

Healthy Aid?

Preliminary Results on Health Aid Effectiveness

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Abstract

There is considerable theoretical debate over if and when development aid can be effective, but cross-sectional quantitative analyses have been relatively inconclusive. Using new foreign aid data, we focus on development projects specifically designed to improve the health of recipient country populations to see if these projects have positive impacts on the health sector. If health aid is effective, it should lead to measurable improvements in health indicators in recipient country populations. We hypothesize that health-targeted aid should improve infant and child mortality and life expectancy in recipient countries. To test the impact of health aid, we use a random coefficients model to predict the effects of bilateral and multilateral health aid on multiple health indicators in recipient countries from 1980 to 2005 using aid data from the Project-Level Aid Database. This dataset includes CRS purpose codes for each project, allowing us to compare aid's performance with donor goals. Although health-targeted aid is positively correlated with better health under certain conditions, it is generally insignificant when compared against aggregate aid or non-health aid. Our results suggest that health aid may not improve the health performance of the average recipient country.

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Understanding Foreign Aid

Despite large amounts of foreign aid research conducted over the past several decades, there is no consensus among development scholars on whether development assistance actually promotes growth in recipient countries. The complex interplay of political, economic, and social forces at work within developing countries makes it difficult to determine the impact of aid projects in those countries. Due to development's reciprocal relationships and the challenge of limited data availability, scholars have come to various understandings of the effectiveness of foreign aid projects in stimulating development and reducing poverty. Some studies suggest that aid leads to growth given the right conditions, while others provide compelling evidence that it is fruitless, or perhaps even detrimental to recipient countries' political and economic growth. In order to reconcile these conflicting results, more research must be conducted on the effectiveness of sector-targeted aid in recipient countries. In this study we disaggregate total aid flows in order to compare health-targeted aid projects and recipient country health indicators. A better understanding of the results of health-targeted aid will be a valuable tool in evaluating the effects of development assistance in general.

Most of the research on the effects of foreign aid has focused on the relationship between aggregate aid flows and general development indicators such as economic growth or democracy. Many scholars concur that development aid to Africa over the past fifty years has been ineffective because apparently stagnant low economic and governance indicators in sub-Saharan Africa over the past several decades suggest that billions of dollars have been wasted there. However, comparing aggregate aid flows to such indicators as economic growth overlooks the specific impacts of aid projects not specifically designed to improve economic growth. Such analysis may miss micro-level improvements in daily life such as safer drinking water, decreased

travel time to markets, or higher literacy rates among women that could be the result of aid projects. Easterly (2006) posits that aid may have contributed to some of these improvements in Africa despite its ineffectiveness in spurring economic growth. He notes that “despite the zero-growth payoff to aid in Africa, there has been a fall in infant mortality and a rise in secondary enrollment in that most aid-intensive continent” (177). Thus, it is possible that certain types of aid have actually had a positive impact on their target sectors in sub-Saharan African countries.

This study attempts to measure aid’s effects in the health sector, one in which Easterly suggests projects may have led to measurable improvements. We disaggregate total aid flows to examine the impact of health-targeted development assistance on the health of recipient country populations. A better understanding of the effectiveness of foreign aid in the health sector will provide a valuable contribution to the ongoing debate on the effectiveness of aid in general by addressing the lack of sectoral aid analysis in the literature. If health aid is effective, projects designed to improve the health of recipient country populations should lead to measurable improvements in health indicators. This study will provide evidence as to whether aid targeted to the health sector leads to the intended result of decreased infant mortality.

Additionally, this analysis contributes to the aid effectiveness literature by utilizing a new database containing data on multilateral and bilateral foreign aid projects from 1970 to 2006. A joint project of Brigham Young University and the College of William and Mary, the Project-Level Aid (PLAID) database contains thousands of foreign aid loans and grants from multilateral donors, international financial institutions, OECD Development Assistance Committee (DAC) bilateral donors and non-DAC-reporting multilateral donors. PLAID offers an improvement over the OECD aid data by including more information on multilateral donors such as the Islamic

Development Bank and the European Bank for Reconstruction and Development. Additionally, PLAID incorporates more aid funding than just Official Development Assistance (ODA), including loans and other official funding.

For each project, the database includes a project description and five-digit sector-specific activity codes as utilized by the DAC Creditor Reporting Service (CRS). These codes enable us to disaggregate total foreign aid by isolating projects with health-sector CRS codes. By combining PLAID data with data from the CRS and the World Bank, we can perform a more comprehensive aid analysis by capturing a larger portion of bilateral and multilateral aid flows.

