjointed targeting of health concerns (Beracochea 2015). While small projects are important to accommodate short-term needs or for testing out

new models of delivery, they tend to cause high regulatory costs for governments and to not be

aligned with national priorities (Piva & Dodd 2009). Between 2002-2006, the CRS only recorded

946 activities that were over US$ 10 million out of the 20,485 documented health projects,

comprising less than 5% of transactions. Piva & Dodd (2009) interpret the relatively large

number of small donor projects in health sector to imply a high level of fragmentation in health

aid. Increasing the amount of large commitments to the public sector and requiring the

assimilation of small donor driven projects assists in the development of a harmonious health

system. This call to action from both international aid agencies and experts on health delivery

systems to focus on a system on integrated delivery implies the support for aid given to the

public sector as the most sustainable and effective method for the building of cohesive health

systems. This type of aid allocation is also financial beneficial to the donor. Piva & Dodd (2009)

argue that channeling aid directly to the public sector through general budget support "is

arguably one of the most efficient aid modalities: it avoids many of the cost and inefficiencies

associated with projects; it is easier to align with the recipient's priorities; and it opens the way

to a broader, strategic dialogue on economy-wide issues" (Piva & Dodd 2009). *H4* looks to test if

the ideology behind the public sector improving health systems is authentic. It measures the

strengthening of health systems through the improvement in infant and maternal mortality five

years after aid implementation.

The next section looks to expand on theories associated with the underlying the

relationship between disease specific aid and the historical influence of vertical programs. The

use of a targeted intervention to receive quick measurable results is a major component as to why

vertical programs have previously been favored for targeting disease control. These programs are

freestanding and provide beneficial solutions for temporal problems, assisting with the control of

an epidemic or providing additional resources in emergency situations. The eradication of small pox can be accredited to the implementation of a vertical program, however since that time no other diseases have been successfully extinguished (Unger et al 2012). When it comes to the distribution of health assistance on a global level, the top-down nature of this method of health delivery is appealing to multilateral agencies and NGO and civil society organizations. Although neo-liberalism promoted the private sector provision of curative care, the way in which vertical programs are modeled continued to incentivize organizations to target disease control. The structure of vertical delivery systems facilitates the association between multilateral and NGO and civil society funding towards disease control focused programs. Between 2002-2006, 25% of all health ODA received was through multi-country initiatives, encompassing aid delivered through multilateral channels as well as NGOs and civil society. Of this aid, a substantial 40.7% was channeled directly to HIV/AIDS initiatives (Piva & Dodd 2009). This statistic is not fairly shocking because the amount of aid allocated toward HIV/AIDS has been known to exceed the national health budget of certain countries in Sub-Saharan Africa. However, this data does demonstrate multilateral agencies and the private sector's emphasis on disease focused funding (Unger et al 2010). A study conducted by Shiffman (2007) shows countries with higher rates of HIV prevalence are associated with the disbursement of a larger proportion of ODA, illustrating a trend in donors displacing funding from other health issues to prioritize HIV/AIDS. Looking to examine the role of disease in relation to sector channeling and expand upon the findings of Shiffman (2007) the following hypothesis is tested:

H5: Countries with a higher prevalence of HIV will receive a greater increase in private sector health aid and/or multilateral health aid funding compared to public sector health aid. Countries

with lowers rates of DPT immunization will receive a greater increase in private sector health aid and/or multilateral health aid funding compared to public sector health aid.

The theory behind this hypothesis is two-fold. First, it assumes that a higher prevalence of HIV or lower immunized population results in an increased proportion of health assistance. This presumption is based off the results of the Shiffman (2007) study in addition to the global rise in HIV/AIDS allocation. Additionally, nations with low levels of development receive more foreign assistance, implying that countries with a small percent of their population immunized receive higher levels of aid. Least developed countries have the worst health outcomes, and directly receive one third of all health ODA to facilitate development efforts (Piva & Dodd 2009). Since the DPT vaccine is inexpensive and easily distributed the percent of the population that has received the immunization is useful indicator to identify low levels of development through lack of basic in-country provision of health services. *H5* tests to see if these theories are consistent across sectors, or if the level of immunization and presence of HIV influence certain channels. Funding to multilateral agencies and/or through NGO and civil society organizations is expected to increase relative to the public sector because international aid agencies have traditionally advocated for disease control through vertical programs, the same health delivery system frequently used to channel multilateral and civil society aid. Additionally, since countries with a higher prevalence of HIV/AIDS receive more funding, and the share of multilateral and civil society aid allotted to the prevention and control of HIV/AIDS continues to rise, it is rational to believe that funding would continue to be distributed proportionally.

Since a large portion of multilateral and NGO and civil societal aid targets HIV/AIDS, it is compelling to examine if aid funded through these sectors improves the prevalence of HIV overtime.

H6: An increase of health aid funded through the NGOs and civil society organizations and/or multilateral agencies yields no affect on the recipient country's prevalence of HIV over five years.

While this study predicts a higher prevalence of HIV to raise the level of multilateral and NGO and civil society funding, the historical inefficiency of vertical health delivery systems suggest funding through multilateral and NGOs and civil society have no significantly impact the prevalence of HIV overtime. This theory assumes that the majority of targeted HIV/AID funding coming from these sectors is disbursed through vertical delivery programs. While vertical programs have empirically lead to lower rates of infection, there are many criticisms of vertical delivery programs. The result of which have caused health policy experts advocate for integration between disease control activities and general health care delivery in order to promote sustainable health improvement.

Vertical delivery programs are implemented with the intent to reach strategic goals outlined by an overarching campaign. In countries lacking health care infrastructure aid recipients are often in need of greater health resources which vertical programs are unable to provide or accommodate due to their top-down structure (Unger et al 2010). The implementation of vertical programs external to existing health services has the potential to duplicate provisions already in place, undermine the services provided by the government, and incentivize the government to not claim responsibility in providing health care (Unger et al 2010). The program Direct Observed Treatment Strategy (DOTS) illustrates that vertical programs need certain country qualities to reach targeted health improvements. DOTS, implemented in 1991, was a global strategy used to control the spread of TB through door-to-door screening and recording. While this program in some cases was very successful and reduced TB infections per patient by

approximately 73% when managed properly, its separation from the government generated a lack of political commitment. The long-term treatment of TB, the short term funding of the strategy, and its operation outside of the government left no accountable stakeholder after project completion making DOTS entirely unsustainable. The program operated externally to the government, fragmenting the provision of care for TB in nations with existing TB programs, while solely administrating that of others (Msuya 2004). The effective implementation necessitated by country characteristics is contradictory to the "one size fits all" model of vertical delivery. The flaws associated with vertical delivery systems are even present in countries regarded globally at higher levels of development. Tkatchenko-Schmidt et al (2010) argued that the structure of the vertical programs in Russia contributed to the struggle to contain HIV/AIDS, hurting instead of helping the system. The report argues that efficient and effective responses to diseases like HIV require the utilization of resources beyond the scope of a solely disease-targeted approach. After evaluating the system discrepancies the paper suggested the following changes in health deliver to improve HIV response "require improvements in their wider health systems, namely advocacy of preventative approaches with a focus on high-risk populations; reallocation of resources from curative services toward primary prevention; building capacities for effective decision-making and long-term planning at the local level" (Tkatchenko-Schmidt et al 2010). Again, this study emphasizes that health delivery needs to be coordinated and integrated with one another. The criticism of vertical programs as the only means of providing health is apparent across country scale, wealth, and development. The inefficiencies of vertical delivery and the immense amount of funding channeled to target HIV/AIDS while lacking corresponding improvement outcomes substantiate my *H6* prediction, that funding through multilateral and NGOs and civil society sectors will not impact the prevalence of HIV over time.

With the overwhelming evidence and policy advocacy in favor of health systems that integrate vertical with horizontal modes of delivery, it begs the question why are donors continuing to finance the implementation of freestanding vertical programs? Aside from the ramifications of an international aid assistance system deeply engrained in providing donor and disease specific funding, research has shown the characteristics of recipient governments to impact donor selectivity. As mentioned previously, the effectiveness of horizontal delivery relies on an existing stable and competent public sector infrastructure. Donors that perceive the government as not functionally sound or demonstrating high levels of corruption tend to seek aid funding through alternative methods than the public sector (Dietrich 2011). In cases where recipient countries have high levels of corruption, vertical delivery appeals to global donors because it combines lack of government involvement and ease in executing quick-fix solutions that produce results. The last hypothesis tested in this paper looks to corroborate the role of government corruption in the relationship between donor selectivity and aid channeling.

