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Roberto Burguet is Research Professor at the Institute for Economic Analysis (CSIC), BGSE. Marcelo Soto is Researcher at the Institute for Economic Analysis (CSIC), BGSE

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Asian Development Bank
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ABSTRACT

The Millennium Declaration (2000) set as one of its targets a substantial reduction in child mortality. This paper studies whether the massive increase in development aid can account for part of the reduction in child mortality observed in developing countries since 2000. To do so, we analyze a panel of more than 130 developing countries over the 2000–2008 periods. We use the time trend evolution of aid to identify an exogenous source of variation. Total aid has had no statistically significant effect on child mortality. However, a disaggregate analysis identifies certain sectors of aid that have had a significant impact. The effects have been larger in high mortality countries, including Sub-Saharan Africa. Projections based on our estimates strongly support the concern that most countries in that region will miss the Millennium Development Goals target on child mortality.

Keywords: ODA, child mortality, aid effectiveness

JEL Classification: O11, O15, I15

I. INTRODUCTION

In September 2000, 147 heads of state or government gathered at the Millennium Summit to ratify the UN Millennium Declaration, which defined eight Millennium Development Goals (MDGs) to be attained by the year 2015. The fourth of this MDGs was to reduce child mortality by two-thirds with respect to its level in 1990. One, although not the only, instrument to pursue these goals was to be a drastic increase in development aid from rich to developing countries.

Development aid has indeed increased since then, and child mortality is now lower than it was in 1990. However, it is generally assessed that the target of this MDG, like that of other MDGs, is out of reach for many countries. The main concern is Sub-Saharan Africa, where the projection of current trends indicates that most countries will miss the goal by a wide margin. Where there is no consensus is in explaining what is to be blamed for the likely failure or what should be amended to avoid it. Cited suspects are the inadequate amount of aid, incorrect targeting, fungibility, fragmentation, governance, etc. New estimates have been offered on how much additional aid would be needed to attain the goal, based on the cost of proven effective interventions. For instance, the Millennium Project estimates that a doubling or tripling of aid from its 2003 levels would be sufficient to achieve the goals (Millennium Project 2005; see Clemens et al., 2007 for a review of other estimates), a target for aid that has almost been attained by the year 2008. Others have cast doubts on how close these estimates are to what it really takes to make the interventions happen and reach the needy (see Clemens et al. 2007). Behind the discussions around these issues, what seems to be common is a strong feeling that more attention should be given to increasing aid effectiveness (Paris Declaration).

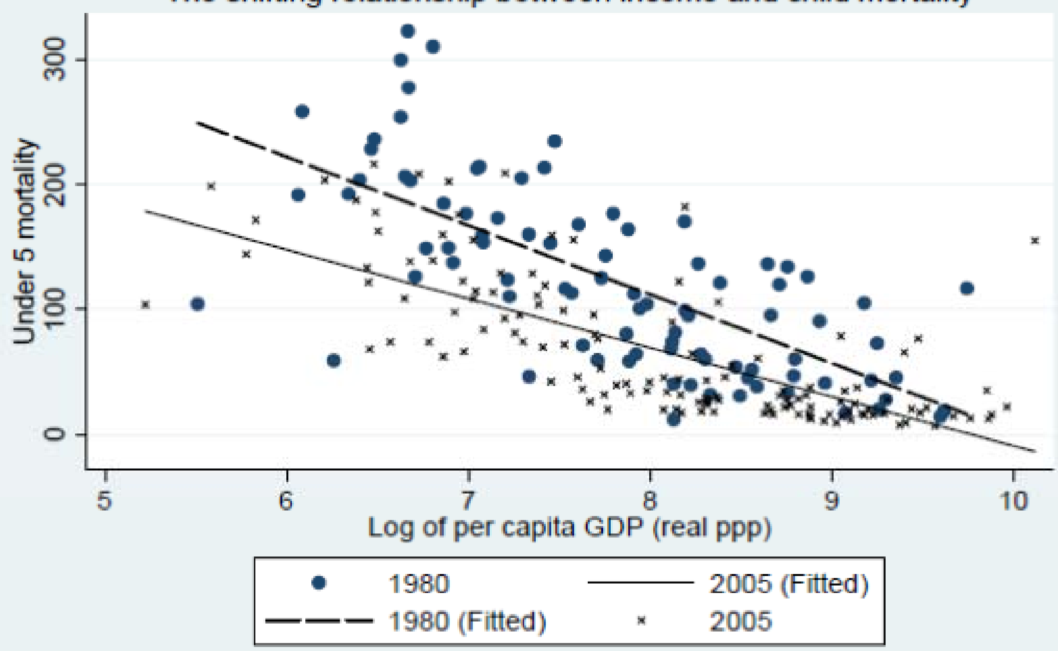
In this paper, we look at what has happened since the Summit in order to answer two related but simple questions: Has aid played any part in the observed reduction of child mortality? If so, what type of aid has been effective to this end, and how large has the impact been?