The Debate on Foreign Aid and its Effectiveness

Many careful studies suggest aid contributes to development while many other thoughtful analyses demonstrate just the opposite. Aid optimists at development institutions like the World Bank justify further aid projects and programs in developing countries with findings that aid leads to growth in "good" policy environments (Burnside and Dollar, 2000; 2004). However, others are skeptical of their claims and have challenged the reliability of those results. Many critics argue that development aid is ineffective, and some even claim it undercuts economic and political development in recipient countries (Bräutigam and Knack, 2004; Knack, 2001). We contribute to this ongoing debate by addressing the gap in quantitative analysis of the effectiveness of specific aid sectors (Bermeo, 2006).

Boone (1996) argues that aid does not decrease poverty with a claim common to many aid critics. He maintains that aid money allows for increased government consumption, which is too often directed toward the wealthy elite rather than to programs that benefit the poor. Others agree that the fungibility of aid funds allows recipient governments to divert those funds away

from the donors' desired targets (Pack and Pack, 1993; Burnside and Dollar, 2000; Collier and Dollar, 2002). In addition, the commonly criticized lack of coordination among donors may make aid less effective or even detrimental if projects overlap or conflict with each other (van de Walle, 1999; Buse and Gwin, 1998). Some scholars even argue that aid has negative returns; too much aid may make domestic governments dependent on outside assistance and weaken both their accountability and legitimacy (Bräutigam and Knack, 2004; Knack, 2001).

Perhaps the most influential critic of the foreign aid regime is Easterly, who describes aid agencies as a cartel of good intentions (2002) and claims that the bulk of their efforts are ineffective. He argues that the lack of coordination between aid agencies leads to duplicative projects, and that agencies focus on highly visible initiatives and frameworks rather than those based on sound economic principles. Also, millions of dollars of aid have been squandered in countries where corrupt leaders or bad policies prevent the money from delivering the expected services. However, Easterly's criticism focuses on the current structures of and relationships among development organizations, not the premise that foreign aid could reduce poverty through economic growth. He cautions against unjustified optimism, but writes that some aid can be effective some of the time (2003).

Most aid advocates concede that aid's effects depend to some degree on recipient countries' international and domestic environments. Selectivity and conditionality, recent focuses in the development world, are based on Burnside and Dollar's findings (2000,2002) that aid is only associated with growth in countries that have sound fiscal, monetary, and trade policies. With these policies in place, increased government spending financed by foreign aid can stimulate growth and reduce poverty. Pumping money into countries with restrictive economic policies does not have beneficial effects because there is no way to translate increased

funds into economic growth. Many other researchers have reached similar conclusions (Collier and Dollar, 2002; Guillaumont and Chauvet, 2001). They also acknowledge that direct donor oversight and coordination with recipient governments are necessary to ensure the money is spent on growth-promoting programs, rather than being funneled into pet projects that have little effect on poverty. Mosley and Suleiman (2007) argue that stable and predictable development assistance is necessary for governments to plan and use those funds efficiently.

Another group of researchers provides empirical evidence suggesting that weak policies and institutions do not dilute the effectiveness of aid, but that aid projects lift people out of poverty despite differences in government or economic policies. These scholars argue that factors in recipient countries such as per capita income, income equity, poverty rates, and good governance do not have significant effects on the results of foreign aid projects (Croghan, Beatty, and Ron, 2006; Asra et al., 2005; Dalgaard, Hansen, and Tarp, 2001, 2004). Others like White refute the fungibility and negative returns criticisms, claiming that donors use foreign aid as both an incentive for reform and as a reward for “strengthen[ing] institutions and policies so that services can be effectively delivered” (1998).

This debate is presently inconclusive because of the limited availability of data. Some studies appear to support the hypothesis that foreign aid causes economic growth under certain conditions (Burnside and Dollar, 2000), but others offer evidence to the contrary by including more observations or re-specifying their models (Easterly, Levine, and Roodman, 2003). So far, most of these analyses have focused on the relationship between aggregate aid flows and general indicators such as democracy and economic growth. Comparing aggregate aid to such indicators can miss the direct impacts of specific projects on their target sectors. If a country receives foreign assistance but experiences no economic growth, one might conclude that the aid was

ineffective or even detrimental. Aid projects must be compared against their stated purposes in order to truly determine their effectiveness.

Clemens, Radelet, and Bhavnani's recent (2004) analysis of short-term aid represents one of the first attempts to quantitatively study the effects of aid projects on their targeted sectors. They differentiate short-term aid (infrastructure, agriculture, industry, and other sectors which promote short-term growth) from humanitarian and long-term aid (which they posit has little or no effect on growth in the short-term) to more accurately judge its effectiveness. Interestingly, they find that short-term aid is positively correlated with short-term economic growth.

