THE IMPACT OF FOREIGN AID ON MATERNAL MORTALITY

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Abstract

There are concerns that developing countries may not be able to meet the targets of the health-related Millennium Development Goals (MDGs), and there are calls by international community to increase resources through foreign aid to enable the attainment of these goals. International efforts to reduce maternal mortality are no exception in this respect. To this end, several donor countries have pledged their support to increase funding towards the reduction of maternal health levels in countries with the poorest maternal health indicators. In spite of these global efforts, the evidence linking foreign aid to reductions in maternal mortality is limited. Using data from the Organisation for Economic Cooperation and Development, the World Development Indicators (WDI) from the World Bank, and the Institute of Health Metrics and Evaluation (IHME), this study analyzes the effects of aid on maternal health in a sample of 106 low- and middle-income countries from 1996 through 2010. Two-stage, fixed effects panel regression models are used to examine the effect of several types of foreign aid on mortality levels. Results show that total foreign aid has a small but statistically significant negative effect on maternal mortality and that aid allocated to the reproductive health sector is associated with even larger reductions in maternal mortality. The study provides evidence that it is important to channel more donor assistance to reproductive health and the promotion of contraceptive use among women as it serves as a tool to empower them and leads to reduction of maternal mortality.

KEYWORDS: Maternal Mortality; Foreign Aid; Reproductive Health Family Planning; Muskoka Initiative

INTRODUCTION

Recent debates concerning the effectiveness of aid in improving development outcomes have been inconclusive. Aid critics (Moyo, 2009; Easerly, 2006; Winters, 2010) have in recent times voiced their concerns that aid is "dead". They maintain that billions of dollars have been transferred to poor economies with the aim of improving living conditions but the results have always been catastrophic, leaving more than a billion people still living in abject poverty. Following the Paris Declaration and the Accra High Level forum on aid effectiveness in 2005 and 2008 respectively, the attention of various policy makers and researchers has been on how the adoption of the memoranda issued at these forums has led to streamlining aid to do more to ensure that the purpose for which it is allocated is achieved. In the case of maternal health, the Muskoka Initiative on Maternal, Newborn and Child Health (MNCH) was one such high-level agreement adopted at the G8 summit in 2010. This initiative saw the commitment of $7.3 billion through 2015 to improve maternal and child health in the world's poorest countries. To ensure that long-lasting results are achieved, core principles were spelled out from the initiative to measure progress, track results and help less-developed countries in the reduction of maternal and child mortality. Some of the principles adopted include: building cost-effective interventions, focusing on countries with the greatest needs while focusing on those making progress on maternal and child mortality, strengthening existing country's health policies and plans that are locally based, better coordination and harmonization, improving accountability, and strengthening monitoring and evaluation (Foreign Affairs, Trade and Development Canada, 2012). With nearly four years elapsed under the Muskoka framework and 2015 rapidly approaching, there is only a short period to the deadline of the Millennium Development Goals and many concerns about increasing resources to low and middle income countries towards delivering effective health interventions to meet the three health related MDGs.

Increasing attention has been paid to maternal mortality given that women are key contributors to most households in less-developed countries, and ensuring that they are healthy means that they can be able to work and take care of their children. Over the past decade, the donor community has committed huge sums of financial resources to the reduction of maternal deaths in developing countries. This amounted to $2.6 billion in 2003 and $6.5 billion in 2010 (Hsu et al. 2010). High levels of maternal mortality are still prevalent in many parts of the world. It is estimated that there were 342,900 unpredicted maternal deaths worldwide in 2008, most of which occur during pregnancy, child birth, or after birth (Hogan et al. 2010). These women leave behind devastated families who cannot afford the cost of health care that came too late or was ineffective (WHO, 2005). Countries with dire maternal health indicators have not been able to invest adequately in health systems and there is, therefore, the need among global health actors and aid donors to invest adequately in health systems and programs to reduce high maternal mortality and morbidity levels in a rapid globalizing world. Given the seeming role for international development assistance in combatting this development challenge, it is important to assess the evidence of aid's efficacy in reducing maternal mortality. As such, this study examines the effect of foreign aid on maternal mortality in low- and middle-income countries using two-stage, instrumental variable, fixed effects panel regression over the period from 1996 through 2010.[1]

BACKGROUND

There are concerns that developing countries, especially in sub-Saharan Africa, may not be able to meet the targets of the health-related Millennium Development Goals (MDGs) and there are

[1] Unfortunately, data availability does not permit us to include the post-Muskoka Initiative period in this analysis to assess whether the concerted efforts have had any additional effect.

calls by the international community to increase resources to enable the attainment of these goals. MDG 5 takes as its aim to improve maternal health, with a target of reducing maternal mortality ratios by 75% between 1990 and 2015. To this end, several donor countries have pledged their support to increase funding towards the reduction of maternal health levels to the countries with the poorest health indicators. Resources remain a crucial element towards the reduction of maternal and child mortality, but government spending is low (Bhutta et al. 2010). Global health funding has emerged as a strategy to transfer resources from developed countries and international organizations such as the World Health Organisation (WHO), the United Nations (UN), the World Bank, among others, to governments and non-governmental actors in developing countries to improve the quality of programs in the health sector.

Tracking the resources of foreign aid is crucial to ensuring appropriate design of policies and that resources are used judiciously for the purpose which they have been allocated. Powell-Johnson and Mills (2007) state that health resource tracking is used to identify a gap between what has been spent and what is required and whether the funding can be used as an advocacy tool to mobilize more resources. Powell-Johnson et al. (2006) note that adequate financing is required to scale-up interventions toward the achievement of the MDGs for child survival and maternal health. The cost of scaling up these interventions is estimated at around $40 to $70 billion dollars each year (Clemens, Kenny and Moss, 2007).

Global funding for health has increased in recent years. Sources of funding are from a myriad of actors actively involved in global health architecture with most of the funding directed at improving health outcomes. It is estimated that that private and public institutions participation in the provision of foreign aid for health grew from $5.6 billion in 1990 to almost $21.8 billion in 2007 (Haffeld, Siem & Rottingen, 2010). Most of the funding from public sources soared from

$4.5 billion in the 1990s to $14 billion in 2007. It has also emerged that, despite this increase in funding, there have not been any effective mechanisms to track the volume of expenditures and most importantly how they are managed and spent (McCoy et al. 200 cited in Haffeld, Siem and Rottingen, 2010). With these challenges inherent in global funding, there have been calls for a single global funding source to increase and coordinate available resources for effective health interventions. This fragmentation may not allow for a proper tracking of resources to the health sector in order to assess their impact on health outcomes. In addition, Haffeld, Siem and Rottingen (2010) argue that a comprehensive mechanism in global funding could contribute to the uniform management of global funds for health and guarantee basic survival needs for the world's poorest people.

Previous foreign aid research has mainly focused on economic development and poverty reduction with mixed results. For example, Bornschier, Chase-Dunn and Robinson (1978), and Hansen and Tarp (2003) show that foreign aid has a positive impact on economic growth. In contrast, Durbarry, Gemmel and Greenaway (1998), and Annen and Kosempe (2009) and Easterly (2003) show that foreign aid has no impact on economic growth. Ekanayake, Cookman and Chatrna's (2000) study on the effect of foreign aid in developing countries show that there is no impact. Given the complex relationship between health and development, there is an interest in exploring how investments in people's overall health in a country contribute to economic development. It is argued that if the productive workforce is healthy, they can work meaningfully towards higher productivity translating into a higher economic growth and development.