H7: Countries with perceived higher levels of corruption receive more health aid through multilateral agencies and NGOs and civil society organizations than the public sector.

While the purpose of this hypothesis is to primarily check that the control variable "corruption" used in the research model is behaving according to Dietrich's (2011) findings, it also looks to incorporate the role of donor selectivity and aid effectiveness.

Data & Methods

This study examines 141 countries, classified as developing by the OECD, from 1995-2014. A full list of countries broken up by region can be found in Appendix B, Table 5. Developing countries were excluded if they had no record of health aid received, or lacked data for both dependent variables. The primary dependent variables of this study are the health outcomes measured through infant mortality rate and maternal mortality rate. All previous studies examining the effect of health aid on health outcomes, have incorporate either of these variables or one similar in nature (Mishra & Newhouse 2009; Bendavid & Bhattachary 2014; Banchani & Swiss 2014). Infant mortality rate was selected due to its sensitivity to changing economic conditions improvements. Lower infant mortality has been associated with short-term development and advancements in "access to medicines and health facilities, water and sanitation, fertility patterns, maternal health, maternal and infant nutrition, maternal and infant disease exposure, and female literacy in addition to per capita GDP and economic inequality," (Mishra & Newhouse 2009). Additionally, infant mortality data is widely available and consistently cited across literature as a common health indicator. This study uses data from the World Bank defining infant mortality rate as the number of infants dying before reaching one year of age per 1,000 live births in a given year (World Bank 2016).

While infant mortality demonstrates the improvement of a health system over a short period of time, the indicator maternal mortality ratio was chosen to examine the development of public health infrastructure over a longer period of time. Improvements in maternal mortality are associated with long-term health developments including service delivery, qualified health

workforce, and beneficial policy initiatives for women and children (Kuruvilla et al 2014). This study uses a modeled estimate of maternal mortality defined as the ratio of the number of women who die from pregnancy-related caused while pregnant or within 42 days of pregnancy termination per 100,000 births. MMR data is also from the World Bank's catalogue of World Development Indicators. The WB's modeled estimate of MMR comes from the proportion of maternal deaths among non-AIDS deaths in women ages 15-49, fertility, birth attendants, and the GDP (World Bank 2016). While infant mortality serves to measure short-term health and poverty improvements, maternal mortality evaluates the long-term impact of health aid on the total health system.

The data source for the primary independent variable, health aid, is drawn from the OECD's Creditor Reporting System's (CRS) database. The CRS tracks all Official Development Assistance (ODA), which is defined as aid given with the intention to improve economic welfare and development (Piva & Dodd 2009). The CRS database has recorded over 2 million grants from 1973 to 2015 and is considered to be the most reliable source for aid data and standard for foreign aid research (Bendavid & Bhattacharya 2014). However, CRS data does not come without limitations. For instance, CRS data does not include aid given by non-OECD governments, lacking a significant amount of aid flow from China, India, and wealthy Middle Eastern countries. Additionally, the CRS does not encompass aid given by private groups, but it does include the Bill & Melinda Gates Foundation (Piva & Dodd 2009). The CRS only records commitments not disbursements of aid. How the OECD defines "commitments" compared to "disbursements" can be found in Appendix C, Table 3. Piva & Dodd (2009) reported that from 2004-2006 over 80% of annual commitments were followed through to disbursement.

Notwithstanding, the reality of foreign aid amounts to a number more robust than that recorded

by the CRS.

The four sectors aid is given through on the CRS serve as the primary independent

variables, in addition to all total health aid regardless of sector. The four sectors are public sector

(bilateral aid), NGOs & civil society (private sector aid), public-private partnerships (PPPs), and

multilateral aid. The official OECD's distinction between multilateral agencies, NGOs, and

bilateral aid is outlined in the literature review section. For the purpose of this research health aid

includes all aid given through the two CRS categories "Health, general" and "Population

policies/programmes and reproductive health." The sub-categories for these areas include the

following: health policy and administrative management, medical education/training, medical

research, medical services, basic health care, basic health infrastructure, basic nutrition,

infectious disease control, health education, malaria control, tuberculosis control, health

personnel development, population policy and administrative management, reproductive health

care, family planning, STD control including HIV/AIDS, and personnel development for

population and reproductive health. The definition of each sub-category can be found in

Appendix C, Table 4.

In order to control for confounding variables this study utilizes a robust set of controls

developed and modeled off previous research. Prevalence of HIV is controlled for to target

countries receiving disease specific aid. Taken from the WB's database on World Development

Indicators HIV prevalence represents the percentage of people ages 15-49 who are infected with

HIV (World Bank 2016). In order to test the effectiveness of disease control related aid this

study includes the immunization of DTP (diphtheria, pertussis, and tetanus). Also taken from the

World Development Indicators database, the WB measures DTP immunization as the percentage

of children ages 12-23 months who receive vaccinations before 12 months or at any time before

the survey. A child is considered adequately immunized against diphtheria, pertussis, (or

whooping cough), and tetanus (DPT) after receiving three doses of vaccine (World Bank 2016).

To capture the countries health, economic, and political status upon receiving aid health

expenditures (% of GDP), GDP, corruption, and conflict are all included. Like the other controls,

health expenditure data is from the WB and is classified as the sum of public and private health

expenditure; covering the provision of health services (preventive and curative), family planning

activities, nutrition activities, and emergency aid designated for health but does not include

provision of water and sanitation (World Bank 2016). Data on GDP at market price in current

USD is also taken from the World Development Indicator database. Corruption and level of

conflict are from the Quality of Government Institute's Standard Time-Series Data. In this

dataset corruption data is included from the Corruption Perceptions Database that measures the

variable through a survey on the abuse of "public office for private gain." It scores countries on a

scale between 0 (highly corrupt) and 100 (highly clean) (QoG 2016). This study uses the

corruption variable to account for government extortion in the case of public sector financing and

to examine the role of donor-selectivity. Intensity of conflict is measured on a scale between 1

(no conflict) to 10 (war). The full QoG rating is as follows:

> How serious are social, ethnic and religious conflicts? 1-10.
> 1. There are no violent incidents based on social, ethnic or religious differences.
> 4. There are only few violent incidents. Radical political actors have limited success in mobilizing along existing cleavages. Society and the political elite, however, are divided along social, ethnic or religious lines.
> 7. There are violent incidents. Mobilized groups and protest movements dominant politics. Society and the political elite are deeply split into social classes, ethnic or religious differences.
> 10. There is civil war or a widespread violent conflict based on social, ethnic, or religious differences. (Teorell et al 2016).

All hypotheses were tested using fixed multivariable linear regression models. Regressions analyzing the presence of corruption or HIV at the time aid was given include data from 141 countries from 1995–2014. To account for the temporal effect aid may have on health outcomes, the primary dependent variables and all control variables except level of conflict are lagged 5 to 10 years respectively depending on the model. Conflict is not lagged due to its ordinal nature and to capture the current state of the recipient upon receiving aid. Regressions including a lag analyze the change in the dependent variable over a 5 or 10 year period, as opposed to the value five years later. For instance, if health aid was given in 1995, the value for infant mortality rate would be the difference between the infant mortality rate in 1995 and 2000. Due to this, models including a five-year lag encompass aid data from 1995-2009 and health indicator data from 2000-2014; while models on a ten year lag include aid data from 1995-2004 and health indicator data from 2005-2014. The control variables are consistent with the dependent variables, also reflecting the change in said indicator over 5 or 10 years. Conflict is excluded from all 10 year lagged regressions due to lack of data. The influence of health aid sectors (public, private, multilateral) on health outcomes was unable to be assessed on a 10 year lag because aid channeled by sector only began to be documented after 2004. Additionally, public-private partnership aid data was completely excluded from the study because of the relative, if any, instances that were reported even after 2004.

Statistical Interpretation and Analysis

A first look at the data reflects the current trends following official development assistance (ODA) since 1995. As Figure 1 in Appendix B demonstrates a majority of health ODA is financed through the public sector, constituting 34.56% of all health aid from 2003-2014. However, much of the CRS's ODA remains undocumented by sector, with multilateral and NGO & civil society aid only representing 19.14% and 12.32%, respectively, leaving 26.01% "to be defined". Figure 2 demonstrates the large growth in public sector aid since 2004, including large spikes in 2009 and 2013. This increase in growth reflects the recent surges in health funding in attempts to reach the MDGs by 2015. Looking at Figure 5 it is not unexpected that the African countries have an overwhelmingly high prevalence of HIV compared to other regions around the world. African nations, specifically Sub-Saharan Africa, also have the highest maternal mortality ratio and infant mortality rates seen in Figures 3 and 4. Maternal mortality in the African region more than doubles the average in East Asia and South & Central Asia. While the African region takes the lead on severity of health indicators in both disease and mortality, Figure 5 shows South & Central Asia and East Asia to receive slightly more health aid on average. Table 2 in Appendix C illustrates the distribution of health aid by sector for each region. As a percentage of their total health aid from 2003-2014, the Far East Asian region receives the most public sector aid, Central & South America the largest percentage of NGO & Civil Societal Aid, and South & Central Asia the most multilateral aid.