We believe that the first question begs to be answered. After all, if we know anything about child mortality (or the closely related issue of life expectancy), then that is how difficult it is to determine what matters for its evolution. Although the strong correlation across countries between per capita income and child mortality or life expectancy is apparent and has been noted for decades, it has also been noted, at least since the influential article by Preston (1975), that this correlation is misleading. Indeed, Preston showed that the curve mapping life expectancy to per capita income had shifted considerably from 1930 to 1960, suggesting that things unrelated to income had a major impact on the reduction of mortality in this period. The shift has continued in more recent times with a major setback in Sub-Saharan Africa (see Soares 2007). This has also occurred in the mapping of child mortality to per capita income (see Figure 1).[1] This latter shift has been even more pronounced in recent times and for low income levels, since life expectancy gains in these countries are proportionally more related to early childhood survival. In addition, cross-country regressions typically show no significant relationship between changes in income and changes in life expectancy (see Cutler et al. 2006, for a recent survey). More importantly, moving from cross-section analysis to panel data, the relationship between income and child mortality or life expectancy is even more problematic. Indeed, the correlation between annual growth in real gross domestic product (GDP) and

1 We have ignored in the plot two outliers with per capita income above $25,000 in 1980 (PPP, 2005 dollars): United Arab Emirates and Saudi Arabia. Their inclusion would only strengthen the shift, but would unduly give weight to less important parts of the fitted line.

change to the under-5 mortality rate for developing countries in the 1973–2008 period was negative but below 10% in absolute terms.[2]

Figure 1
The shifting relationship between income and child mortality



Source: Authors' estimates.

But if increases in income per capita are not clearly related to reductions in child mortality, we may suspect that increases in aid may suffer from the same lack of impact. After all, arguably, what aid mainly does is to provide a country with resources that it lacks due to the low income of its citizens or scarce government revenue to be able to hopefully undertake whatever policies the aid is intended for (aid is something that flows from rich to less wealthy countries). Therefore, we cannot take it for granted that aid has a significant impact.

Our first finding in this paper is that some official aid has indeed played a role in reducing child mortality, at least in countries that had high mortality at the beginning of the sample period, as most of Sub-Saharan Africa did. This is certainly good news. In particular, it at least provides hope that something can be done to achieve MDG–4. We find that aid has not only had an effect but also identify what type of aid has caused that effect. Not surprisingly, three sectors closely associated to health are the aid sectors that have this significant effect on child mortality. Our analysis uses a recently available data from the Organisation for Economic Co-operation and Development (OECD) that specifies donor, recipient, and type of official development assistance (ODA) actually disbursed in each year from 2000 to 2008. We refer to ODA simply as aid. We estimate the simplest fixed effect (recipient) model of under-5 mortality as a function

[2] The correlation is still lower if we consider only the 2000–2008 period or if we compute the correlation between under-5 mortality and lagged GDP growth.

of aid (and other covariates). We instrument aid using a novel yet simple instrument. By construction, the instrument is uncorrelated with time-specific mortality shocks. However, the exogeneity of the instrument requires the long term trend of aid to not be spuriously correlated with the long term mortality trend in each country. This correlation does not seem to exist, when we consider out-of-the-sample trends in mortality. More formally, we rely on standard overidentifying restriction tests to check the validity of the hypothesis. In Section III we discuss the identification strategy in detail. The results of this model suggest that aid has a larger impact in countries with higher initial mortality. When the mortality rate is low, aid has a much less significant effect in further reducing it.