While these studies provide an important step in obtaining empirical evidence of the role of foreign aid on development outcomes, few studies to date have examined the impact of foreign aid on health outcomes such as mortality. Greco et al. (2008) tracked the flow of health-related

aid from 2003 through 2006 and found that aid to maternal health did not always go to the most affected countries. Earlier studies point to a negative effect of aid on mortality and health outcomes specifically in the case where aid increased the indebtedness of recipient countries (Bradshaw et al. 1993; Sell and Kunitz 1986). Shen and Williamson (1999) find that greater indebtedness – in some cases aid-related – indirectly increases maternal mortality, but conclude their study with a rallying call to donors, arguing: "It is likely that even a modest increase in aid could substantially improve maternal mortality rates if it were spent on improving the access of poor women to health services" (p. 211). More recent studies on the impact of foreign aid on mortality have mainly focused on infant mortality (Mishra and Newhouse, 2009; Burguet and Soto, 2012). Similarly to the economic literature, empirical evidence suggests that the effects of foreign aid on mortality are inconclusive. For example, Williamson (2008) found that foreign aid is ineffective in improving overall health. However, Mishra and Newhouse (2009) found that overall aid had no impact on infant mortality while health aid was significant. Powell-Johnson et al. (2006) also found a positive relationship between mortality and Official Development Assistance (ODA). Considering the significant international attention paid to the maternal mortality issue by the international community and donor agencies in recent years, the relative absence of empirical evidence linking aid and reduced mortality is surprising. This study will aim to provide some of this evidence and examine the impact of several categories of foreign aid on maternal mortality over time.

Challenges to Global Health Funding

There are challenges associated with global health funding in developing countries. Sridhar (2010) has summarized these challenges. There is challenge of coordination among global actors providing funding for the health sector in developing countries. "It is estimated that there are

more than 40 bilateral donors, 24 United Nations (UN) institutions, 20 global and regional funds, and 90 global health initiative active at the moment" (Sridhar, 2010; p. 3). Most of the global donors tend to focus on specific projects (HIV/AIDS, malaria, TB, etc.) that makes coordination among these institutions very difficult. Most of the initiatives are driven by donor agendas rather than the country's priority needs, resulting in a fragmentation which prioritizes issues that are not paramount to the country's needs. It sometimes prevents governments of the receiving country from developing and implementing well coordinated and comprehensive plans in the health sector. Scholars are of the view that donors have their own way of implementing initiatives in a country, thereby, weakening national health strategies and the plans of the recipient country. Moreover, many of the initiatives that are being funded lack mechanisms for accountability, transparency, and evaluation and focus on short-term results without regard for questions of sustainability.

Another challenge that has been associated with global health funding is an emphasis on "new players" instead of strengthening existing institutions (Sridhar 2010). For example, UNAIDS was created from the WHO's Global Program on HIV/AIDS as a result of the perceived failures of the latter. As a result, the United Nations created a new institution separate from the WHO because it could not solve all the global health challenges that it was mandated to undertake. An additional major challenge in the global funding landscape is the shift in promoting health systems, or horizontal interventions. "Horizontal interventions are defined as those that strengthen the primary care system, improve health systems service and delivery, and address general non-disease specific problems such as health worker shortages and inadequate skilled birth attendants "(Sridhar, 2010, p. 464). There is, for example, confusion as to how financing should penetrate the health system by promoting specific targets that indicate the strength of the

health system, such as maternal mortality or through general approaches such as the building of clinics. Thus, there is tension as whether to focus on vertical activities with the intention of financing vertical activities. With the current system of measurement focusing on disease-specific causes of death, instead of investing in health systems, it becomes difficult to track and measure performance. The imperative for donors to fund programs that are results-oriented in the short term clearly demonstrates that there is little incentive to fund health systems.

It has also emerged that, the question of who donors should fund is a challenge. In recent years, like in the wider aid community, it appears there has been a shift of funding towards non-state actors. As noted by Sridhar (2010), the Global Fund's use of the Country Coordinating Mechanism (CCM) gives room to civil societies as it is supposed to make space for other actors in the participation process. Most of the funding is channelled through non-state actors with limited state control in the prevention, treatment, and care of health interventions. The marginal involvement of developing country governments in global health raises issues of sustainability. The state is the key actor in development, and the government is directly responsible for the health of its citizens. Therefore, it is important to strengthen health systems through the government for long term benefits. Another challenge to global funding occurs when the funding arrangement has been made to suite the interests of particular actors (McCoy et al., cited in Sridhar, 2010). Most of the funds are geared towards northern organizations, who are believed to be efficient and provide the technical knowledge in terms of personnel who are paid huge sums of money in consultation fees giving back what has been invested in developing countries to developed countries. As well; there is no consensus as to areas to invest in, resulting in a plurality of approaches (Sridhar, 2010). Considering these challenges inhibiting the successful

implementation of global health programs, it is probable that global funding towards the reduction of maternal mortality may not achieve the desired outcomes.

The politics of health aid

Global health by its nature is politics, since there are different actors in the health sector with competing interests in a country. This has further been shown in the nature of foreign aid in promoting both the interests of the donor and the recipient countries (Morgenthau, 1962). Past research on the politics of foreign aid shows that the donors of foreign aid usually have an agenda to pursue in the recipient country (Boone, 1995; Werker, 2012). Schraeder et al. (1998; cited in Werker, 2012) finds that Japan's aid is motivated by trade interests. Also, it has been widely agreed that politically motivated aid seems to be less effective than aid given for pure altruism (Werker, 2012). Similarly, Woods (2005) provides a classic case about how the United States development assistance goes to strengthen security issues in the recipient country, especially in the context of the global war on terrorism. Although, the US continues to support security issues, this has not diverted attention from giving aid to other sectors in a recipient country such as education, health, and agriculture among others. This is typified by the Millennium Challenge Account (MCA), where the recipient receives grants according to results achieved by the poorer countries rather than promises made by the US. Woods (2005) notes that countries are eligible for the MCA if they demonstrate commitment to just and good governance, economic freedom, and investing in their people. Even with such laudable aims, Woods questions whether the MCA had lived up to its expectation. The MCA made a promise to disburse US$ 2.5 billion in 2005 alone, but in the two years after its creation, no disbursements

were made. Woods suggests this is because the amounts promised were instead being used to promote security imperatives in the name of promoting development:

> The promised US$ 2.5 billion is only slightly more than the US$ 2 billion estimated cost of hiring private security contractors to protect US contractors working on projects being financed by the US$ 18.6 billion 2004 aid package for Iraq, and equal to the US$ 2.5 billion in windfall Iraqi oil revenues that the US military was spending on quick-hitting development projects in Iraq in early 2004 (Woods, 2005; p.398).

It can be argued that since aid is often given with a motive, its impact in improving health outcomes may be minimal since the agenda given is "coated with sugar" under the disguise of promoting development.