Regression tables 1 and 2 indicate that with all variables held constant health aid is significantly correlated with improved infant mortality rate and maternal mortality ratio over a five-year period. For every $1 million increase in health aid funding there is an expected 0.031 change in infant mortality rate and 0.283 change in maternal mortality ratio every five years. Health aid was also found to be significant in improving both indicators over a 10 year period. When all other variables are held constant, an increase of $1 million in health aid predicts a 0.188 change in infant mortality and a 1.663 change in maternal mortality over ten years. This predicted change is substantially larger for each health outcome, implying that health aid implementation has a greater impact over a longer period of time. Although all models on both lags have a statistically significant f statistic, the adjusted R^2 is higher on the models with a 10 year lag, accounting for ~40% of the variation with in the data compared to only ~20% in the 5 year lagged models. These findings on infant mortality substantiate pervious research (Mishra & Newhouse 2009; Bendavid & Bhattachary 2014) that increases in health aid are correlated with lower infant mortality rate. Furthermore, it demonstrates that increases in health aid are also associated with lower maternal mortality ratio over five and ten years refuting the findings of Banchani & Swiss (2014).

In addition to looking at how overall health aid impacted infant and maternal mortality, this study examined the relationships between health outcomes and the sectors (public, NGO & civil society, multilateral) aid is channeled through on a five-year lag. The purpose of this is to see if aid funded through a specific sector has a greater impact in improving the health indicator overtime. The regression in table 6 finds public sector and NGO & civil society aid to be statistically significant in relation to the change in infant mortality rate over five years with all else held constant. An increase of $1 million USD in public sector funding predicts 0.021

improvement in infant mortality rate, while a unit increase in NGO & civil society funding

predicts a 0.066 change. The relationship between multilateral aid and infant mortality was not

significant. The higher correlation between infant mortality and NGOs & civil society sector

suggests that aid given to the private sector improves infant mortality over a five-year period

slightly more than aid given to the public sector.

The model examining the relationship between maternal mortality and aid sectors found

in Table 7 also finds total public sector aid to be significant, but the same does not hold true for

NGOs & civil society or multilateral aid. For every increase in $1 million of public sector

funding, there is a predicted 0.273 change in maternal mortality over five years. The models in

table 6 and 7 demonstrate that funding from the public sector is correlated to both improved

infant and maternal mortality over a five-year period. This correlation corroborates my

hypothesis that aid funded through the public sector has a greater association to improved health

outcomes for both indicators compared to multilateral aid or NGOs & civil society funding.

The regression in Table 8 examines whether the control variables, most notably the

prevalence of HIV, are associated with more or less total health aid funding. The model finds

prevalence of HIV, percent immunized for DPT, level of corruption, and level of conflict to all

be significant. It is expected that for every 1% increase in the prevalence of HIV among the

population there is a predicted 1.440 million increase in health aid funding. As the percent of the

population increases in immunization for DPT there is a predicted 0.593 less aid received. This

finding is logical because as a country becomes more developed (as indicative by a greater

percentage of the population immunized) it receives less aid. This statistical association

illustrates that health aid is primarily distributed to developing and/or low-income countries. This

model also exhibited rational findings for the controls level of conflict and corruption. The

correlations indicated that higher corruption leads to less aid, while higher levels of conflict leads more aid. Holding all other variables constant as the perceived level of corruption increases, there is a predicted -1.337 decrease in total health aid. Indeed, for each unit increase in level of conflict there is a predicted 5.310 increase in health aid. The F statistic for this model is significant however, it is not very representative of the data with a fairly high residual standard error and an R^2 explaining only 8.9% variation.

The regressions run in Table 9 look to expand on the control relationships from Table 8 through breaking aid up by sector. The association between public sector aid and the two disease related controls, prevalence of HIV and percent immunized for DPT, is significant. Level of corruption is significant for all sectors, but has the biggest decrease in funding in relation to the public sector. With all else held constant a one unit increase in the level of corruption predicts a 0.450 reduction in public sector aid. Level of conflict is significant with every sector however, as conflict increases one unit the is a greater association with aid through the public sector or multilateral channels compared to NGOs & civil society. Lastly, health expenditure (% of GDP) was only significant in relation to multilateral aid. Inferring that when all controls are held constant, a percent 1% increase in health expenditures results in a 1.058 decrease in multilateral funding.

Discussion

The empirical research conducted provides sufficient evidence to support the position that health aid is associated with improvements in maternal and infant mortality. The positive association between health aid and improvements in infant mortality over five and ten years supports the hypothesis, *H1*. *H1* states that *an increase in health aid lowers the recipient country's infant mortality rate on a five and ten-year lag*. These results confirmed the findings of Mishra & Newhouse (2009) and expanded upon theories proposed by Bendavid & Bhattachary (2014). The relationship remaining significant between aid and infant mortality 5-10 years after the aid related activity was documented speaks to the long lasting effect health aid has. Depending on the project or campaign, aid that is "disbursed" one year, may actually be allocated different ways overtime (Bendavid & Bhattachary 2014). The larger coefficient in the ten-year model suggests the impact of health aid on infant mortality rate is more substantial overtime.

Health aid was also found to improve maternal mortality over 5 and 10 years. This did not support *H2, an increase in health aid does not affect the recipient country's maternal mortality on a five-year lag*; however it did support *H3, an increase in health aid lowers the recipient country's maternal mortality rate on a ten-year lag*. The improvement of maternal mortality over both five and ten years suggests that the benefits of health aid are effective in improving and providing reproductive, maternal, and child care in the years immediately following distribution. The variable health expenditure (% of the GDP) is also significant in the

regression in table 2 examining the effect of health aid on maternal mortality over 5 years. The significance of this variable implies that as maternal mortality improves, there is an associated increase in a nation's health expenditures. Since maternal mortality is known to improve through capacity building of public health infrastructure (Kuruvilla et al 2014), and a decrease in maternal mortality is associated with an increase in health expenditures, it is rational to conclude that improvements in maternal mortality are related to greater health funding through the private sector. Similar to the models between health aid and infant mortality, bigger improvements are also predicted of maternal mortality over ten years as compared to five.

For both health outcomes we should interpret these statistics with caution. In all four models, the control variables GDP, prevalence of HIV, and percent immunized for DPT were also significant. This suggests that improvements in infant or maternal mortality may not necessarily be from health aid, but overarching improvements in development. This theory holds greater weight in justifying why large improvements in health are seen over ten years. Findings from Bendavid & Bhattachary (2014) suggest that the relationship between health aid and both under-5 mortality and life expectancy and to fade in significance 3 and 5 years after disbursement respectively. The models used in this study lack to take into account the strength in association between the primary independent and dependent variable, implying that the relationship between health aid and health improvements is potentially null.

Breaking the variable of health aid up into three channels, public sector, NGOs and civil society, and multilateral agencies also yielded significant relationships in regard to health improvements. An increase in public sector and NGO and civil society aid respectively is predicted to improve infant mortality over five years. The coefficient was larger for aid funded through the NGO and civil society sector, implying that this type of aid has a stronger

association with improving infant mortality compared to public sector funding. This finding did

not support part of *H4*, which hypothesizes: *An increase of health aid funded through the public*

sector lowers infant mortality rate and maternal mortality rate over five years in a more

substantial manner than funding through NGOs & Civil Society and multilateral agencies. While

this relationship between civil society funding and improvements in infant mortality was not

predicted, after further investigation it can be easily explained by the qualities of infant mortality

as a poverty indicator and the commons trends in civil society funding. Civil society

organizations (CSOs) form to provide public services to the population that are lacking from

government administration. In low-income countries where government provision of public

goods is relatively low, CSOs have stepped in to fill the void. Specifically within health, the