Some recent studies have also found that aid has played some role in the observed reduction in child and infant (under-1) mortality rates. Among these, Chauvet, Gubert, and Mesplé-Somps (2009) and Mishra and Newhouse (2009) are the closest to our paper. Both find a significant but small effect of aid. In Section IV, we discuss how our results compare to theirs and also important differences in our identification strategy.

Having established that aid has had an effect on child mortality and identified the sectors that matter, we would like to explore what this exercise can tell us about the prospects for MDG–4. We do this in Section V. We assume that the level of aid remains constant at its level in the last year of the sample, 2008. Given this assumption, we then compute our best prediction of under-5 mortality in the target year 2015, for high mortality countries, including all countries in Sub-Saharan Africa.

Admittedly, these are rough estimates. We do not see them as solid arguments in the transformational versus marginal views (as Easterly, 2009, puts it) on aid. Projecting into the future what can be considered a first order approximation to local effects is an exercise subject to uncertainties that are difficult to assess. We claim, however, that the exercises can be used as starting points in a discussion of the role of aid, or the need to improve its efficiency, in reaching MDG–4.

In any case, the exercises seem to support the worst fears with respect to the African continent and some other high mortality countries. Most countries south of the Sahara would miss the target by a considerable margin, given the current trend of affairs. Using the estimated parameters in our model we can obtain an (even rougher) estimate of the aid needs, if aid was to be the tool to reach the MDG–4. The exercise shows that scaling up aid to levels that can be expected to be agreed upon would not be sufficient.

That said, the good news is that aid, if not enough to achieve MDG–4, and inefficiently as it may be currently used, does still have an impact in reducing child mortality precisely where this problem is most acute. Between 1.85% and 4.5% of children that can be expected to be born in 2015 and die by the age of 5 in the absence of any aid will survive beyond that age if aid stays at the 2008 level.

The outline of the paper as follows. Section II presents the main data used in the empirical analysis. Section III discusses the econometric model and the instruments used for identification. The main results and robustness checks are reported in Section IV. Section V discusses the implication of our results for the prospects of MDG–4. Section VI concludes.

II. DATA DESCRIPTION

The empirical analysis focuses on the 2000–2008 period. Two reasons explain this choice. First, as mentioned in the introduction, it was in the year 2000 that the Millennium Declaration took place, and therefore it was the year in which a new global initiative was launched to bring child mortality to a specific target. This initiative led to a massive increase in aid flows to developing countries. Not only has the overall amount of aid—measured by total disbursements—quadrupled over the period but also each donor is individually contributing to a larger number of countries. This massive aid effort, whose effects are largely unknown, deserves study in itself.

The second reason to focus on this period is that the information on aid disbursements before the year 2000 is of low quality. According to the OECD—our data source for aid series as discussed below—the coverage ratio for data on disbursements, a measure of the comprehensiveness of the data was around 90% after 2002. As a matter of fact, the OECD recommends using data on aid commitments rather than disbursements before that year. We have decided to stick to disbursement data because, as is well known, aid commitments do not necessarily lead to actual disbursements. In any case, the results presented below are robust to changes in the sample to the 2002–2008 period.