Mayhew (2002) states that donors are subject to international and political interests that can influence their decisions on programs and services support to the detriment of local needs. A case in point is the anti-abortion stance by the Republicans in the US that has resulted in a policy that denies family planning funding to foreign NGOs that are known to promote abortion (Mayhew, 2002). Moreover, donors sometimes pressure recipient countries to adopt international policies even if those policies are not appropriate for the specific country's needs. These result in adoption of international policies that may make national governments unpopular in their own countries. This is construed on the background that countries with "good policies" should receive aid in line with the donor's interest. This does not distinguish between countries with which aid works and those it does not work (Lensik and White, 2000). The tendency here is that as long as the recipient country remains in the "good books" of the donor, the objective for giving aid does not matter. Some donors such as the US and the United Kingdom, are now tying aid to human rights practices and threatened to cut off aid to countries that do not promote the rights of gays and lesbians, especially in Africa. Some commentators are quick to point out that these donors want to use aid as bait to subvert the sovereignty of these countries. But most governments that

receive aid remain largely adamant for fear of losing political power. In recent times, there have been issues with the allocation of foreign aid in the health sector and which areas in the health sector are given priorities over the other. The general argument has been that the level of human needs should serve as a criterion for aid allocation (Travis, 2010) and the greater the amount of need in a particular country, the greater and higher the allocation.

Focusing on financing in the health sector, the decision to allocate resources in specific interventions in the health sector is not related to the performance of the country's health indicators (Stepping, 2013). For instance, maternal and infant mortality do not influence the decision of the donor in deciding the amount of aid to allocate.

Global Health Actors in Foreign aid: who are they and what do they do?

Health actors in foreign aid have increased over the years. Besides the traditional foreign aid actors such as the major bilateral donor agencies, multilateral development banks, national health ministries and the WHO, there have been new entrants to the global heath aid architecture such as civil society and NGOs, private institutions, and private foundations pumping money to the Global South for improved economic development and health outcomes. As discussed earlier, each category of donors has particular interests and priority areas they spend their money. Szlezak et al. (2010) observe that the changing relationships among the old and new donors in the form of norms, expectations, and formal and informal rules has ordered their operations. Furthermore, there also exist other semi-autonomous organisations that work in "partnership" with the older ones such as the WHO's Roll Back Malaria Partnership (RBM), Stop TB, the Global Alliance for Vaccines and Immunization (GAVI), the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), and many others. McCoy, Chand and Sridhar (2009)

review the structure of the global fund landscape in health and analyzed the operations and activities of the various actors. They are of the view that global actors perform three basic functions. The first function is what they called "providing", which concerns the various sources from which for global health funds are mobilized. The actors involved in this function are mainly the donor country governments; private foundations; the general public; and business and private corporations. The second function of global actors is concern with "managing" that deals basically with pooling of global funds and the mechanisms to transfer these monies to recipient countries. The actors involve in this function are the official bilateral aid agencies of donor countries; international governmental organisations (IGOs); global health partnerships (GHPs); NGOs; private foundations; and the business or corporate sector. The third function is "spending", and it involves the actual disbursement of the global funding. The actors in this function are multilateral agencies in the health sector; GHPS; private sector; for-profit organisations; low and middle income country (LMIC) governments; and LMIC CSOs. While these functions appear to operate in a linear manner, in actuality this may not be so and that there could be an overlapping and multiplicity of functions as portrayed. This is presented in Figure 1 below. The present study focuses primarily on the aid relationship between one of the types of 'managing' actors, bilateral aid agencies, and the entire range of 'spending' actors in our sample of developing countries.

[FIGURE 1 ABOUT HERE]

Simply providing funds from donors to recipient countries does not in itself suggest that health outcomes would be achieved. Attention has also been paid to strengthening existing health systems, since funds are necessary condition but not sufficient condition for improved health conditions (Balabanova et al., 2010). The strengthening of health systems should be geared

toward removing barriers at the community and household levels; health services delivery; health sector policy and management; public policies across various sectors; and environmental and contextual characteristics (Hanson et al. 2003; cited in Mangham & Hanson, 2009). Similarly, Marchal, Cavalli and Kegels (2009) argue that global health actors claim to strengthen health systems but in reality they focus on specific disease interventions or tend to focus on their own objectives by implementing programs that serve their interests. This deliberate neglect of health systems mean that health outcomes may be difficult to achieve especially in sub-Sahara Africa where there are weak health systems that, among other challenges, lack critical human resources; have inefficient drug supplies; rely on poor quality of information; and have weak monitoring systems.

Donors also use various strategies and instruments in the allocation of health aid. Dodd and Lane (2010) document that instruments used by donors in their activities are project support, where funds are used to purchase specific goods and services, and budget and sector support, where funds are disbursed directly to the government's budget in support of a health. In recent times there have been shifts towards Sector-Wide-Approaches where all the development partners contribute their monies to a common basket for the financing of specific health projects (Dodd and Lane, 2010). Moreover, there has been a conceptual shift towards aid effectiveness. It has been recognized that most donors engage in parallel and uncoordinated programs. Following from the Paris Declaration on aid effectiveness, donors are now evaluated by the Development Assistance Committee (DAC) of the OECD on certain criteria to ensure that their aid produced the expected outcome (Dodd and Hill, 2007). These are:

1. Harmonization (coordination and use of common procedures),

2. Alignment (following country policies and where possible making use of country systems),
3. Managing for results (donor relinquish control of the day to day management of aid funds, and then focus on results in terms of better development outcomes).

As the Paris Declaration has become a reference point for aid effectiveness, it is important to ensure that foreign aid deliver maternal health results. When donors coordinate their programs appropriately and by aligning donor assistance to recipient country government's budget and policies, foreign aid seemingly has the potential to be directed towards ensuring that maternal mortality is reduced.

DATA AND METHODS

Data

Data for this study are drawn from the Organisation for Economic Cooperation and Development (OECD) Creditor Reporting System (CRS) database, the World Development Indicators (WDI) from the World Bank, and the Institute of Health Metrics and Evaluation (IHME) data base. The source from the OECD is the net bilateral Official Development Assistance (ODA) commitments by the Development Assistance Committee (DAC) donors reported from the CRS. This study considers all forms of aid commitments allocated by the DAC donor countries. We consider the effects of four categories of bilateral aid: total aid, total health-related aid, reproductive health aid, and family planning aid.[2] The sample consists of 106 low- and middle-income countries that were eligible to receive the various categories of aid between 1996 and 2010. In total, the

[2] These correspond to the following DAC Sector Codes in the CRS: Total Aid (1000); Health Total (120 I. 2); Reproductive Health Care (13020); and Family Planning (13030).

sample consists of 798 country-year observations over that period for which all data was available. Descriptive statistics for our sample are shown in Table 1.