WHO has documented CSOs to contribute to health services, health promotion and information

exchange, policy setting, resource mobilization and allocation, and monitoring quality of care

and responsiveness (WHO 2001). Infant mortality rate, on the other hand, is considered to be a

very sensitive measure of population health that is correlated with both disease epidemics and

structural changes in health systems (Reidpath & Allotey 2003). Countries without the provision

of health as a public good have correspondingly high levels of infant mortality. A small amount

of CSO funding in this environment has the potential to substantially change infant mortality due

to its receptiveness as an indicator. While public sector funding is associated with improving the

national health system, civil society funding results in a larger decrease in infant mortality

because of its provision when government services are lacking. However, an increase in public

sector funding is also significant in improving infant mortality. Though countries with low infant

mortality may change more substantial from CSO aid, the relationship between public sector aid

and IMR implies that IMR continues to improve with the strengthening of national health

services. This follows the findings of Kuruvilla (2014) stating, "Health-sector investments accounted for around half the mortality reduction in children under five years between 1990 and 2010. High-impact interventions and systems strengthening were important; e.g. for immunization and other child health interventions, skilled birth attendance and maternal and newborn care and family planning" (Kuruvilla 2014). While infant mortality may be impacted more by aid directed to poverty relief and initial service provision, like that of CSO funding implementation, the long term and sustainable preventative care that comes from the cohesion of strong health systems improves the mortality of children under 5. This potentially suggests that CSO aid is better at improving health outcomes closely connected to high levels of poverty, while public sector aid improves health outcomes dependent on long-term preventative health. Lastly, the lack of significant relationship between infant mortality and multilateral aid may suggest the failure of multilateral agencies in delivering services the improve poverty conditions or relieve disease burden. This notion corroborates the position that vertical programs (highly utilized and advocated by multilateral organizations) implement aid ineffectively.

The findings supported the second part of *H4* and found only an increase in public sector funding out of all three channels to be associated with a significant decrease in maternal mortality over five years. As mentioned previously, improvements in maternal mortality occur through advancements in the building of capacity and infrastructure of in-country health systems. A report conducted by the Center for Strategic & International Studies (CSIS) Policy Center in 2012 found that a majority of maternal related deaths are associated with delays in receiving adequate care. These delays can often be caused by due to regional difficulties as well as inadequate health facilities lacking of skilled delivery staff, training, and equipment (Nieburg 2012). Improving health systems in these areas has been shown to reduce symptoms like

postpartum hemorrhaging or other conditions that cause maternal mortality (Nieburg 2012). The

relation between maternal mortality and public sector funding substantiates the argument that

public sector funding strengthens in-country health programs. This idea contributes to the overall

argument that the sectors aid is channeled through are associated with improvement in differing

health outcomes. Under this notion, channeling of aid through certain sectors should be utilized

depending on the project's health objective or goal.

The findings in model 9 did not support hypothesized relationship between disease-

related health indicators and aid channeling. The first part of *H5* stated: *countries with a higher*

prevalence of HIV will receive a greater increase in private sector health aid and/or multilateral

health aid funding compared to public sector health aid. The regression found the opposite to be

true, with higher levels of HIV associated with an increase in public sector funding. The cause of

the relationship may be related to historical precedent of disease-control programs, HIV/AIDS

funding trends, and the recent emergence of global health initiatives. The market approach for

health care delivery influenced by neoliberalism policy and advocated by aid agencies has long

been the international standard concerning "aid effectiveness" (Unger et al 2012). This model

contributed to the privatization of health care and the delegation of disease control activities to

the public sector. While a majority of multilateral aid is largely earmarked for HIV/AIDS related

projects, the bilateral aid flow towards the sector is massive in comparison. In 2007 the total

bilateral commitment for HIV/AIDS control was US\$ 4553.4 million, more than double the size

of the total multilateral commitment of US\$ 2086.0 (OECD-DAC 2009). It is logical to explain a

high prevalence of HIV in association with increases in public sector funding because the public

sector's role has largely emphasized disease control, generating a substantially more bilateral

than multilateral aid for HIV/AIDS. Only recently has the international community seen a

change in the funding environment towards disease control programs through the emergence of

global health initiatives (GHIs). GHIs are public-private partnerships that target disease

(examples include the Global Fund to Fight AIDS, Tuberculosis, and Malaria, the GAVI

Alliance, and UNITAID). These initiatives have brought a massive influx of funding into the

health sector, however they face criticism due to their vertical delivery structure. Opponents in

the health field believe GHIs to continue the long history of ineffective disease-control programs

that are results driven and focus on global goals. The effects of which they argue will

unnecessarily burden the national health system with administrative costs and taking away from

the country-level health priorities (Schwank 2012). This dialogue has caused some GHIs, namely

the Global Fund and the GAVI Alliance, to incorporate mechanisms that assist in integration into

horizontal programs to promote coordination between health systems. Schwank (2012) analysis

and case study of existing GHIs suggests that the funding of health delivery is shift toward a

"diagonal model, where funds are raised vertically but disbursed horizontally – through national

health systems aligned with country priorities" (Schwank 2012). This shift in sector funding is

too recent to be reflected in this study, but may in the future lead to a significant relationship

between level of HIV prevalence and funding through CSOs and/or multilateral agencies, in

addition to the existing association with the public sector.

The results also did not support the second half of *H5*, which said: *countries with lower*

rates of DPT immunization will receive a greater increase in private sector health aid and/or

multilateral health aid funding compared to public sector health aid. Instead, a low level of the

population immunized for DPT was associated with funding increases in the public sector, NGOs

and civil society, and multilateral aid. These associations can be interpreted as reflections of

development. Countries with low levels of the population immunized for DPT represent those

with the most minimal health services that rely on development assistance. Very low-income countries receive funding across all sectors, explaining the association with small populations immunized for DPT.

H6 looks examine if the large increases in health aid targeting HIV/AIDS has made a significant impact. It predicts: *an increase of health aid funded through the NGOs and civil society organizations and/or multilateral agencies yields no affect on the recipient country's prevalence of HIV over five years*. The research findings support this hypothesis, however there was a very slight positive relationship between public sector funding and lower HIV prevalence. This association is representative of the argument I make in the theory section of this paper, asserting that the lack of horizontal and vertical integration in delivery has led to inefficient and ineffective aid implementation. [potential to elaborate about HIV/vertical vs. horizontal systems].

The final hypothesis in this study examined if perceived corruption influenced the sector aid was channeled through. *H7* predicts: *countries with perceived higher levels of corruption receive more health aid through multilateral agencies and NGOs and civil society organizations than the public sector*. Higher levels of corruption were found to reduce funding through all sectors, with the coefficient in the public sector indicating the largest drop, and that of NGOs and civil society representing the smallest. This supports the theory proposed by Dietrich (2011), that donors tend to seek alternative methods of funding should they perceive the aid will not be allocated effectively. However, the cause of such a paradigm may be rooted in the influence of neoliberalism ideology of aid delivery. In Dambisa Moyo's book, *Dead Aid*, she argues that the separation of funding between the public sector and the private sector actually incentivizes government corruption because of the inability to coordinate and regulate all services. Moyo

(2009) argues that the aid given to CSOs undermines and prevents the government from developing a sustainable system for effective aid implementation. A donor choosing to give to the private sector due to the recipient's perceived high level of corruption may actually be perpetuating the cycle.

Conclusion

The research presented provides support for the position that the channel and respective delivery system health aid is funded through plays a role in improving the infant mortality rate and maternal mortality rate of the recipient country. It suggests that public sector funding is the most effective channel to improve health conditions that are dependent on curative care and capacity building in health systems. It additionally promotes the notion that funding civil society organizations in countries where the provision of public services is minimal can help raise destitute levels of health. The results presented further the apparent link between health delivery systems and health improvements through the utilization of sector channeling. The statistically substantiated health improvements in association with public sector funding supports the ideology that horizontal delivery is effective in strengthening health systems. On the other hand, the lack of improvements in the prevalence of HIV related to any of the sectors aid is delivered through reflects the current imbalances and fragmentation in effective aid implementation due to years of donor-drive disease focused programs.