If foreign aid is effective, the results of aid projects will contribute to donor purposes. Therefore, evaluations of aggregate aid measured against economic performance may be missing the mark. Following the lead of Clemens et al., we argue that analyzing sector-specific outcomes provides a much better picture of whether aid projects are effective. In this study we disaggregate aid data to explore the relationship between health-targeted aid and health indicators in recipient countries. If this type of development assistance is effective, mortality rates should decrease and life expectancies should increase when a country receives more health-targeted aid.

Until recently, this kind of research has been precluded by the lack of available data on health in developing countries and health-targeted foreign aid projects. Researchers such as Jackson and Mills (2007) have emphasized the need for "timely, reliable and complete information on financial resources" of countries' health systems to improve both coordination and effectiveness of aid projects. In addition, the lack of comprehensive data on the purpose and amount of aid projects limits research on development assistance because it is not clear where all the money is going and why. Without this knowledge, researchers cannot perform large-N quantitative tests to determine whether aid projects are associated with improvements in the

sectors they are directed toward.

There has, therefore, been little quantitative research done on the effects of health-targeted foreign aid. However, certain qualitative studies have shed some light on the impact that health aid may have in developing countries. In case studies of four developing countries, Croghan, Beatty, and Ron (2006) find that health interventions, foreign aid, and technical assistance led to decreases in those countries' infant mortality rates, irrespective of factors such as economic development, good governance, and quality health care systems. In fact, they find that Bangladesh and Ecuador achieved positive health outcomes *in spite* of poor governance, lack of health infrastructure, and low levels of economic development. This result suggests that health-targeted development assistance can improve health outcomes in developing countries whether or not other factors are conducive to bettering health.

Even one of the most outspoken aid critics suggests that foreign aid may have contributed to positive health outcomes such as significant reductions in infant mortality rates in sub-Saharan Africa during the past several decades (Easterly 2006). Despite his overall skepticism of the effectiveness of most development assistance, Easterly notes that aid seems to lead to general improvements in some sectors, including health, water and sanitation, and education. The purpose of our study is to explore this claim. We hope that our quantitative analysis of health-targeted development assistance will contribute to the work of Croghan et al., Easterly, and other scholars in determining whether or not health-targeted aid is an effective means of promoting health in the developing world.

Shiffman (2006) is also critical of foreign aid donors' health interventions and initiatives. He finds that donor funding for various communicable diseases does not closely correlate with the prevalence of each disease. Shiffman contends that health assistance must be increased and

that donors must provide a more balanced allocation of current resources for health interventions. Thus, a large-scale quantitative analysis of health-targeted foreign aid and its effects on health in developing countries is timely and relevant to the current debate. With the current emphasis on health in the UN Millennium Development Goals and the development community in general, understanding the effectiveness and impact of health aid is of utmost importance.

A better knowledge of health aid's effects would prove useful in aid allocation decisions at a time when the focus on the role of health in development is increasing. Recent focus on health issues such as AIDS in the development community has possibly led to an increase in general health aid but a decrease in funding for more effective projects emphasizing prevention. According to MacKellar (2005), HIV/AIDS and infectious disease are the only two sectors in which development assistance for health increased from 1993 to 2003. He shows that basic health care, health education, reproductive health, family planning, basic nutrition, and other health interventions actually decreased as a percentage share of total development assistance during this ten year period. However, in a more recent study, Greco, Powell-Jackson, Borghi, and Mills (2008) find that donor disbursements for child health and maternal health increased by 63% and 66% respectively from 2003 to 2006. Encouragingly, they show that countries with higher under-five mortality rates received more official development assistance, suggesting that perhaps donors are shifting funding toward the people who need it most.

Hypothesis and Data

Health indicators have generally improved in almost all developing countries over the last few decades. Infant mortality rates have declined significantly for countries with both high, moderate, and low initial infant mortality. Funding for health aid projects has generally risen across this same time period, but did these projects contribute to significant increases in the

health of developing country populations?

When donors fund health-targeted aid projects their goal is to improve health in recipient country populations, either indirectly through budget assistance for government health ministries or directly through projects on the ground. There are numerous pathways by which aid-funded projects can lead to increased health in recipient countries, of which we mention just a few. Providing up-to-date medical equipment and training medical workers results in better quality and increased accessibility of medical care. These projects allow for more people to receive better medical care, thus extending life expectancy and decreasing mortality rates. Additionally, immunizations and other preventative programs such as neonatal care, nutritional programs, and medicine distribution reduce susceptibility to disease, thereby resulting in a healthier population.