[TABLE 1 ABOUT HERE]

The dependent variable in this study is Maternal Mortality Rate (MMR): the number of maternal deaths in a given period per 100,000 women of reproductive age during the same time period (WHO, 2012) Our MMR measure is from the Institute for Health Metrics and Evaluation's "Maternal Mortality Estimates and MDG 5 Attainment by Country 1990-2011" dataset (IHME 2011). The WHO defines maternal death as "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes" (WHO ICD-10, 2010, p. 156). The causes of maternal death according to the WHO can be direct or indirect causes. The direct causes are those resulting from complications of the pregnant state, from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above. The indirect causes are those not due to direct obstetric causes. Not surprisingly, there is a close association between economic development in a country and its rates of maternal mortality. Figure 2 highlights this relationship for our sample countries in 2010, showing that wealthier countries are likely to have lower rates of mortality. Mean MMR in our sample is approximately 330 deaths per 100,000 women, while median MMR is approximately 150. MMR varies significantly across different geographic regions within our sample and over time. Figure 3 shows this variability, revealing that overall MMR has declined over time, but remains high certain regions.

[FIGURE 2 ABOUT HERE]

[FIGURE 3 ABOUT HERE]

The principal independent variables are the annual amount of aid flows in four categories (total aid, health aid, reproductive health aid, and family planning aid) in millions of constant 2011 USD. . Our analysis included the natural log of these measures to account for skewness.

It is also important to control for other variables that have impact on maternal mortality. The other variables included are skilled birth attendant, female secondary education, adolescent fertility rate (each from the World Bank's World Development Indicators dataset), and population using any method of contraception and the total population (from the UN Department of Economic and Social Affairs' World Contraceptive Use 2012 datast). These independent variables are explained below.

Skilled birth attendant: according to a statement by WHO, ICM, and FIGO in 1999, the term 'skilled attendant' refers to "an accredited health professional – such as midwife, doctor or nurse – who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management or referral of complications in women and newborns". Traditional birth attendants either trained or not, are excluded from this category of skilled health workers (WHO, 2004 cited in Nanda, Switlick and Lule, 2005). This measure reflects the percentage of births attended by skilled health personnel, with a mean of 68% of births in countries in our sample over time.

Adolescent fertility rate: The association between maternal mortality and the age at birth of mothers is well-established in the literature (Conde-Agudelo et al. 2005; WHO 2012; Nove et al. 2014). In our models, adolescent fertility is measured by the rate of births per 1,000 women aged 15-19 years, and averages 82 births per 1,000 women in our country sample.

Modern Birth Control Use: We account for contraceptive use in our analysis using a measure of the percentage of population using at least one modern form of birth control. In our models we use this measure to serve as a proxy measure of reproductive health services and women's empowerment (WHO, 2011). The mean of modern birth control use in our sample is 33%.

Female Secondary School enrolment: To control for the level of women's empowerment in our sample countries, we include a measure of female secondary school enrolment. This measure is the ratio of female children of the official secondary school age who are enrolled in secondary school to the female population of the official secondary school age (World Bank, 2011). In our sample, the average female secondary school enrolment ratio is 54%.

Analysis

We use a two-stage fixed effects panel regression model to analyze the impact of foreign aid on maternal mortality. Because foreign aid levels are likely to be correlated with measures of development and the other independent variables in our model, we control for endogeneity by using this two-stage approach. In the first stage regression, the instrumented aid measure is regressed on the other independent variables and as well as several additional determinants of aid levels, including GDP per capita, population, democracy level, and lagged aid flows. By controlling for the endogeneity of the aid measures we are able to arrive at a more accurate model of aids effects on maternal mortality. We lag all of our independent measures five years behind the dependent variable to allow for a temporal gap in which the effects of aid might take hold. Thus, in our analysis we are predicting, for example, the effects of all independent measures in 2000 on MMR in 2005, or the effects of independent variables in 1996 on MMR in 2001. Given that maternal mortality rates are unlikely to change drastically from one-year to another, the present MMR is highly correlated to MMR in the previous year. To account for this

serial autocorrelation we also include a lagged dependent variable as an independent variable in our models. Finally, we run separate sets of nested model for each of the four aid measures because they are too highly correlated to provide meaningful results if included in a single model.

RESULTS

[TABLE 2 ABOUT HERE]

We present our results in four tables, one for each type of aid. Table 2 presents the results examining the effects of total aid on maternal mortality. The results from Table 2 indicate that total aid has a significant impact on maternal mortality when other factors are considered. In the each model, total aid appears to have a significant negative effect on maternal mortality. In Model 4, controlling for all other variables, an aid increase of 10% would yield a decrease of approximately 6 deaths per 100, 000 in maternal mortality rate.[3] In the full model, the only other statistically significant coefficient is the lagged dependent variable.

[TABLE 3 ABOUT HERE]

Table 3 examines the effect of total health-related aid on maternal mortality. In the first model it is seen that health aid has a significant association with maternal mortality rate, with a 10% increase in health-related aid predicting a 9 death reduction in MMR all else equal. When controlling for all independent variables, we the effect of total health-related aid is no longer statistically significant. Adolescent fertility rate shows the expected positive association with MMR in Models 3 and 4, with each additional adolescent birth predicting and additional 1.14 maternal deaths in Model 4.

[3] This effect is obtained by multiplying the coefficient for logged aid in Model 4 by a 10% increase: -61.73 x log(1.1) = -61.73 * 0.09531 = -5.88.

[TABLE 4 ABOUT HERE]

Table 4 shows the results of reproductive health aid on maternal mortality. In each model, reproductive health aid has negative relationship with MMR at the $p<0.001$ level. Model 4 predicts that a 10% increase in reproductive health aid would be associated with a reduction of more than 9 deaths per 100,000 in the MMR. Even when controlling for our other independent variables, the effect of reproductive aid is robust. Interestingly, in Model 4, the effect of female secondary school enrolment is statistically significant and associated with an increase in MMR.

[TABLE 5 ABOUT HERE]

Finally, in Table 5, we show the models of the effect of Family Planning-Focused aid on MMR. In contrast to the other three aid types, aid to family planning is positively associated with maternal mortality rates. In Model 4 of Table 5, a 10% increase in aid to family planning would predict an increase in MMR of just over 2 deaths per 100,000 women. This result runs contrary to our expectation that aid, and in particular aid to family planning, would work to reduce MMR, and we analyze this contradictory finding in the discussion that follows. Also in Model 4, we see that both adolescent fertility and birth control use are associated with MMR in the manner we expected. A one point increase in the percent of population using modern birth control is associated with a 2 death reduction per 100,000 in MMR. Adolescent fertility is again positively related to MMR, with each additional birth by a woman in the 15-19 age bracket predicting an additional 1 death increase per 100,000 in the MMR.

[FIGURE 4 ABOUT HERE]

DISCUSSION

Our findings show clearly that, overall, aid has limited impact on maternal mortality. Indeed, a 10% increase in total overall aid would only predict about a 1.8% reduction in MMR in a country

with mean MMR levels in our sample. As Figure 4 highlights, the effects of reproductive health-focused aid is stronger than that of total aid. Given the narrowed focus of reproductive health-focused aid, it is not unexpected it might reduce maternal mortality more directly. If, for instance, reproductive health aid is specifically channeled to the promotion of prenatal and postnatal care including deliveries (which are crucial in elements in the reduction of maternal mortality), an increase in reproductive health aid will have a greater likelihood of diminishing maternal mortality rates.