A. Data on Aid

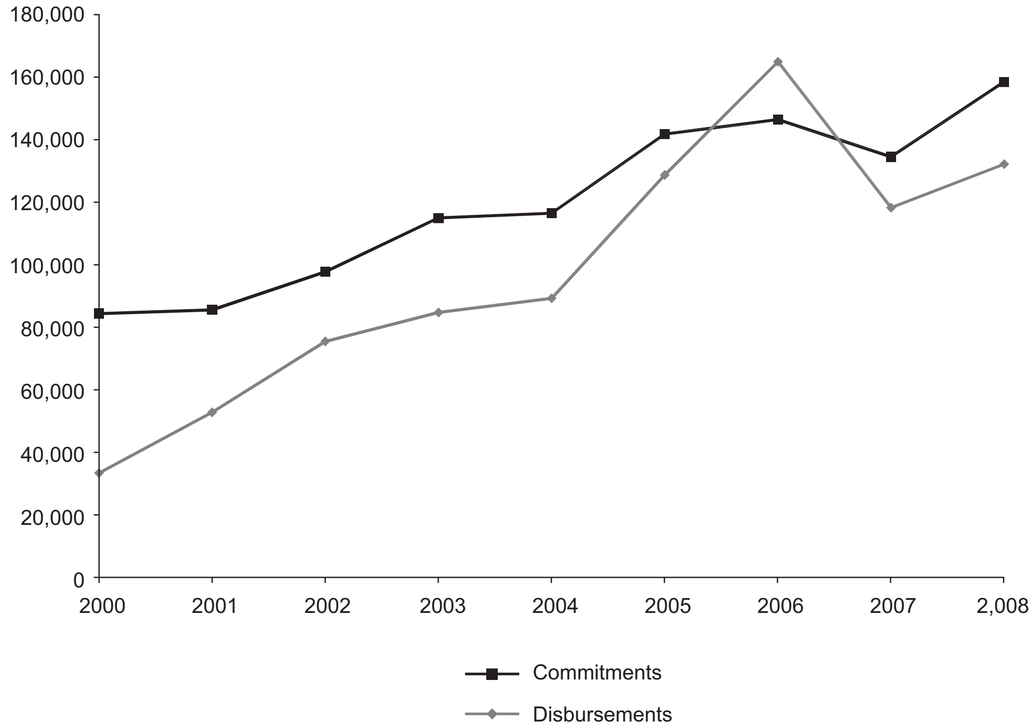
Aid data is from the OECD's Creditor Reporting System. It consists of total official disbursements in each recipient country on a yearly basis. It includes bilateral aid from the OECD's Development Assistant Committee (DAC) member countries, the European Commission, and other international organizations (namely the World Bank and regional development banks). The OECD collects its data directly from DAC members' aid agencies and from multilateral organizations. The aid data used in this paper is in 2008 US dollars. Note that aid from countries that are not part of the DAC,[3] and private aid[4] are not included in the analysis because of lack of information.

Figure 2 shows the evolution of total aid during the sample period. Commitments and disbursements have both increased steadily in these years. Disbursements are systematically lower than commitments except for year 2006 when disbursements amounted to more than $164 billion. After a fall in 2007, aid flows increased again in 2008 in spite of the global economic crisis.

[3] Other donors include non-DAC OECD countries (such as Mexico and Turkey), new non-OECD EU members, Arab donors, and, importantly, the People's Republic of China and India. Although data from these countries is not always directly comparable with DAC data, some estimates put their contribution at roughly 8% of the DAC aid. (See Zimmermann and Smith 2011).

[4] Aid from public agencies and multilateral organizations that is channeled through NGO's is counted as DAC aid. So, aid through UN programs like GAVI or GFATM is included, but aid from private funds like the Bill and Melinda Gates Foundation is not.

Figure 2: Official Development Assistance
(constant 2008 dollars)



Source: Authors' estimates.

The OECD classifies aid according to the sector of the economy that the project is designed to assist. Examples of sectors are "Basic education," "Conflict prevention and resolution," "Water supply and sanitation," etc. Table 1 presents the main sectors according to total disbursements in 2008. (Appendix Table A contains the full list of the 37 sectors.) In 2008 "Government and Civil Society, general," which covers a broad range of public sector management activities, and "Action relating to debt" accounted for the largest disbursements with a combined figure of about $24 billion or 18% of total disbursements. Since we will be dealing in the empirical analysis with aid divided by recipient countries' populations we also report unweighted per capita figures. In 2008, the list of DAC recipients included 151 countries. Among those for which we have data on population the average aid received was $133 per person (column 2). However even leaving aside small, island territories,[5] the amounts received varied widely across recipients. For instance, Cape Verde received over $300 in aid per person in 2008, whereas countries with similar per capita income like Pakistan and Nigeria received less than $10 per person. Also, there was wide variation across sectors over the sample period: the "Construction" sector amounts on average to only $0.02 per person and "Action relating to debt" accounts for more than $10 of average annual per capita aid (column 3). Aid increased in all but three sectors over the 2000–2008 period (see Appendix Table A).