The positive relationship between public sector aid and improvements in maternal and infant mortality, but not HIV prevalence, is contradictory and illustrates the complexity of aid effectiveness. This research suggests that to lower HIV prevalence greater funding needs to be allocated to the public sector in order to build a coordinated and cohesive disease response across the national health plan. However, the majority of funding for HIV/AIDS is already channeled through the public sector. This contradiction questions the influence of donor constraints on public sector allocation. Foreign assistance is all too often conditional to prioritize the objectives

of the donors, rather than allocated based on country-need. This is seen through the allocation of

aid solely based on the country levels of HIV and the continued frequent use of vertical

initiatives. Piva & Dodd (2009) found that from 2002-2006 ten countries received 49.1% of the

total health ODA that was committed to least developed countries, even though they only

encompassed 21% of the population. Aid continues to go to countries with a disproportionately

high prevalence of HIV/AIDS, while countries with other adverse health outcomes, like high

levels of morbidity and mortality, receive substantially less (Piva & Dodd). Niger, where under-5

mortality is 259 per 1,000 births and the HIV/AIDS prevalence is 1.1%, only receives 3.41

health ODA per capita, compared to Lesotho that receives 12.7 health ODA per capita, with a

low under-5 mortality of 82 per 1,000 births and high HIV/AIDS prevalence of 23.2%. Schwank

(2012) points out that this focus on funding for the control of HIV/AIDS does not match the

actual disease burden found in most developing countries. "HIV/AIDS, tuberculosis, and malaria

account for 5.2%, 2.7%, and 4% percent of the total disease burden in lower income countries

respectively. Non-communicable disease, which are largely ignored by donors and draw less

than 3% of overall aid to health, represent almost a third of the disease burden" (Schwank 2012).

The trend in funding HIV/AIDS is largely the result of the donor driven support for disease

specific campaigns.

Global policy has largely favored the objectives of the donor, so while aid may by

channeled through the public sector, it is given with reservations and regulations. This type of

"project aid" causes the recipient government high transaction costs to monitor and generally

undermines national health priorities (Dijkstra 2013). If funding is given specifically to target

HIV/AIDS it will not assist in the growth of the overall health system, a necessary variable in the

long-term care and treatment of HIV/AIDS. Even when funded through the public sector the

donor's primary ownership continues foreign assistance to be focused on global targets. While

the Paris Declaration (2005) looked to transform this system through strategies related to the four

principles of ownership, alignment, harmonization, and managing for results, the theoretical

framework is not without limitations or contradictions. Dijkstra (2013) argues that the new

delivery of aid paradigm is unlikely to improve effectiveness because ownership and selectivity

over aid is based upon the idea that the country and donor share the same objective preferences.

This is clearly not the case consistently in the international system and would hurt the

harmonization and alignment needed for the allocation of aid (Dijkstra 2013). This continuation

of a donor drive framework does little to incentivize a transition in health system delivery.

Although, an integrated approach to delivering services is widely accepted for improvement and

cohesion in the overall health system, policy makers still tend to favor vertical initiatives.

International donors have greater ease funding vertical initiatives because the do not necessitate

bureaucratic involvement. Additionally, donors are drawn to vertical models for producing quick

results, causing those systems to continue as the standard platform and constitute the majority of

aid delivery research.

The analysis from this study should be interpreted with caution. All findings are reliant

on data provided by the OECD that classifies the channels of aid into rather broad sectors (public

sector, NGOs & civil society, and multilateral). The connection between aid implementation in

the public sector through horizontal programs, and implementation by CSOs and multilateral

agencies through vertical programs is overly generalizable. While many horizontal programs are

implemented through the public sector, they are also carried out by multilateral agencies and

CSOs, which inversely holds true in relation to vertical programs. OECD only tracks committed

aid activities, not accounting for disbursement, indicating that the recipient country might not

have ever received a portion of aid included in this data. Additionally, this data only includes the

aid activities of OECD countries, failing to how robust health aid actually is. Since the Paris

Declaration occurred in 2005 this study does not reflect the transition in policy orientation since

then. Still, given these limitation, this study is the first to investigate the role of channeling aid by

sector in association to health improvements overtime.

The diverse stakeholders and constituents involved in aid delivery and implementation

open up many avenues for future research. Similar studies may look to expand the aid data set,

encompassing other sources than OECD, that breakdown aid classification to a more micro level

than bilateral and multilateral aid. There is need for research to expand upon donor selectivity as

it relates to funding certain projects in the public sector, and how that is influenced by health

system delivery. To further explore the relationship between delivery sectors and systems case

studies should be utilized to analyze the type of projects and initiatives associated with public,

private and multilateral funding.

Appendix A: Regressions

Table 1: Multiple regression on the effect of health aid on infant mortality over 5 years

==
Dependent variable: Change in Infant Mortality Rate over 5 years for 141 countries from 1995-2009

Total Health Aid (USD millions)	**0.031***
	(0.003)
Prevalence of HIV	**1.872***
	(0.245)
% Immunized (DPT)	**-0.148***
	(0.020)
Level of Conflict	-0.127
	(0.087)
Level of Corruption	-0.007
	(0.032)
Health Expenditure (% of GDP)	-0.127
	(0.087)
GDP	**0.000***
	(0.000)
Constant	**6.272***
	(0.268)

Observations	760
R2	0.281
Adjusted R2	0.275
Residual Std. Error	5.201 (df = 752)
F Statistic	**43.083*** (df = 7; 752)

==
Note: *p<0.01

For all independent variables except health aid and conflict, it is the change in the variable over five years.

Table 2: Multiple regression on the effect of health aid on maternal mortality over 5 years

==
Dependent variable: Change in Maternal Mortality Ratio over 5 years for 141 countries from 1995-2009

Total Health Aid (USD millions)	**0.283***
	(0.032)
Prevalence of HIV	**13.452***
	(2.654)
% Immunized (DPT)	**-1.724***
	(0.222)
Level of Conflict	0.242
	(0.947)
Level of Corruption	**-0.233***
	(0.351)

Health Expenditure (% of GDP)	**-2.590***
	(1.730)
GDP	**0.000***
	(0.000)
Constant	**25.735***
	(2.906)

Observations	760
R2	0.228
Adjusted R2	0.221
Residual Std. Error	56.360 (df = 752)
F Statistic	**31.714*** (df = 7; 752)

==

Note: *p<0.01

For all independent variables except health aid and conflict, it is the change in the variable over five years.

Table 3: Multiple regression on the effect of health aid sectors on HIV prevalence over 5 years

==

Dependent variable: Change in HIV prevalence over 5 years for 141 countries from 1995-2009

Total Public Sector Aid (USD millions)	**0.001***
	(0.001)
Total NGO & Civil Society Aid (USD millions)	0.003
	(0.004)
Total Multilateral Aid (USD millions)	-0.001
	(0.002)
% Immunized (DPT)	0.001
	(0.003)
Level of Corruption	**-0.011***
	(0.005)
Health Expenditure (% of GDP)	-0.007
	(0.249)
GDP	**0.000***
	(0.000)
Constant	**0.134***
	(0.041)

Observations	236
R2	0.083
Adjusted R2	0.055
Residual Std. Error	0.424 (df = 228)
F Statistic	**2.949*** (df = 7; 228)

==

Note: *p<0.05

For all independent variables except health aid and conflict, it is the change in the variable over five years.

Table 4: Multiple regression on the effect of health aid on infant mortality over 10 years

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Dependent variable: Change in infant mortality rate over 10 years for 141 countries from 1995-2004
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Total Health Aid (USD millions)	**0.188***
	(0.026)
Prevalence of HIV	**2.390***
	(0.946)
% Immunized (DPT)	**-1.231***
	(0.117)
Level of Corruption	0.145
	(0.171)
Health Expenditure (% of GDP)	-0.380
	(0.938)
GDP	**0.000***
	(0.000)
Constant	**32.593***
	(2.031)

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Observations	326
R2	0.422
Adjusted R2	0.411
Residual Std. Error	23.339 (df = 319)
F Statistic	**38.742*** (df = 6; 319)

```
===============================================================================
```
Note: *p<0.01

For all independent variables except health aid and conflict, it is the change in the variable over ten years.

Table 5: Multiple regression on the effect of health aid on maternal mortality over 10 years

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```
Dependent variable: Change in maternal mortality ratio over 10 years for 141 countries from 1995-2004
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```

Total Health Aid (USD millions)	**1.663***
	(0.266)
Prevalence of HIV	**51.260***
	(9.738)
% Immunized (DPT)	**-11.823***
	(1.204)
Level of Corruption	-1.323
	(1.762)
Health Expenditure (% of GDP)	-15.720
	(9.657)
GDP	**-0.000***
	(0.000)
Constant	**122.356***
	(20.919)

```
-------------------------------------------------------------------------------
```

Observations	326
R2	0.424
Adjusted R2	0.413
Residual Std. Error	240.366 (df = 319)
F Statistic	**39.075*** (df = 6; 319)

==

Note: *p<0.01

For all independent variables except health aid and conflict, it is the change in the variable over ten years.