[FIGURE 5 ABOUT HERE]

With an equally narrow focus as reproductive health-related aid, what might explain the counterintuitive finding we see in the case of the effects of family planning-focused aid? Comparing the relationship between reproductive health aid and family planning aid in Figure 5 reveals relatively low correlation between the two types of aid (Pearson's R of 0.27 in our sample). This suggests that the same countries receiving significant amounts of reproductive health aid are not necessarily also in receipt of family planning aid and vice versa. Likewise, the bivariate relationship of family planning aid to each of adolescent fertility, birth control, and MMR reveal very low levels of correlation <0.1 in each case. This implies that, regardless of the intent of family planning-related aid to make contraceptives more widely available, these programs are not associated with reducing MMR either directly or indirectly through reduced fertility or contraceptive use. Cleland et al. (2006) suggest that uneven and at times inconsistent uptake of the most effective contraceptive methods, erosion of donor and government support for family planning, and the reallocation of funds towards HIV/AIDS programming are all factors in the reduced efficacy of family planning programs in recent years. Given these challenges, it is not, perhaps, surprising that our results reveal an association between family planning aid and

higher levels of maternal mortality. If family planning programs are increasingly limited, have less political support, and are being sidetracked by resources reallocated to other priorities, it is not unimaginable that they might not reduce maternal mortality.

In contrast to the narrower focus of reproductive health aid, health-related aid more broadly has no statistically significant effect on maternal mortality once other factors are controlled for. This may be due to the fact that the category of all health-related aid is expansive and the amount allocated for maternal health is marginal. This is clear in our sample, where the mean level of health-related aid was $35.2 million, while mean aid focused on reproductive health amounted to only slightly more than ten percent of that amount at $3.8 million. It is not surprising, then, that aid to the broader health sector might not contribute directly to reductions in maternal mortality. Indeed, as has been indicated in much research, maternal mortality rates tend not to influence the amount of aid that is allocated to the health sector, whereas, in the case of HIV/AIDS, prevalence rates are closely linked to the amount of foreign funding for HIV/AIDS programs (Youde, 2010; Shiffman, 2006). It is as a result of the threat of the disease globally, which donors believe may be a threat to their own citizens and, therefore, to commit more resources to reduce the prevalence rates (Shiffman, 2006). A report from the OECD indicates that between 2006 and 2007, the amount of aid allocated for HIV/AIDs programs constitute 39% as compared to 13% of aid allocated to the reproductive health sector (OECD 2008). Maternal mortality may have seized the attention of the international aid community, but it is clear that, even with efforts like the Muskoka Initiative, funding does not yet match the development challenges posed by maternal mortality.

Apart from the effects of aid on maternal mortality, our study also reveals some interesting findings with regards to the other independent variables. One contradictory result is the effect of

female secondary education on maternal mortality in Table 4 when measuring the effect of reproductive health aid. The positive relationship between education levels and maternal mortality in this case seems to be an aberration, as it is difficult to imagine the context in which increased women's education put them at greater risk of maternal death. The result in Table 4 is likely a red herring, particularly given that the effect of education does not meet with the usual expectations of statistical significance in any of our other models and is inconsistently positive and negative in all four tables. Indeed, the research literature on girl's education would suggest exactly the opposite: when females are enrolled in school they can delay giving birth at an early age and that also indicate they are able to reduce the risks associated with giving birth at an early age. Education also has a positive relationship to health and when females are highly educated, they can be able to take care of their reproductive health needs. McAlister and Baskett (2006) state that education gives women the power to seek proper health care and conclude that investment in female education will help improve maternal materiality. It is noted from the results that when female education is controlled, the skilled birth attendant, prenatal and sanitation variables are insignificant indicating that when females are educated they will take the necessary measures to improve on their wellbeing. These findings are consistent with other studies that have found a positive association between female education and maternal health (Celik & Hotchkiss, 2000; Munsur, Atia & Kawahar, 2010; Halim, Bohara & Ruan, 2010). Education may also operate indirectly through the other factors in our models. It could be that when young females are exposed to early education they are exposed to information about the dangers of teenage pregnancies. They will take the necessary preventive measures to prevent becoming pregnant. They are also empowered and can make decisions about their reproductive

health issues. Moreover, education also reduces vulnerability in terms of poverty among women since highly educated women secure jobs that takes them out of the poverty trap.

The results regarding adolescent fertility and birth control use are less remarkable. Each factor shows the type of association with MMR that we would expect to see based on the research literature on maternal mortality. In all but one set of our models higher rates of adolescent fertility are associated with higher rates of maternal death. Likewise, our findings show that increasing access to modern methods of contraception reduces maternal mortality. The results of this study are consistent with Ahmed et al. (2012) study which found that increased access to contraception in countries with low prevalence of contraceptive use averted 272,040 maternal deaths. This is because people can make choices regarding their reproductive health issues and will also avoid unintended pregnancies and to space the number of children they have. Women with high parity are more likely to have high maternal mortality as compared to women who have timed and spaced their children. In addition, contraceptives lower the risk of unwanted and unintended pregnancies which often lead to abortion, considered to be the leading cause of maternal mortality in most developed countries (Rosmans and Graham, 2006; Okonofua, 2006; Haddad and Nour, 2009). Despite our contradictory finding regarding the impact of family planning related aid funds, the effects of birth control use suggest it may well remain important to ensure that donor assistance is channelled towards the provision of contraceptives as it is a substantial and effective strategy of reducing maternal mortality in developing countries. Cleland et al.'s (2006) argument that family planning receive more international priority within the context of the MDGs or in the post-2015 agenda that follows, might be worth heeding in this case.

CONCLUSION

Since health aid is generally broad, there is little evidence to suggest that health aid leads to a reduction in maternal mortality. The impact of health aid on maternal mortality is minimal and to ensure that there is an accelerated progress towards the achievement of the MDGs through the international community, there is a need to increase more resources not only to the health sector but to the health related MDGs. This study is consistent with other studies the find no relationship between health aid and infant mortality (Mishra and Newhouse, 2009; Williamson, 2008). Aid allocated for the purpose of reproductive health, however, shows a statistical significant association with reduced maternal mortality. It is important, therefore to channel more resources to reproductive health-focused aid to accelerate the progress toward the attainment of the maternal health-related MDGs. Our results show that, despite the potential inefficacy of previous family planning-focused aid programs, access to contraceptives has a significant effect on the reduction of maternal mortality. It would, therefore, be important to channel more donor assistance to the promotion of contraceptive use among women as it serves as a tool to empower them and to take decisions that influence their reproductive behavior.

Our results show that future research would be necessary to include other donors missing in this analysis. This study only analyzed bilateral ODA from the DAC donors and did not capture multilateral aid or aid from other non-traditional donors such as the WHO, NGOs, private foundations, businesses, among others. By tracking the amount committed from these other donors, a clearer picture of the effects of donor assistance on maternal mortality might emerge. Future research should track the amount of resources from the other donors not reported by the DAC so that the true effect of foreign assistance on maternal health could be established. Research is also needed to do a comparison between the DAC and the non-traditional donors to compare the behavior of these groups of donors and their impact on maternal mortality.

A second limitation of this study is that it does a cross-country analysis of donor funding to various countries and the results may not be in context for all countries. A possible extension of this study should focus on individual countries and the amount of donor assistance received respectively, with more attention paid to what services, expertise, and reforms aid money is actually funding. A detailed case study of individual country is necessary in order to establish a more nuanced picture of the effect of foreign aid on maternal mortality. Donor decisions on the level of maternal health assistance provided, the nature of those programs, and how they are implemented in individual countries likely vary widely and it would be important to treat each country as a unique case.