Health-targeted development assistance should cause measurable improvements in health indicators in recipient countries because the projects it funds are specifically designed to increase health. Health aid may also act as a signal to recipient governments that donors are watching their countries' health performance, giving them incentives to focus on bettering that sector (Bermeo, 2006). Thus, if health-targeted aid is effective, we expect aid to be highly correlated with improvements in health indicators for recipient country populations. We test this by modeling health aid's effect on developing countries' infant mortality rate (IMR) as the best measure of public health, but we also include separate models for under-five mortality rates and life expectancy at birth to test for robustness.

Our dataset includes IMR, under-five mortality, and life expectancies for all non-OECD countries each five years from 1985 to 2005, which we obtained from the World Development Indicators of the World Bank (2008). These three indicators are consistently utilized in both medical and social science research as measures of a population's overall health because they

reflect many important health factors such as quality and availability of medical care, maternal health, nutrition, and prevalence of disease. We include all countries for which health indicators were reported at least once during the period of our study; however, we recognize that these measurements of health could be more likely to be missing or inaccurate for those countries with the worst health conditions. The distribution for each indicator roughly follows a normal curve.

Our analysis is constrained by the availability of data on health-targeted aid flows; however, our data reflects the most comprehensive picture of health aid possible. We use data from PLAID (2008), the CRS (2008), and the World Bank (2008) to obtain the total value of health-targeted aid a country received each year from 1980 to 2004. Projects in the dataset come from both the CRS' bilateral donor data and PLAID's multilateral donor data; all loans and grants with CRS purpose codes in the health sector² are included. Although the PLAID dataset offers an improvement over the OECD dataset on multilateral and international financial institution aid data, the World Bank projects have not yet been coded, so we include all World Bank Group projects receiving World Bank health sector classification.

Aid totals for each country and year reflect donor commitments. They are then divided by each country's population to create per capita aid totals. Since the health effects of aid projects are not immediate, we use five year aid totals to compare with health indicators for the following year. For example, Albania's total health aid from 1980 to 1984 is compared with its infant mortality in 1985. In order to obtain linear relationships, these totals are transformed by taking their natural logarithms. We repeat the same process to obtain the per capita aid to the water and sanitation sector (which may also improve health by reducing disease), for all sectors except

² See Appendix A for descriptions of the CRS health sector purpose codes.

health and water/sanitation, and for total (aggregate) aid. We understand that we are unable to account for all aid flows because of the lack of aid data from non-DAC bilateral donors and private organizations, but with PLAID's addition to the CRS we capture a larger piece of aid flows than previous studies.

Aid data may be biased by the aid donors who could inflate their reports of their foreign aid-giving activities. Because commitment data is more readily available, our dataset reports foreign aid commitments and not actual disbursements; although commitments should reflect disbursements we cannot be sure that all of the reported aid is actually delivered. Additionally, we recognize that project disbursements typically span a number of years and often do not reach recipient countries in the same year they are committed. However, given the extremely limited availability of disbursement data our best option is to measure aid flows by project commitment amounts.

Our models include controls for the most important factors affecting public health in order to more fully isolate the effects of health-targeted aid. The most important of these is per capita GDP adjusted for purchasing power parity, which we obtain from the World Bank Development Indicators (2008) and convert to constant 2000 United States dollars. We transform this variable by taking its natural logarithm and lag it by five years in order to measure its long term effects on health. GDP is the essential control in health studies because wealthier countries have much better health indicators than poorer countries. Wealthier countries should have overall better living conditions, more people should be able to afford healthcare, and the treatment available should be higher quality than in poorer countries. In fact, GDP alone predicts over half of the variation in health among recipient countries. We also include population data from the

World Bank because at a given economic level, it may require more resources for states with high populations to improve health rates since they have to provide services to more people.

We employ the Polity Index (Marshall and Jaggers, 2006) to control for democracy because we expect that more democratic countries, which are more accountable, have greater incentives to ensure their citizens receive basic health care. Polity scores reflect the presence or lack of democratic institutions in a given country, a score of -10 representing absolute autocracy and 10 representing absolute democracy. The Polity Index accounts for political competition, selection of the executive, constraints on executive power, and other factors that measure democratic traits of each country's political system.

Our analysis rests on the assumption that aid commitments are reaching their intended targets, but this is not always the case. In an effort to account for fungibility, we control for transparency as reported by the Political Risk Services Group's (2008) International Country Risk Guide (ICRG). A country's ICRG score indicates the probability that government officials will accept or demand bribes in exchange for special favors. ICRG scores range from 0 (highly corrupt) to 6 (highly transparent). Governments with higher levels of transparency should be less likely to divert aid money from its intended purposes. Thus aid should be more effective in those countries where medicine is actually delivered than in more corrupt ones where officials may spend the funds on activities that do not improve health.