Table 6: Multiple regression on the effect of health aid sectors on infant mortality over 5 years

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Dependent variable: Change in Infant Mortality Rate over 5 years for 141 countries from 1995-2009

Total Public Sector Aid (USD millions)	**0.021***
	(0.007)
Total NGO & Civil Society Aid (USD millions)	**0.066***
	(0.038)
Total Multilateral Aid (USD millions)	-0.004
	(0.019)
Prevalence of HIV	**2.418***
	(0.656)
% Immunized (DPT)	**-0.190***
	(0.027)
Level of Conflict	-0.134
	(0.096)
Level of Corruption	-0.006
	(0.051)
Health Expenditure (% of GDP)	0.079
	(0.249)
GDP	**0.000***
	(0.000)
Constant	**7.654***
	(0.449)

Observations	236
R2	0.304
Adjusted R2	0.276
Residual Std. Error	4.198 (df = 226)
F Statistic	**10.945*** (df = 9; 226)

==

Note: *p<0.1

For all independent variables except health aid and conflict, it is the change in the variable over five years.

Table 7: Multiple regression on the effect of health aid sectors on maternal mortality over 5 years

==

Dependent variable: Change in Maternal Mortality Ratio over 5 years for 141 countries from 1995-2009

Total Public Sector Aid (USD millions)	**0.273***
	(0.085)
Total NGO & Civil Society Aid (USD millions)	0.221
	(0.486)
Total Multilateral Aid (USD millions)	0.365
	(0.248)
Prevalence of HIV	**17.401***
	(8.480)
% Immunized (DPT)	**-2.392***
	(0.343)
Level of Conflict	-0.899
	(1.241)
Level of Corruption	0.324
	(0.665)
Health Expenditure (% of GDP)	3.475
	(3.220)
GDP	**0.000***
	(0.000)
Constant	**45.217***
	(5.799)
Observations	236
R2	0.280
Adjusted R2	0.252
Residual Std. Error	54.225 (df = 226)
F Statistic	**9.788*** (df = 9; 226)

Note: *p<0.05

For all independent variables except health aid and conflict, it is the change in the variable over five years.

Table 8: Multiple regression on the effect of HIV prevalence on health aid funding

Dependent variable: Health aid funding (USD million) for 141 countries from 1995-2014

Prevalence of HIV	**1.440***
	(0.459)
% Immunized (DPT)	**-0.593***
	(0.165)
Level of Corruption	**-1.337***
	(0.234)
Level of Conflict	**5.310***
	(0.962)
Health Expenditure (% of GDP)	-1.677
	(1.171)
GDP	0.000*
	(0.000)
Constant	**143.907***

(13.280)

Observations	1,245
R2	0.093
Adjusted R2	0.089
Residual Std. Error	83.743 (df = 1238)
F Statistic	**21.265*** (df = 6; 1238)

Note: *p<0.01

Table 9: Multiple regression on the presence of corruption and HIV influencing health aid sector

funding

Dependent variable:	Public Sector	NGOs & Civil Society	Multilateral
Level of Corruption	**-0.450***	**-0.168***	**-0.372***
	(0.194)	(0.084)	(0.166)
Prevalence of HIV	**0.811***	0.198	0.149
	(0.344)	(0.152)	(0.261)
% Immunized (DPT)	**-0.220***	**-0.185***	**-0.145***
	(0.129)	(0.052)	(0.079)
Level of Conflict	**1.165***	**0.493***	**1.323***
	(0.650)	(0.263)	(0.389)
Health Expenditure (% of GDP)	0.212	-0.194	**-1.058***
	(0.879)	(0.361)	(0.533)
GDP	**0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)
Constant	**52.977***	**29.435***	**39.779***
	(10.740)	(4.306)	(6.507)
Observations	872	810	651
R2	0.026	0.042	0.058
Adjusted R2	0.019	0.035	0.050
Residual Std. Error	51.638 (df = 865)	20.534 (df = 803)	27.873 (df = 644)
F Statistic	**3.850*** (df = 6; 865)	**5.585*** (df = 6; 803)	**6.660*** (df = 6; 644)

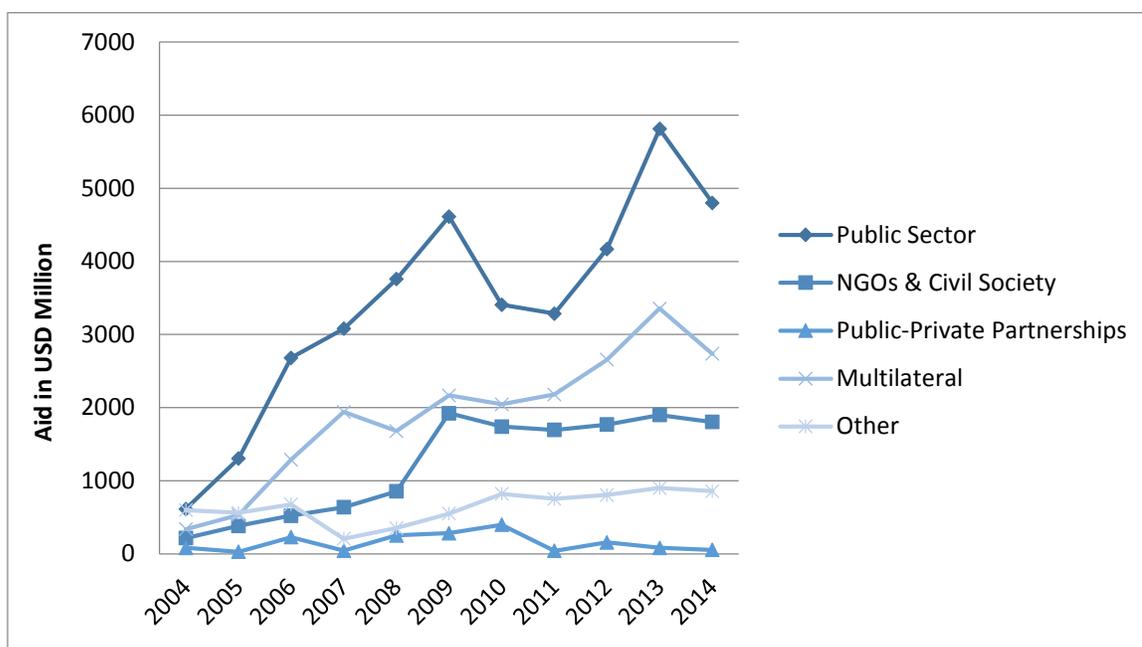Note: *p<0.1
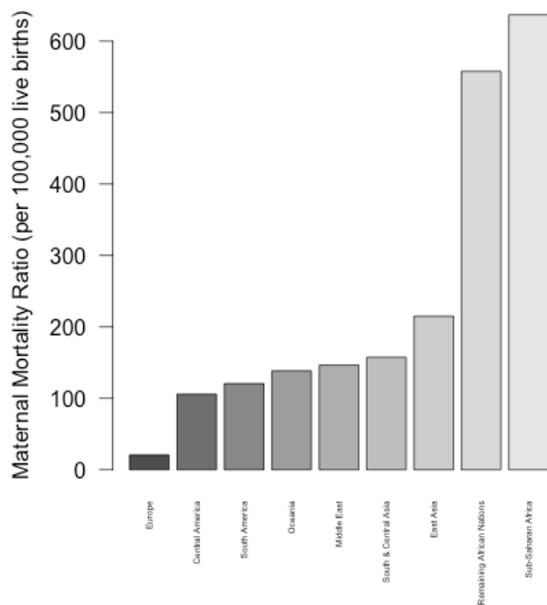
Appendix B: Figures