The results of this study should be interpreted with caution since the data on the DAC reporting system broken down at the sector level are commitments from the donor community rather than actual disbursements, so actual aid flows to each country might depart significantly from what donors committed. Still, given these data limitations, our study is one of the first to clarify the relationship between aid and maternal mortality over time, and makes a contribution to both the research literature on maternal mortality specifically, and to the literature on the effects of aid more generally.

The Muskoka Initiative in 2010 drew significant donor attention to the issue of maternal mortality and encouraged an intensification of efforts towards supporting recipient countries in achieving MDG 5 and reducing the burden of maternal mortality. Our results suggest that this international agenda-setting exercise is not without merit. Foreign aid at the aggregate level and more narrowly focused on issues of reproductive health is associated with declining maternal mortality. As 2015 approaches, these results suggest that the international community would do

well to continue to invest its development assistance resources in ongoing efforts to counter maternal mortality wherever it remains a significant threat to women's lives.

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Table 1. Sample Descriptive Statistics, 106 Countries, 1996-2010

Variable	N (Country years)	Mean	Standard Deviation	Min	Max
Maternal Mortality Ratio	798	330.8	371.3	8.9	2592.5
Births attended by skilled health personnel, percentage	798	67.7	27.9	8	100
Adolescent fertility rate (births per 1,000 women ages 15-19)	798	81.8	49.3	3.36	221
Population using modern method of birth control (percent)	798	33.3	21.4	1.2	86.2
School enrollment, secondary, female (% gross)	798	54.4	31.8	3.6	116
GDP per capita, constant 2010 $	798	2650.1	5387.4	128.3	35316.3
Population (millions)	798	47.7	168.8	0.4	1303.8
Total aid (millions constant 2011 USD)	798	662.1	904.8	0	10004.1
Aid to reproductive health (millions constant 2011 USD)	798	3.8	11.9	0	191.1
Total aid to Health (millions constant 2011 USD)	798	35.2	62.2	0	606.7
Aid to family planning (millions constant 2011 USD)	798	2.7	7.3	0	90.7
Polity IV Score	798	1.4	6.3	-10	10

TABLE 2. Instrumental Variable Two-Stage Fixed Effects Regression of Maternal Mortality on Total Foreign Aid, 1996-2010

	(1)	(2)	(3)	(4)
Total aid (constant 2011 USD)	-96.55***	-92.38***	-61.81*	-61.73*
Lagged Maternal Mortality Ratio	0.45***	0.45***	0.44***	0.44***
Births attended by skilled health personnel, percentage		-0.47	-0.26	-0.01
Adolescent fertility rate (births per 1,000 women ages 15-19)			1.02*	0.81
Population using any modern method of birth control (percent)			-0.43	0.08
School enrollment, secondary, female (% gross)				-1.15
Constant	650.46***	659.78***	410.84*	457.61**
Observations	798	798	798	798
Countries	106	106	106	106
R-Squared	0.17	0.23	0.60	0.65

* p<0.05, ** p<0.01, *** p<0.001

TABLE 3. Instrumental Variable Two-Stage Fixed Effects Regression of Maternal Mortality on Total Health-Related Foreign Aid, 1996-2010

	(1)	(2)	(3)	(4)
Total aid to Health (constant 2011 USD)	-94.55***	-89.29***	-43.80	-49.47
Lagged Maternal Mortality Ratio	0.41***	0.41***	0.43***	0.42***
Births attended by skilled health personnel, percentage		-0.51	-0.10	0.11
Adolescent fertility rate (births per 1,000 women ages 15-19)			1.33**	1.14*
Population using any modern method of birth control (percent)			-1.42	-0.72
School enrollment, secondary, female (% gross)				-0.98
Constant	374.35***	395.07***	186.27*	234.78**
Observations	798	798	798	798
Countries	106	106	106	106
R-Squared	0.27	0.37	0.82	0.82

* p<0.05, ** p<0.01, *** p<0.001

TABLE 4. Instrumental Variable Two-Stage Fixed Effects Regression of Maternal Mortality on Reproductive Health-Focused Foreign Aid, 1996-2010

	(1)	(2)	(3)	(4)
Aid to reproductive health (constant 2011 USD)	-89.68***	-90.13***	-84.14***	-98.90***
Lagged Maternal Mortality Ratio	0.36***	0.36***	0.36***	0.35***
Births attended by skilled health personnel, percentage		0.05	0.23	-0.27
Adolescent fertility rate (births per 1,000 women ages 15-19)			0.25	0.54
Population using any modern method of birth control (percent)			-0.77	-1.45
School enrollment, secondary, female (% gross)				2.54*
Constant	226.98***	223.89***	211.58*	122.77
Observations	798	798	798	798
Countries	106	106	106	106
R-Squared	0.59	0.58	0.66	0.35