Table 1³ displays the number of observations, mean, standard deviation, minimum, and maximum for each variable. Aid recipient countries have extremely varied initial health indicators; some populations have health rates similar to OECD countries and some experience

³ See Appendix B.

up to 20 times the child and infant mortality. As Graph 1⁴ demonstrates, IMR decreases very linearly across time for almost all countries, with larger improvements for the countries with worse initial health. Because of the large amount of variation in both initial health and rate of improvement, we employ a model with both fixed and random effects to account for country-specific health performance across the time period of our study.

Testing and Results

We model the effect of health-targeted foreign aid on recipient countries' health indicators using a latent growth curve, a type of random coefficients model advocated by Beck and Katz (2007) for time-series-cross-section data. This mixed model includes both fixed effects accounting for each country's specific initial health status, and random effects allowing for each population's different rate of improvement in health. Thus, each recipient country has a unique intercept and slope in models of the effects of health aid on its population's health status. A random coefficient model allows us to look at both the mean effects and country-specific effects of health aid. Observations for each year are nested within each country, imposing a hierarchical structure onto OLS data and creating a time variable to account for natural health improvement across the twenty-five years of this study. The resulting equation accounts for variation in intercepts (the first term) and in trends across time (the second term). For country i and time t :

$$IMR_{i,t} = [\beta_0 + \gamma_{0,i}] + [\beta_1 + \gamma_{t,i}]T + \beta_2 X_{i,t} + u_{i,t}$$

When health aid, water aid, and all other aid are included in a model of IMR⁵ controlling for GDP and population, other aid is statistically significant but health aid is not. Adding

⁴ Appendix B.

⁵ See Table 2, Appendix B for the results of the IMR models.

democracy and transparency to the model makes health aid become significant, but both models suggest that health aid increases infant mortality while water aid and other aid decrease it. This seemingly incorrect sign for health aid may be partially explained by its collinearity with other aid. When no other type of aid is included in the model, total aid is statistically significant and has a coefficient of -0.35. Still, its substantive impact appears trivial as an increase in total aid of one standard deviation leads to a 0.97 decrease in IMR. This massive increase in aid would only lower the average infant mortality in the developing world from about 63 to about 62.. The random-effects parameters show a large variance in the mean effect, which indicates that random effects are important and justifies our use of a mixed effects multilevel regression model. Transparency is not significant, and neither is population, democracy, or the interaction of aid and transparency.

Models of child mortality achieve similar results to the IMR models.⁶ Controlling for the steady decrease in under-five mortality across time, both total aid and non-health aid are significantly correlated with additional improvements in child health. Again, health aid is only significant when controlling for water aid, other aid, GDP, population, democracy, and transparency, but it has the wrong sign. Transparency makes a small but significant contribution to child health in this model. As in the IMR models, total aid alone is significant, but its health impact appears to be smaller than that of non-health aid. These results suggest that perhaps health-targeted aid projects are ineffective because they provide no greater health benefits than aid to other sectors.

All variables are less strongly correlated with life expectancy⁷ than infant and child mortality, which are less sticky health indicators, but the models are generally similar. Both total

⁶ See Table 3 in Appendix B for the results of the under-five mortality models.

⁷ See Table 4.

aid and health aid are significant, but their signs show that their small effects are associated with decreases in longevity. Perhaps aid is even less effective at contributing to long-range overall health than it is in decreasing child mortality. Even when health aid, total aid, or non-health aid are significant, their trivial substantive effects on each of our health indicators suggest that aid projects do not lead to the measurable improvements in health that might be expected.

Water aid never significantly contributes to health improvements in any model, suggesting its indirect health effects are not strong enough to translate into increases in general health. Democracy and population size also appear to be insignificant factors on overall country health. While transparency is barely significant in models of life expectancy and child mortality, its substantive effects are trivial. Controlling for these and other factors that should theoretically affect public health, GDP has by far the largest impact on developing country health indicators.

Developing countries' wealth has a much greater effect on their populations' health than does aid, improving health by about 22 times as much in models of each health indicator. A general increase in GDP in the developing world appears to drive the steady decrease in mortality rates across the past few decades. Our model is not designed to explain why GDP has risen, but no study has yet conclusively linked GDP growth to aid. Therefore, it appears that a country's wealth, independent of the aid it receives, may be the determining factor of the health of its population and the rate of improvement in health indicators.