5 For instance, Mayotte, a French overseas department, received over $2,500 per capita, and Palau over $2,000.

Table 1. Main Aid Sectors (Disbursements in 2008 dollars)

Sector	Total, 2008 ($ million) (1)	Per capita, 2008 (2)	Per Capita, Average 2000–2008 (3)	Per Capita, Change 2000–2008 (4)
Government and Civil Society General	12,172.3	10.93	7.96	5.53
Action Relating to Debt	11,928.5	13.86	10.18	8.48
Emergency Response	9,498.4	3.35	2.79	0.77
Population Pol./Progr. and Reproductive Health	8,227.7	3.98	1.84	1.59
Transport and Storage	7,588.2	9.73	6.82	1.38
Total Aid (37 sectors)	131,920.0	133.65	97.23	53.85

Per capita figures are simple averages across aid recipient countries.

Source: Authors' estimates.

B. Data on Child Mortality and Other Data

Mortality data is from the Inter-agency Group for Child Mortality Estimation (IGME). This group was created in 2004 to monitor progress towards the achievement of the Millennium Development Goal on child mortality reduction. The IGME has recently published child mortality estimates on a yearly basis for most countries in the world. The main data sources are sample surveys and civil registration, whenever available. The IGME compiles available national-level data from these various sources and applies statistical methods to produce comparable data across countries on child mortality. A full description of their methodology and the mortality database is discussed in IGME (2010). Table 2 presents summary statistics on child morality during the sample period.

Table 2: Under-5 Mortality Rate
(per 1000 children born alive)

Year	Countries	Mean (Unweighted)	Std. Dev.	Min.	Max.
2000	129	77.1	61.8	5.3	250.3
2001	129	74.9	60.7	5.2	243.0
2002	129	72.8	59.5	5.1	236.0
2003	126	72.2	58.3	7.4	229.2
2004	125	70.5	57.3	7.2	222.6
2005	124	68.8	56.4	6.8	216.2
2006	128	65.1	55.3	6.4	209.9
2007	127	62.9	54.4	6.0	209.0
2008	125	61.6	53.6	5.7	209.0

Source: Authors' estimates.

The estimates presented include a number of other variables that may be relevant determinants of child mortality. The values for these variables are taken from the World Bank's World Development Indicators. Measures of conflict are taken from Banks (2009).

Appendix Table B reports summary statistics for each country in the sample.

III. ECONOMETRIC SPECIFICATION

The econometric model aims to estimate the effect of foreign aid given to a country on child mortality in that country. The following equation for the mortality rate m_{it} in recipient country i during year t is estimated:

$$m_{it} = \mu_i + \mu_t + \delta\left(\frac{A_{it-1}}{N_{it-1}}\right) + \sum_k \beta_k X_{kit-1} + e_{it} \qquad (1)$$

where A_{it} and N_{it} are respectively total aid and total population in country i and year t (t = 2000, ..., 2008), X_{kit-1} (k = 1, ..., K) represents other K possible determinants of mortality, μ_i and μ_t are country and year specific effects, and e_{it} is a mortality shock. Initially the only parameter that is allowed to vary across countries is the intercept μ_i. The term μ_t captures common time trends in mortality across countries. A common technological shock that entails a worldwide change in mortality would be captured by this term.

This specification implies that aid potentially has two effects on mortality. An increase in per capita aid in year $t-1$ may directly affect mortality in year t. But an increase in aid may also potentially affect some of the X variables and thus have an indirect effect on mortality. For example, if one of the regressors in X is domestic conflict and one particular type of aid helps to reduce conflict, then this type of aid would have an indirect effect on mortality even if it does not have any direct impact. The rationale for considering the direct channel is that aid may affect the proximate determinants of mortality through mechanisms not accounted for by X. The main goal of this paper is to estimate this direct effect.

As stressed by Deaton (2010) the most obvious problem with regressions that seek to assess aid effectiveness is the simultaneous feedback from the dependent variable to aid. For example, if a positive mortality shock in year $t-1$ attracts more aid during that year then δ_{OLS} coefficients would be positively biased. This result would play against the finding that aid reduces mortality. Also, note that the insertion of lagged aid (as opposed to contemporaneous aid) does not solve the simultaneity problem because the shock e_{it} is likely to be serially correlated. Therefore in order to estimate the effects of aid on mortality, we need to identify an exogenous variation in aid, i.e., a variation that is not correlated with the shocks of equation (1).