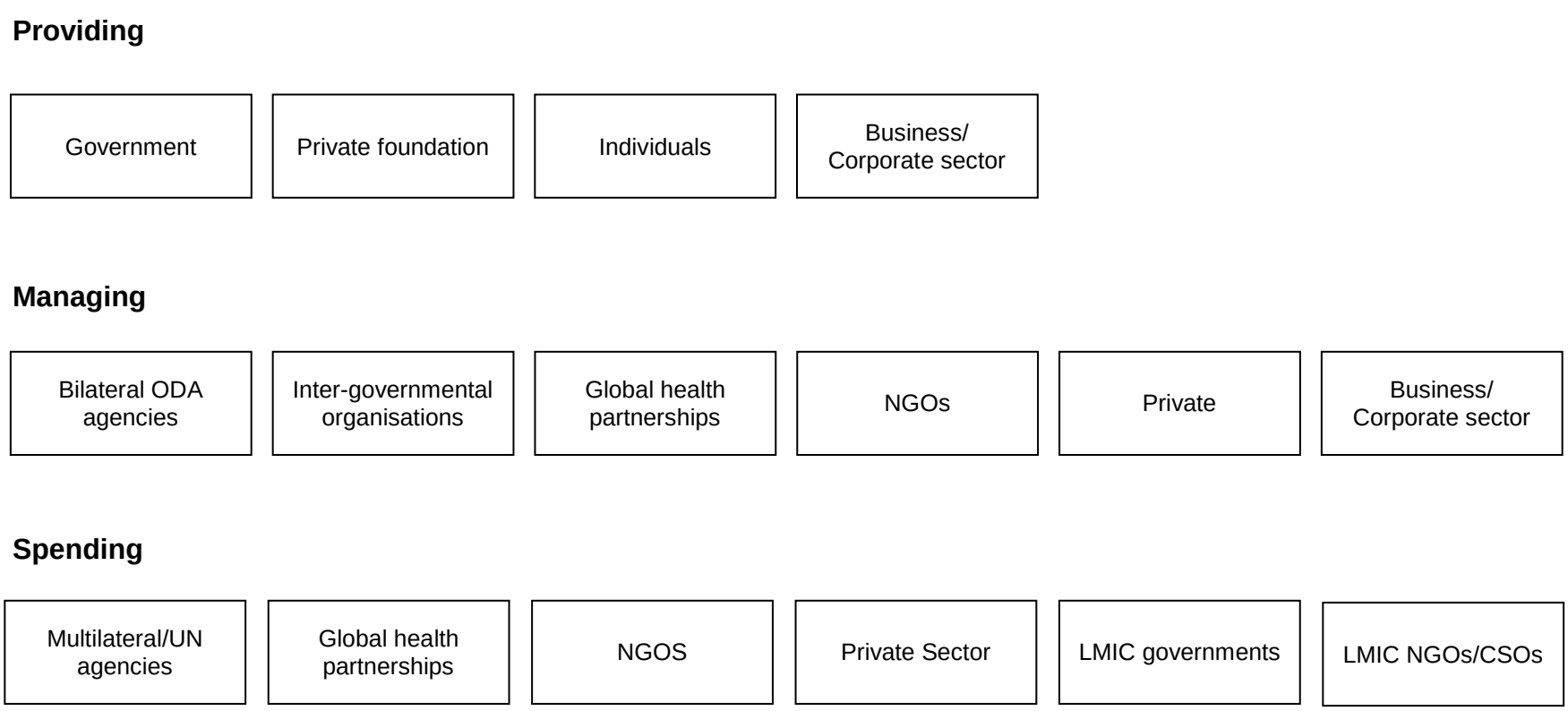
* p<0.05, ** p<0.01, *** p<0.001

TABLE 5. Instrumental Variable Two-Stage Fixed Effects Regression of Maternal Mortality on Family Planning-Focused Foreign Aid, 1996-2010

	(1)	(2)	(3)	(4)
Aid to family planning (constant 2011 USD)	47.21***	44.51***	29.01**	24.59*
Lagged Maternal Mortality Ratio	0.44***	0.44***	0.43***	0.44***
Births attended by skilled health personnel, percentage		-0.79	-0.09	-0.10
Adolescent fertility rate (births per 1,000 women ages 15-19)			1.06*	1.12*
Population using any modern method of birth control (percent)			-2.15*	-2.36*
School enrollment, secondary, female (% gross)				0.04
Constant	96.27***	152.32***	102.38	103.84
Observations	798	798	798	798
Countries	106	106	106	106
R-Squared	0.83	0.84	0.87	0.88

* p<0.05, ** p<0.01, *** p<0.001

Figure 1. Schematic representation of global funding landscape



Source: McCoy, Chand and Sridhar (2009)

Figure 2. Relationship of Sample Country GDP per Capita and Maternal Mortality, 2010