Conclusions

Our models suggest that broadly-defined health sector aid has a negligible impact on the health of recipient country populations. On the other hand, the effect of GDP on health indicators is quite large. These results raise compelling questions beyond the scope of this study. What has driven the general increase in GDP in developing countries over the past few decades? Is there a

reciprocal relationship between health and GDP where improving health spurs economic growth? Are certain types of health aid more effective at reducing mortality than others? It is quite possible that those programs that improve health most dramatically are the cheapest, such as malaria inoculations or treatment with rehydration therapies. If these programs are indeed the most effective at reducing mortality, it seems likely that large increases in health aid funding would not contribute much to further improvements in health.

More targeted research with better data may undermine these results in the future. As the PLAID dataset continues to increase coverage, additional testing will capture an ever-larger picture of aid flows. More exhaustive analyses can also be conducted by imputing missing data for health and economic indicators. Using the project descriptions and CRS codes available in PLAID it is possible to further disaggregate health aid by project type to determine the relative effectiveness of health projects. With more specific health data, various types of health projects could be compared against their specific expected health outcomes, such as prevalence of diseases, ratios of doctors to the total population, and numbers of hospital beds available in recipient countries. These results could help us determine which health projects deliver and which do not, providing useful information to guide aid donors.

The health effects of aid projects outside the health sector also warrant further study, as projects for clean drinking water and sanitation may prove to be more cost-effective methods of improving quality of life than building hospitals. Understanding which aid sectors produce better results will enable allocation of aid funds toward more productive sectors and away from those which may be more visible but less beneficial to recipient country populations. We also suggest that future studies include regression tests on bilateral and multilateral health aid separately in order to capture any differences that donor preferences may have on project outcomes.

Finally, we also recognize that quantitative research by nature offers only a broad picture of the impact of health aid on a global scale, so qualitative research on health-targeted aid will continue to be of vital importance. We hope to see more case studies of health projects in developing countries to address gaps in the aid effectiveness literature. Although quantitative research can help us find which pieces fit into the puzzle, qualitative studies can trace aid projects from commitment to completion, allowing us to fit the puzzle pieces together.

This analysis suggests that while health aid may lead to improved health indicators under certain conditions, the resulting improvements are trivial. While it appears that health aid is statistically correlated with better health, its almost negligible effects on important health indicators cast doubt on its effectiveness. However, the evidence of this study alone is not enough to determine if health-targeted aid projects are useful or futile. Better data and more analysis are required to gain a better picture of the results of individual projects and health sector aid in general.

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Appendix A – CRS Health Sector Purpose Codes

| CRS Code | Title | Description |
|-----------------|---|---|
| 12110 | 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. |
| 12181 | Medical education/training | Medical education and training for tertiary level services. |
| 12182 | Medical research | General medical research (excluding basic health research) |
| 12191 | 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 (16063)]. |
| 12220 | 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. |
| 12230 | Basic health infrastructure | District-level hospitals, clinics and dispensaries and related medical equipment; excluding specialised hospitals and clinics (12191). |
| 12240 | 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. |
| 12250 | Infectious disease control | Immunisation; prevention and control of malaria, tuberculosis, diarrheal diseases, vector-borne diseases (e.g. river blindness and guinea worm), etc. |
| 12261 | Health education | Information, education and training of the population for improving health knowledge and practices; public health and awareness campaigns. |
| 12281 | Health personnel development | Training of health staff for basic health care services. |

Appendix B – Variables and Model Results

Table 1. Summary Statistics

| | Observations | Mean | Standard Deviation | Minimum | Maximum |
|-------------------------------------|---------------------|-------------|-------------------------------|----------------|----------------|
| Log of health aid per capita | 977 | 0.76 | 1.78 | -8.11 | 5.47 |
| Health aid per capita | 977 | 8.15 | 18.56 | 0 | 238.13 |
| Log of water aid per capita | 977 | 1.07 | 1.84 | -17.02 | 5.85 |
| Water aid per capita | 977 | 13.07 | 32.40 | 0 | 348.79 |
| Log of other aid per capita | 1051 | 3.27 | 2.74 | -8.66 | 7.87 |
| Other aid per capita | 1051 | 195.64 | 301.31 | 0 | 2609.02 |
| Log of total aid per capita | 977 | 3.59 | 2.72 | -8.66 | 7.94 |
| Total aid per capita | 977 | 230.81 | 335.17 | 0 | 2808.46 |
| Log of lagged GDP per capita | 823 | 8.11 | 1.09 | 4.92 | 11.28 |
| GDP per capita | 823 | 5876.85 | 7518.31 | 136.52 | 79031.6 |
| Polity (democracy) | 719 | 0.11 | 6.96 | -10 | 10 |
| Transparency | 526 | 2.74 | 1.11 | 0 | 6 |
| Population (millions) | 977 | 28.18 | 116.69 | 0.03 | 1304.5 |
| Infant mortality | 900 | 59.31 | 43.22 | 2.4 | 192 |
| Under-five mortality | 894 | 87.82 | 73.21 | 2.7 | 336 |
| Life expectancy | 893 | 62.58 | 10.79 | 31.17 | 80.88 |

Note: We use logged aid variables in the analysis.