We use two different instruments to capture exogenous variations in aid. The first instrument corresponds to the predicted values of per capita aid from a regression of aid on a country-specific time trend. Fitted values are (not surprisingly) strongly correlated with aid itself and thus they fulfill the identification condition.[6] As for the exogeneity condition, if e_{it} is independent from time, then the instrument is exogenous by construction. But the probability distribution of e_{it} may be time dependent. For instance assume that mortality trends are country specific as follows:

$$m_{it} = \mu_i + \mu_t + \pi_i t + \delta\left(\frac{A_{it-1}}{N_{it-1}}\right) + \sum_k \beta_k X_{kit-1} + u_{it} \qquad (2)$$

[6] This is confirmed by the high first-stage F-statistics.

where, π_i is a random country-specific trend slope with $E(\pi_i) = 0$ and u_{it} is a white noise. In this case, the shock in equation (1) would be given by

$$e_{it} = \pi_i t + u_{it} \tag{3}$$

Defining the instrument $z_{it} = c_{Oi} + c_{1i}t$ and denoting expected values with bars, the exogeneity condition is $E(z_{it-1} - \bar{z}_{it-1})(e_{it} - \bar{e}_{it}) = 0$. This implies that the second condition for obtaining a consistent estimate of δ is equivalent to $E(c_{1i}\pi_i) = 0$.[7] Therefore in order for z_{it} to be a valid instrument, the slopes defining the country specific trends of aid and of mortality shocks must be uncorrelated. We explore whether the exogeneity condition is met in different ways. First, note that if $E(c_{1i}\pi_i) \neq 0$ holds true, then a regression of out-of-sample mortality on z_{it} should yield significant coefficients. We have regressed m_{it-9} on z_{it} (in addition to time and country-specific effects) over the period t = *2000, ..., 2008*, and the coefficients were not significant. That is, there is no significant correlation between the trend of mortality in the 1991–1999 period and the aid trend in the 2000–2008 period.

In order to formally evaluate the exogeneity condition, we also carry out overidentification restriction tests, which require a second instrument. The aid effectiveness literature has often used total population as an instrument for aid.[8] The rationale for this is that countries with larger populations receive less per capita aid on average (Easterly 2009). Here we opt to use total GDP as an instrument rather than population in order to dissipate concerns about a potential correlation between population size and mortality shocks. As we show later, total GDP is significantly (and negatively) correlated with per capita aid flows which confirm a negative size effect. Note that equation (1) includes country fixed effects, so identification does not come from a correlation of aid with a country's average GDP but with a country's GDP deviations from its average.

The exogeneity condition for total GDP is likely to be satisfied as well. First, cross-country evidence shows that there is no correlation between per capita GDP growth and changes in life expectancy over 10, 20, or 40-year periods between 1960 and 2000 in developing countries (Cutler, Deaton, and Lleras-Muney 2006). This is indicative of the absence of an obvious link between GDP changes and mortality changes. Second, we show that when aid is included in the regressions, total GDP is not correlated with mortality. We interpret this finding as evidence consistent with the validity of the exclusion restriction.

As mentioned before we use total GDP mainly as a second instrument to test the exogeneity of the aid trend instrument.

The use of a country-specific time trend as an instrument offers the advantage to allowing the computation of a specific instrument for each aid sector. This greatly improves identification of the aid variables. Indeed, identification depends on the surge in aid during the sample period, and the variability that this increasing trend presented across recipients and sectors. The use of this instrument also marks an important difference with respect to other approaches followed in the literature. Mishra and Newhouse (2009) implement the system GMM estimator (Blundell and Bond 1998). This estimator is only valid if the residuals of the main

7 Note that the condition $E(c1i\pi i) = 0$ is not required for the consistency of δ. But if this condition is not verified, the estimate of the country specific effect μi is not consistent.