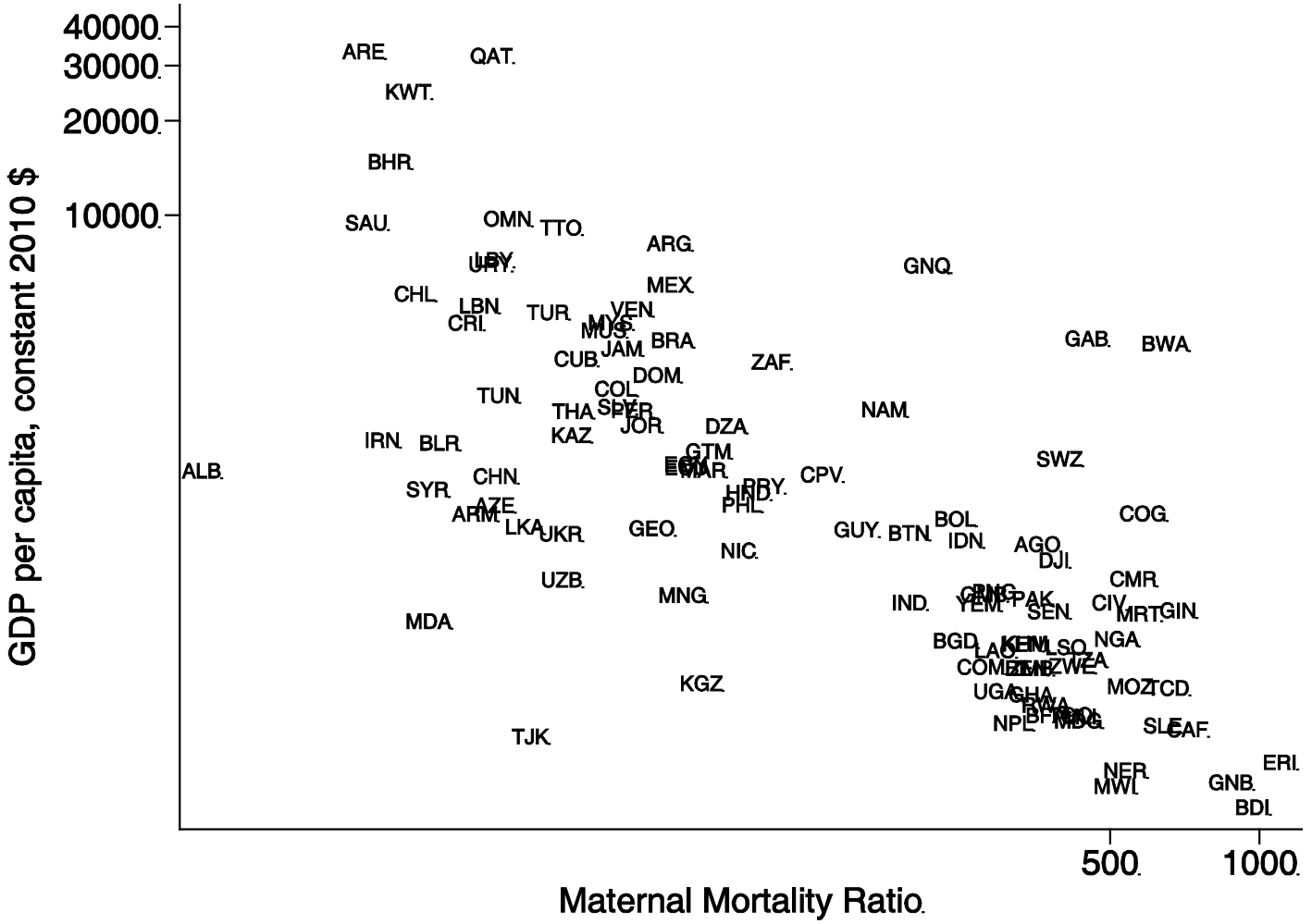


Figure 3. Mean Maternal Mortality Ratio by Region, 1995-2010

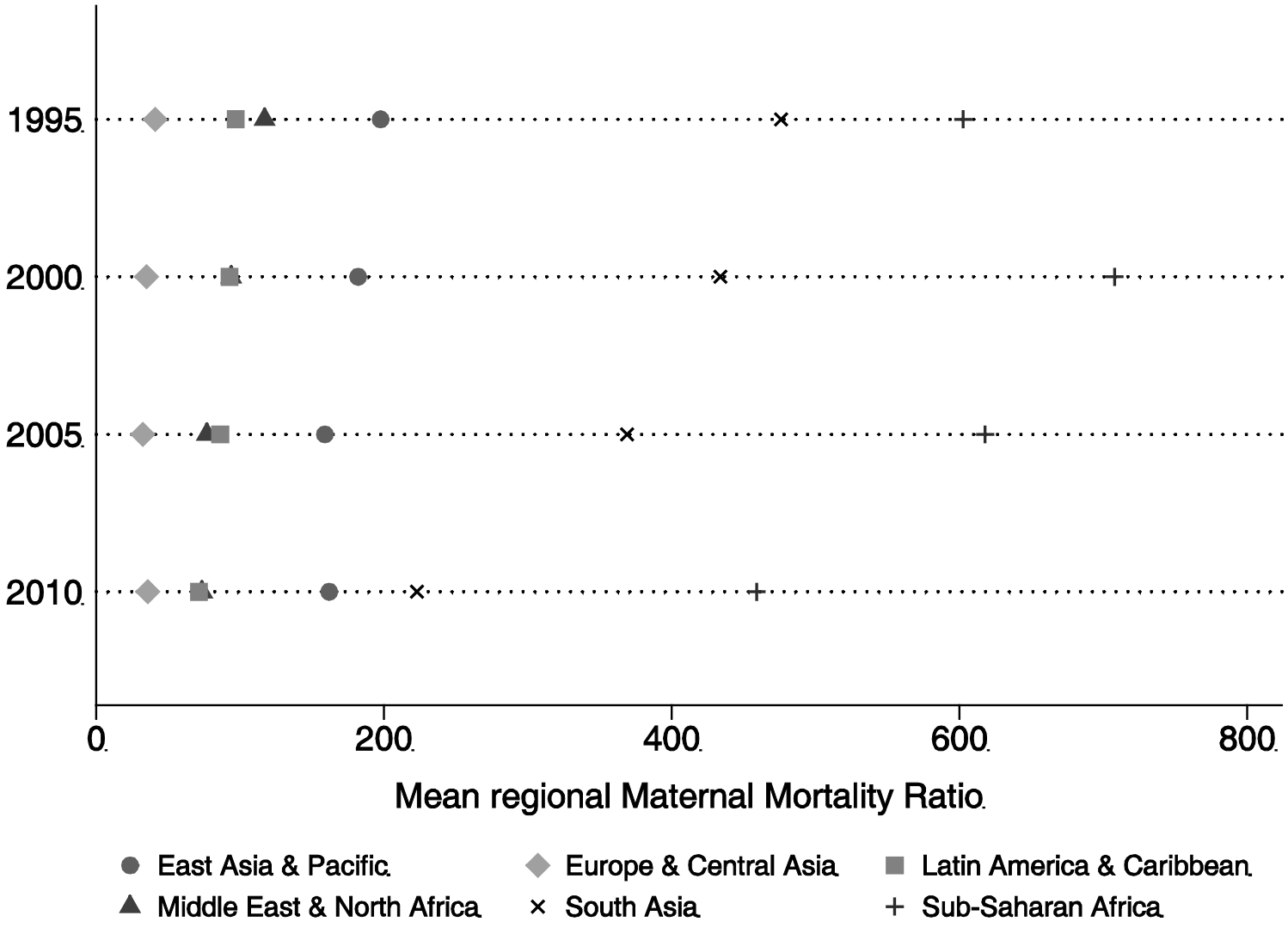


Figure 4. Marginal Effects of Logged Aid on Maternal Mortality with 95% Confidence Intervals (Model 4 from Tables 2-5)

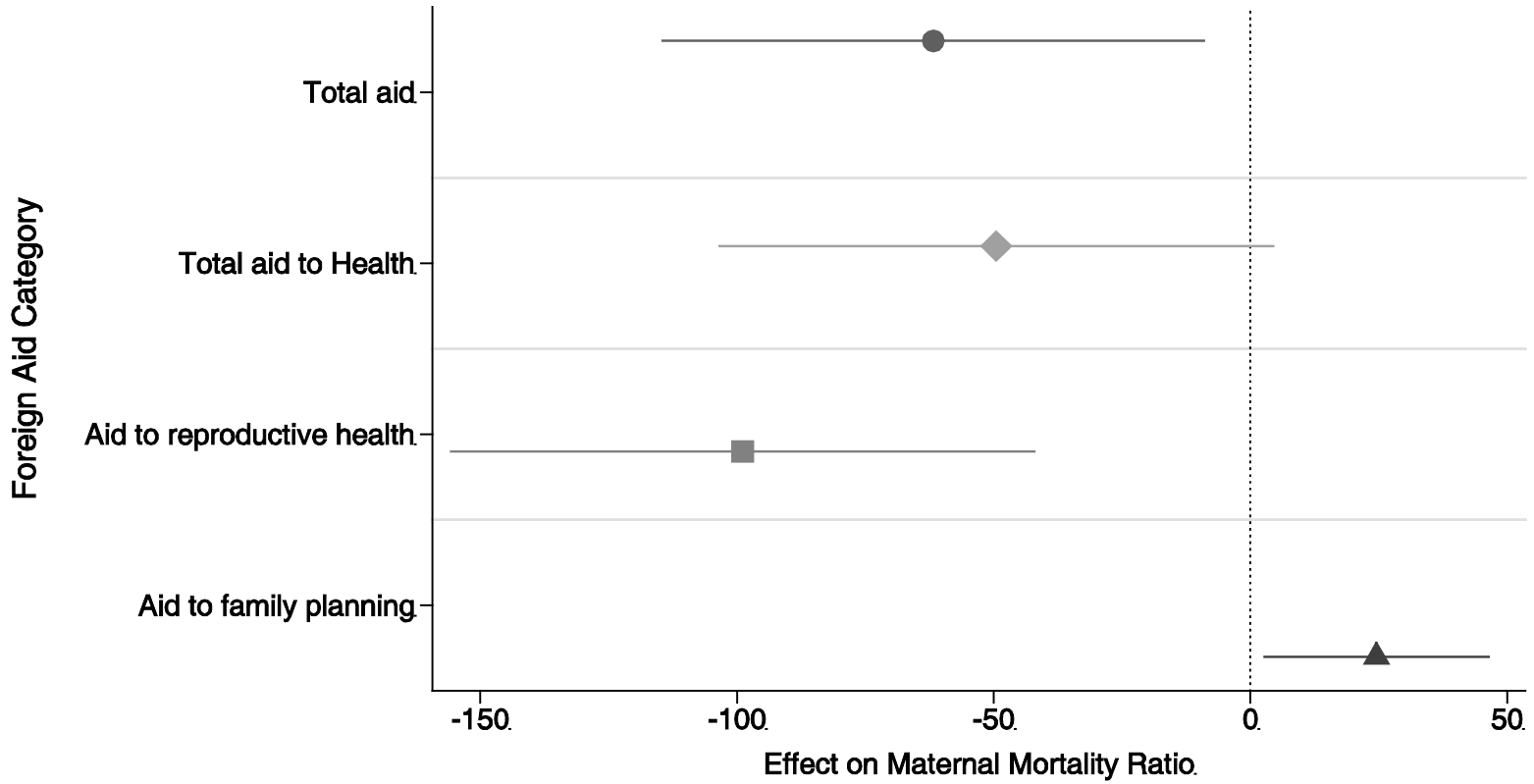


Figure 5. Scatterplot of Family Planning vs. Reproductive Health-related Aid, 1995-2010