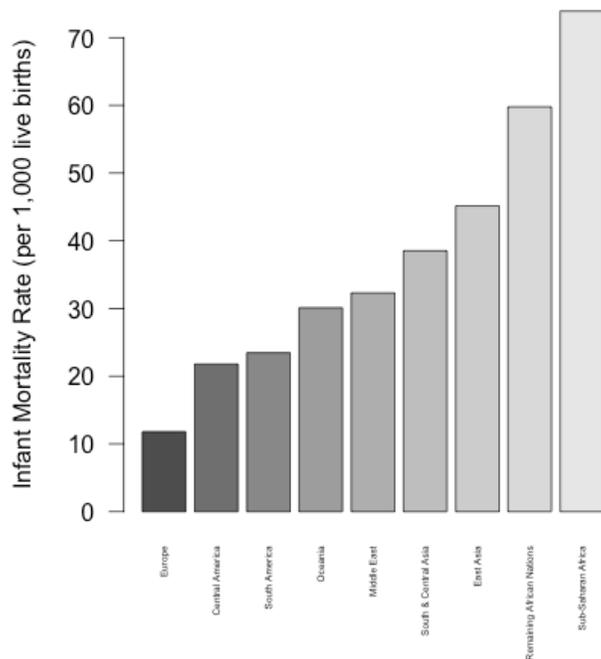**Figure 1: Health Aid by Channel, All Developing Countries, 2003-2014**
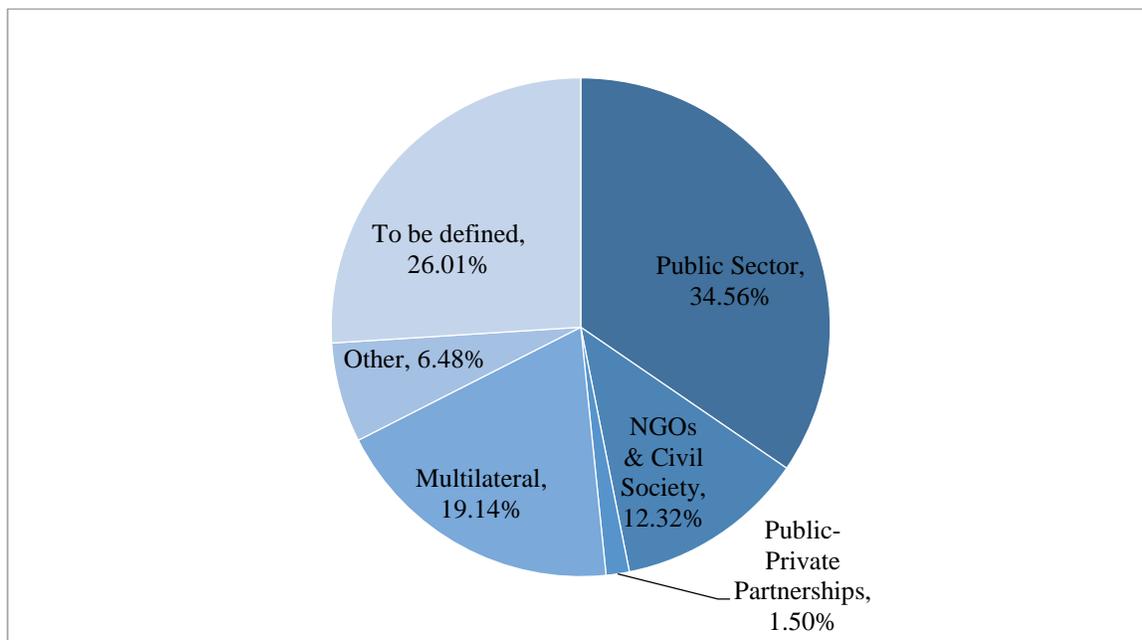
Figure 2: Trends in Health Aid by Channel, All Developing Countries, 2004-2014
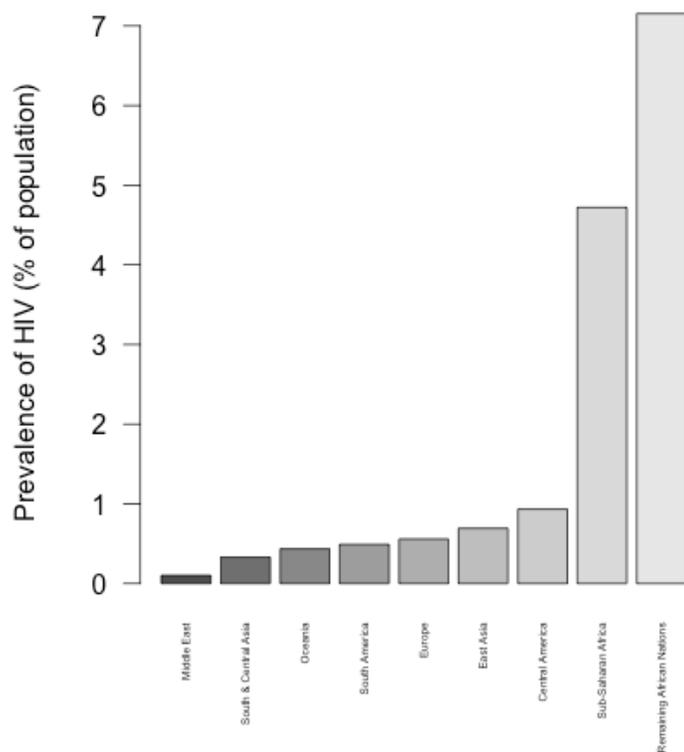
Figure 3: Average maternal mortality ratio by region, All Developing Countries, 1995-2014
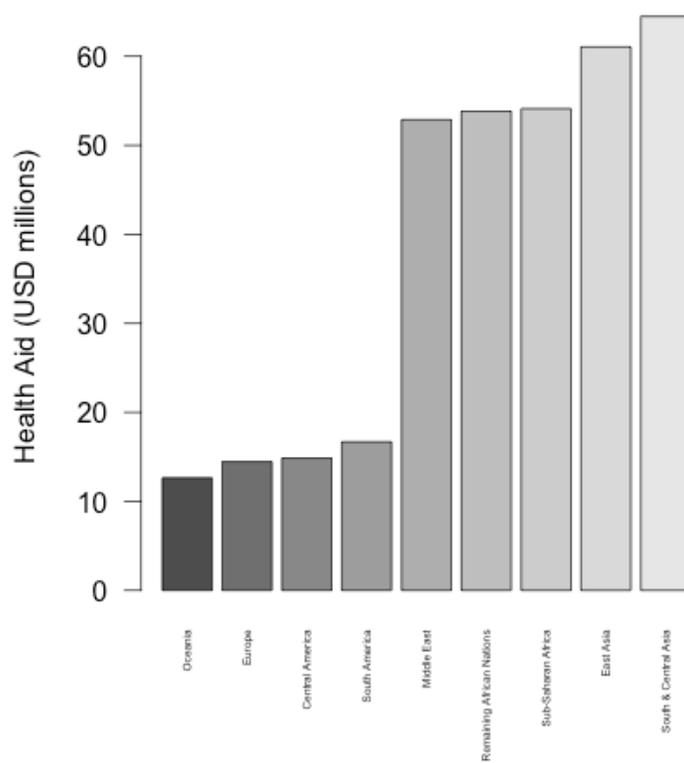

Figure 4: Average infant mortality rate by region, All Developing Countries, 1995-2014

Figure 5: Average HIV prevalence by region, All Developing Countries, 1995-2014

Figure 6: Average health ODA by region, All Developing Countries, 1995-2014

Appendix C: Tables

Table 1: Summary Statistics of All Model Variables, 141 countries, 1995-2014

Variable	Mean	Standard Deviation	Min	Max	NA's
Health Aid (USD millions)	42.62	81.54864	0	977.18	229
Public Sector Aid (USD millions)	24.9679	51.55049	0	529.3412	1464
NGOs & Civil Society Aid (USD millions)	8.4274	19.10498	0.0004	256.3158	1654
Public-Private Partnerships Aid (USD millions)	2.1078	5.76627	0.004	32.8292	2775
Multilateral Aid (USD millions)	14.1005	27.40737	0.001	222.9468	1909
Prevalence of HIV (% of population 15-49)	2.836	5.427626	0.1	29.6	810
Immunization, DPT (% of children ages 12-23 months)	81.88	18.14652	3	99	62
GDP (USD)	8.92E+10	4.45E+11	1.10E+07	1.04E+13	115
Infant Mortality Rate (per 1,000 live births)	43.62	31.02935	3.5	158.3	20
Maternal Mortality Ratio (per 100,000 live births)	310	357.626	4	2900	140
Health Expenditures (% of GDP)	5.7981	2.511332	0.7153	22.5333	248
Conflict, (0=none, 10=war)	0 (median)	1.925716	0	10	41
Corruption (0=highly corrupt, 100=highly clean)	32.27	12.35838	4	79.4	1065

Table 2: Distribution of Health Aid by Channel (% of total health aid), 2003-2014

Channel	Region							
	All Developing Countries	Europe	Africa	Central America & South America	Far East Asia	South & Central Asia	Middle East	Oceania
Public Sector Aid	34.56%	47.85%	39.16%	39.86%	55.76%	32.23%	19.27%	36.70%
NGOs & Civil Society Aid	12.32%	9.43%	15.95%	16.43%	5.72%	7.05%	6.63%	8.56%
Public-Private Partnerships Aid	1.50%	1.52%	0.53%	0.11%	0.57%	0.14%	0.02%	1.18%
Multilateral Aid	19.14%	8.90%	17.39%	9.96%	8.53%	20.33%	14.36%	9.80%
Other	6.48%	7.30%	4.41%	5.97%	4.34%	4.47%	24.38%	13.30%
To be defined	26.01%	25.00%	22.55%	27.68%	27.01%	35.78%	31.59%	30.47%

Table 3: OECD Definition of Commitment and Disbursement

Commitment	Commitments measure donors' intentions and permit monitoring of the targeting of resources to specific purposes and recipient countries. They fluctuate as aid policies change, and reflect how donors' political commitments translate to action. They thus give an indication about future flows.
Disbursement	Disbursements show actual payments in each year. They show the realization of donors' intentions and the implementation of their policies. They are required to examine the contribution of donors' actions in development achievements. They better describe aid flows from a recipient's point of view.