Graph 1.

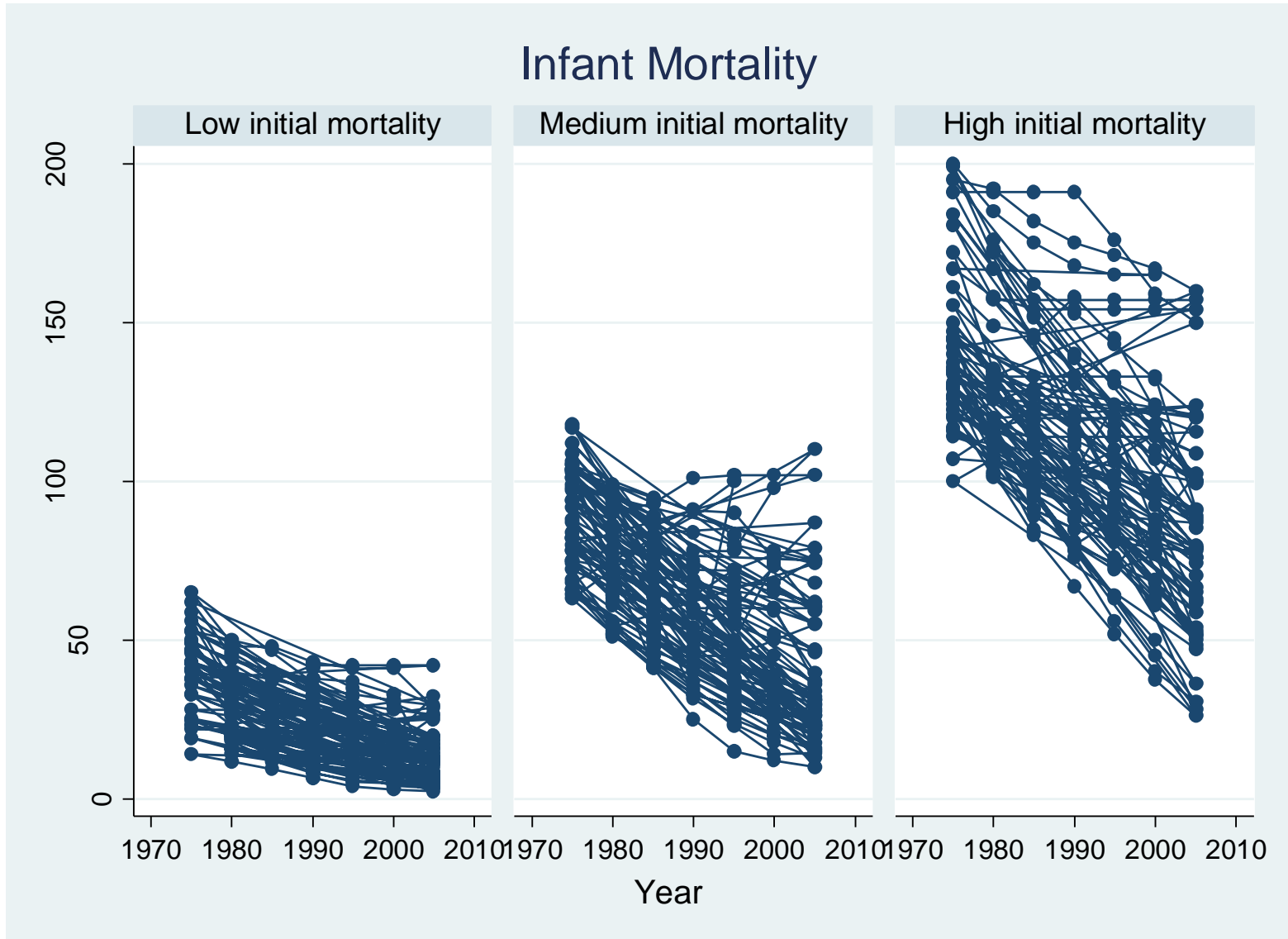


Table 2. Effects of Health-Targeted Aid on Infant Mortality Rate

| Variable | Model 1 | Model 2 | Model 3 |
|-------------------|--------------------|--------------------|---------------------|
| Year | -1.10*** (0.09) | -1.10*** (0.09) | -1.18*** (0.11) |
| Lhaid5 | | 0.16 (0.15) | 0.27* (0.17) |
| Lwaid5 | | -0.23 (0.16) | -0.23 (0.18) |
| Loaid5 | | -0.34*** (0.13) | -0.56*** (0.15) |
| Ltaid5 | -0.35*** (0.09) | | |
| Ln GDP per capita | -7.64*** (1.17) | -7.59*** (1.17) | -11.86*** (1.53) |
| Population | -0.01 (0.02) | -0.01 (0.02) | -0.01 (0.02) |
| Democracy | | | 0.01 (0.08) |
| Transparency | | | -0.51 (0.37) |
| Intercept | 135.06 | 134.80 | 172.26 |
| N | 636 | 636 | 435 |

*** Significant at the 1 percent level

** Significant at the 5 percent level

* Significant at the 10 percent level

Random effects parameters

| | Model 1 | Model 2 | Model 3 |
|-------------|-----------------|-----------------|-----------------|
| Sd year | 0.28 (0.02) | 1.00 (0.07) | 0.96 (0.08) |
| Sd constant | 7.50 (0.63) | 39.90 (2.53) | 39.31 (2.98) |
| Correlation | -0.35 (0.11) | -0.59 (0.06) | -0.65 (0.07) |

Table 3. Effects of Health-Targeted Aid on Under-Five Mortality

| Variable | Model 1 | Model 2 | Model 3 |
|-------------------|---------------------|---------------------|---------------------|
| Year | -1.17*** (0.15) | -1.67*** (0.15) | -1.80*** (0.18) |
| Lhaid5 | | 0.28 (0.24) | 0.42* (0.24) |
| Lwaid5 | | -0.31 (0.25) | -0.34 (0.26) |
| Loaid5 | | -0.48** (0.20) | -0.73*** (0.22) |
| Ltaid5 | -0.46*** (0.15) | | |
| Ln GDP per capita | -11.48*** (1.88) | -11.42*** (1.88) | -15.62*** (2.42) |