8 Some well known examples are Boone (1996), Burnside and Dollar (2000), Hansen and Tarp (2001), and Clemens, Radelet, and Bhavnani (2004).

equation are not autocorrelated. This condition does not seem to hold. Similarly, Chauvet, Gubert, and Mesplé-Somps (2009) use lagged aid as an instrument, which has the same shortcomings. If mortality shocks attract more aid and the shocks are autocorrelated, this instrumentation technique introduces a positive bias to the estimates. As we will discuss later, such bias is consistent with the fact that we find stronger effects from aid.

Another advantage of this instrument is that it allows us to capture the effects that aid received in more than one period in the past might have on current mortality. Indeed, as we show in the appendix, the 2SLS estimate of δ in equation (1) is the sum of all lagged aid coefficients that affect current mortality. For instance, if the "true" model implies two lags of aid, the estimated coefficient is the sum of the two lagged aid coefficients. Therefore, we do not need to be particularly concerned with the right number of lags of aid that we should include in the regressions. We now turn to the main results.

IV. EMPIRICAL RESULTS

A. Main Findings

The sample is an unbalanced panel of 132 recipient countries for which we have data on population and GDP[9] over the 2000–2008 period with a minimum of three and a maximum of nine observations per country. The sample contains more than 1,100 observations. Table 3 reports estimates of equation (1) where initially the aid variable is the sum of all 37 sectors and when no additional controls are included (all regressions include time and country specific intercepts). Column 1 presents the first stage results where aid is regressed on a country-specific time trend and lagged GDP.[10]

[9] We also drop five small islands (St. Kitts-Nevis, St.Vincent and Grenadines, the Marshall Islands, the Federated States of Micronesia, and Palau). They are clearly not representative in terms of the aid received. A full list of the countries in the sample is presented in Appendix Table B.

[10] In this and all following regressions, standard errors are obtained by clustering residuals by recipient country.

Table 3: The Effects of Total Aid on Child Mortality
(Under- 5 mortality rate)

Dependent Variable

Variables	Per Capita Aid 0LS (1)	Child Mortality 0LS (2)	Child Mortality 2SLS (3)	Child Mortality 2SLS (4)
Trend aid	1.044*** (0.0700)			
Total GDP	1.73e 05***			1.73e 06
Lagged per capita aid	(5.14e 06)	0.00183	0.0190	(4.75e 06)
				0.0185
		(0.00581)	(0.0329)	(0.0335)
0bservations	1,142	1,142	1,142	1,142
R squared	0.369	0.540		
Number of countries	132	132	132	132
F test for instruments in first stage regression			177.0	219.0
Hansen i test p value			0.697	

Notes:

Robust standard errors in parentheses. Instruments for lagged per capita aid are trend aid and total GDP (column 3) and trend aid only (column 4). See Section III for a detailed explanation of the instruments and estimation strategy.

*** p<0.01, ** p<0.05, * p<0.1.

Time and country effects included in all regressions.

Source: Authors' estimates.

The two variables are significant at a 1% level which confirms that both instruments are highly correlated with aid. The OLS estimate of equation (1) (column 2) yields a negative but insignificant coefficient for aid. The 2SLS estimation (column 3) results in a coefficient nearly ten times larger but it is not significant either, since the standard errors of the coefficients also increase considerably in the IV estimation. These results suggest that the lack of significance of aid is not due to a positive bias in the estimated coefficients. Note that the overidentification restriction test does not reject the exogeneity of the instruments. Finally, when total GDP is included as a regressor rather than as an instrument for aid it does not enter significantly. As discussed, we interpret this result as an indication that total GDP satisfies the exclusion restriction. If GDP is not correlated with the disturbances, then the overidentification restriction test is a valid test for exogeneity of the trend instrument.

The fact that the overall aid that a country receives has no significant effect on mortality does not mean that all aid sectors are irrelevant for mortality. Aggregation may mask significant effects that some particular sectors may have. After all, total aid includes sectors as diverse as "Fishing," "Banking and financial services," and "Administrative costs of donors." It is hard to imagine that aid assigned to such sectors might have an effect on child mortality and that may explain why total aid does not have a statistically significant impact on mortality.