Table 4: Creditor Reporting System health aid categories and definitions

Category	Definition
Section 1: General health	
Health policy and administrative management	Health sector policy, planning and programmes; aid to health ministries, public health administration; institution capacity building and advice; medical insurance programmes; unspecified health activities.
Medical education/training	Medical education and training for tertiary level services.
Medical research	General medical research (excluding basic health research).
Medical services	Laboratories, specialised clinics and hospitals (including equipment and supplies); ambulances; dental services; mental health care; medical rehabilitation; control of non-infectious diseases; drug and substance abuse control [excluding narcotics traffic control
Section 2: Basic Health	
Basic health care	Basic and primary health care programmes; paramedical and nursing care programmes; supply of drugs, medicines and vaccines related to basic health care.
Basic health infrastructure	District-level hospitals, clinics and dispensaries and related medical equipment; excluding specialised hospitals and clinics
Basic nutrition	Direct feeding programmes (maternal feeding, breastfeeding and weaning foods, child feeding, school feeding); determination of micro-nutrient deficiencies; provision of vitamin A, iodine, iron etc.; monitoring of nutritional status; nutrition and food hygiene education; household food security.
Infectious disease control	Immunisation; prevention and control of infectious and parasite diseases, except malaria, tuberculosis, HIV/AIDS and other STDs. It includes diarrheal diseases, vector-borne diseases (e.g. river blindness and guinea worm), viral diseases, mycosis, helminthiasis, zoonosis, diseases by other bacteria and viruses, pediculosis, etc.
Health education	Information, education and training of the population for improving health knowledge and practices; public health and awareness campaigns; promotion of improved personal hygiene practices, including use of sanitation facilities and handwashing with soap.
Malaria control	Prevention and control of malaria.
Tuberculosis control	Immunisation, prevention and control of tuberculosis.
Health personnel development	Training of health staff for basic health care services
Section 3: Population policies/programmes and reproductive health	
Population policy and administrative management	Population/development policies; census work, vital registration; migration data; demographic research/analysis; reproductive health research; unspecified population activities.
Reproductive health care	Promotion of reproductive health; prenatal and postnatal care including delivery; prevention and treatment of infertility; prevention and management of consequences of abortion; safe motherhood activities.
Family planning	Family planning services including counselling; information, education and communication (IEC) activities; delivery of contraceptives; capacity building and training.
STD control including HIV/AIDS	All activities related to sexually transmitted diseases and HIV/AIDS control e.g. information, education and communication; testing; prevention; treatment, care.
Personnel development for population and reproductive health	Education and training of health staff for population and reproductive health care services.

Table 5: Developing countries included in sample by region

Note: Classified developing countries by OECD's CRS that were excluded from the data due to little or no reported health aid, infant mortality rate, or maternal mortality ratio are as follows: Cyprus, Gibraltar, Malta, Bahamas, Bermuda, British Virgin Islands, Cayman Islands, Netherlands Antilles, Falkland Islands, Brunei Darussalam, Hong Kong, Macau, Singapore, Taiwan, Kuwait, Qatar, United Arab Emirates, French Polynesia, New Caledonia, Northern Mariana Islands, Seychelles, Slovenia, Aruba, Turks and Caicos Islands, Israel, Wallis and Futuna, Tokelau, Niue, Nauru, Cook Islands, Montserrat, Grenada, Anguilla, Saint Helena, Mayotte, Benin, and Kosovo.

South America, 12 countries		South & Central Asia, 22 countries		Sub-Saharan Africa, 36 countries		Remaining African Nations, 16 countries	
Argentina	Guyana	Cambodia	Georgia	Angola	Ghana	Algeria	South Sudan
Bolivia	Paraguay	Indonesia	India	Botswana	Guinea	Libya	Sudan
Brazil	Peru	Malaysia	Kazakhstan	Burkina Faso	Guinea-Bissau	Morocco	Swaziland
Chile	Suriname	Philippines	Kyrgyzstan	Burundi	Kenya	Tunisia	Tanzania
Colombia	Uruguay	Thailand	Maldives	Cabo Verde	Lesotho	Seychelles	Togo
Ecuador	Venezuela	Timor-Leste	Myanmar	Cameroon	Liberia	Sierra Leone	Uganda
Central America, 19 countries		Vietnam	Nepal	Central African Republic	Madagascar	Somalia	Zambia
Antigua and Barbuda	Honduras	Armenia	Sri Lanka	Chad	Malawi	South Africa	Zimbabwe
Barbados	Jamaica	Azerbaijan	Tajikistan	Comoros	Mali	**Europe, 9 countries**	
Belize	Mexico	Bangladesh	Turkmenistan	Congo	Mauritania	Albania	Former Yugoslav Republic of Macedonia
Costa Rica	Nicaragua	Bhutan	Uzbekistan	Cote D'Ivoire	Mauritius	Belarus	Moldova
Cuba	Panama	**Middle East, 12 countries**		Democratic Republic of the Congo	Mozambique	Bosnia and Herzegovina	Montenegro
Dominica	Saint Kitts and Nevis	Afghanistan	Oman	Djibouti	Namibia	Croatia	Serbia
Dominican Republic	Saint Lucia	Pakistan	Saudi Arabia	Equatorial Guinea	Niger		Ukraine
El Salvador	Saint Vincent and the Grenadines	Bahrain	Syrian Arab Republic	Eritrea	Nigeria	**Oceania, 11 countries**	
Guatemala	Trinidad and Tobago	Iran	West Bank and Gaza Strip	Ethiopia	Rwanda	Fiji	Samoa
Haiti		Iraq	Yemen	Gabon	Sao Tome and Principe	Kiribati	Solomon Islands
East Asia, 4 countries		Jordan	Turkey	Gambia	Senegal	Marshall Islands	Tonga
China	Lao People's Democratic Republic	Lebanon				Micronesia	Tuvalu
Democratic People's Republic of Korea	Mongolia					Palau	Vanuatu
						Papua New Guinea	

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Education:

The Pennsylvania State University   May 2016
Schreyer Honors College
B.A. International Politics & B.S. Health Policy Administration
Dean's List seven semesters
Phi Beta Kappa

School of International Training   January 2015 – May 2015
- Abroad semester in Vietnam examining critical issues related to development and social change.
- Program included extensive cultural immersion through home stays focusing on experiential learning.

Experience:

Bold Earth Teen Adventures, Golden, CO   May 2015 – August 2015
Trip Leader
- Responsible for health and safety of youth ages 14-18 for two 21-day trips to Fiji.
- Served as an outdoor educator, coordinated 80 hours worth of community service, and responsible for trip media content from photo and video marketing to the daily online blog.

The Center for Community Health and Development (COHED), Hanoi, Vietnam   April 2015
Program Development Intern
- Assisted in grant preparation, translation, and multimedia implementation for USAID projects.

National Organization for Rare Disorders (NORD), Washington, D.C.   May 2014 – August 2014
Health Policy Intern, Diane Dorman
- Worked on NORD's public policy team researching and analyzing legislation, drafting position statements, and managing NORD's policy work on social media and online blogs.

Leadership:

Penn State IFC/Panhellenic Dance Marathon (THON), *Public Relations Team*   August 2012 – present
Production Development Intern
- Selected to be on a small production team to assist in the planning and execution of the largest student run philanthropy raising over $13 million in 2015 alone to conquer childhood cancer.
- Role focused on creating compelling video content, promoting the cause across social media platforms, and coordinating all production aspects associated with events throughout the year.

Penn State Student Alumni Core, *Lion Ambassador*   January 2013 – present
- Appointed as a student representative of the alumni association to instill greater pride among the student body and to serve the university through the implementation of campus projects, philanthropic events, and guiding prospective students on tours.

LGBTQA Student Resource Center, *Student Representative*   August 2015 – present
- Advised the university on the advancement and promotion of LGBTQA related issues on campus.

Africana Research Center, *Undergraduate Researcher*   August 2013 – May 2014
- Assisted faculty members in data collection and coding examining the role of media and health.