| Population | -0.02 (0.03) | -0.02 (0.03) | -0.02 (0.03) |
| Democracy | | | -0.01 (0.11) |
| Transparency | | | -1.12*** (0.54) |
| Intercept | 201.19 | 201.01 | 241.43 |
| N | 633 | 633 | 432 |

*** Significant at the 1 percent level

** Significant at the 5 percent level

* Significant at the 10 percent level

Random effects parameters

| | Model 1 | Model 2 | Model 3 |
|-------------|-----------------|-----------------|-----------------|
| Sd year | 1.61 (0.11) | 1.61 (0.11) | 1.57 (0.12) |
| Sd constant | 69.11 (4.33) | 69.10 (4.33) | 70.31 (5.24) |
| Correlation | -0.58 (0.06) | -0.58 (0.06) | -0.62 (0.07) |

Table 4. Effects of Health-Targeted Aid on Life Expectancy

| Variable | Model 1 | Model 2 | Model 3 |
|-------------------|-------------------|-------------------|--------------------|
| Year | 0.16*** (0.03) | 0.17*** (0.03) | 0.21*** (0.03) |
| Lhaid5 | | -0.12* (0.07) | -0.21*** (0.06) |
| Lwaid5 | | 0.01 (0.07) | -0.06 (0.07) |
| Loaid5 | | -0.04 (0.06) | -0.02 (0.06) |
| Ltaid5 | -0.10** (0.04) | | |
| Ln GDP per capita | 3.61*** (0.40) | 3.62*** (0.40) | 4.20*** (0.48) |
| Population | 0.01 (0.01) | 0.01 (0.01) | 0.01 (0.01) |
| Democracy | | | -0.05* (0.03) |
| Transparency | | | 0.59*** (0.14) |
| Intercept | 31.63 | 31.27 | 24.27 |
| N | 621 | 621 | 429 |

*** Significant at the 1 percent level

** Significant at the 5 percent level

* Significant at the 10 percent level

Random effects parameters

| | Model 1 | Model 2 | Model 3 |
|-------------|-----------------|-----------------|-----------------|
| Sd year | 0.28 (0.02) | 0.28 (0.02) | 0.28 (0.02) |
| Sd constant | 7.77 (0.57) | 7.70 (0.57) | 7.50 (0.63) |
| Correlation | -0.33 (0.09) | -0.33 (0.08) | -0.35 (0.10) |