We explore this by analyzing the effects of each of the 37 aid sectors individually. To do so, we first identify and drop outliers following the procedure proposed by Billor, Hadi, and Velleman (2000).[11] Then we run a routine to estimate equation (1) 37 times, where each regression is estimated using a different aid sector. Each regression is run with the instrument

[11] According to Hadi and co-authors, this is an improvement on the original Hadi (1994) procedure because it is computationally less demanding although it provides similar results.

that is specific to the corresponding aid sector as described earlier. Proceeding in this way we identify four sectors that are highly significant (at a 1% level).[12]

One of these sectors ("Administrative costs of donors") has a positive coefficient but the Hansen test rejects the hypothesis that the trend of this aid variable is exogenous, so we disregard this sector.

The other three sectors with highly significant coefficients are directly or indirectly related to health. The first one is "Basic health" which comprises basic health care (e.g., paramedical and nursing programs, supply of drugs, etc.), health infrastructure, nutrition (in particular, maternal, child, and school feeding), infectious disease control (including malaria and tuber culosis but excluding HIV/AIDS), education of population to improve health practices, and training of health personnel for basic health care services. The second sector is "Population policies/programs and reproductive health" which also includes aid for health-related activities. In particular, it includes aid for prenatal and postnatal care, family planning, delivery of contraceptives, and all activities related to sexually transmitted diseases (STD) and HIV/AIDS, like education, testing, prevention, and treatment. In addition to these items, this sector involves activities that are not directly related to health interventions, such as aid for census work and demographic research and analysis. The third sector is "Food aid and food security programs" which refers to the supply of edible food or cash payments for food supplies (it excludes emergency food aid). This sort of aid may potentially also has a direct effect on health.

One sector that should be noted because of its lack of significance in equation (1) is "General health," which includes, among others, medical education and training, medical research, equipment, and aid to health ministries. Similarly, there is no evidence that aid for education at any level (basic, secondary, or post-secondary) has contributed to any reduction in child mortality.

The results obtained by OLS and IV estimation for the three sectors that obtain significant coefficients (in the IV regressions) are reported in Table 4.[13] According to the point estimates obtained in 2SLS (columns 1–4), a one dollar increase (in 2008 prices) in per capita aid in basic health would reduce the under-5 mortality rate by about 1.9 per thousand children born alive. Food aid displays a somewhat larger coefficient although its standard error is larger as well. Finally, population programs aid—the third sector with a highly significant coefficient—displays a somewhat smaller point estimate. If the three sectors are added and included together as a single variable (column 4), the resulting coefficient is again highly significant although the point estimate is smaller than the one obtained for "Basic health" and "Food aid." The F-statistics suggest that the instruments used in each regression satisfy the identification condition. Also, in all cases results from Hansen tests do not reject the exogeneity of the instruments. Note that relative to OLS coefficients (columns 5–8), the IV estimates always yield larger effects from aid variables. This is consistent with the presence of positive simultaneous feedback from mortality to aid.

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[12] At a 5% level the expected number of false positives of 37 independent draws is almost 2. So, we set the more strict confidence level of 1%.

[13] The number of observations varies across columns because of missing aid observations.

Table 4: Impact of Specific Aid Sectors
Dependent variable: Under-5 Mortality Rate

	2SLS Estimation Aid variable is:				OLS Estimation Aid variable is:			
	Basic Health (1)	**Population Programmes (2)**	**Food aid (3)**	**Health + Population + Food (4)**	**Basic Health (5)**	**Population Programmes (6)**	**Food aid (7)**	**Health + Population + Food (8)**
Lagged per capita aid	1.899***	0.978***	2.858***	0.980***	0.559***	0.664***	0.686***	0.490***
	(0.585)	(0.358)	(0.838)	(0.257)	(0.190)	(0.247)	(0.225)	(0.114)
Observations	1,129	1,101	1,012	1,141	1,129	1,101	1,012	1,141
R squared					0.553	0.577	0.555	0.584
Number of countries	132	132	132	132	132	132	132	132
F test for instruments in first stage regression	43.90	18.82	265.3	30.03				
Hansen i test p value	0.721	0.601	0.965	0.187				

Source: Authors' estimates.

These estimates are larger than the ones available in the existing literature.[14] Apart from the differences in the instruments used for estimation, a number of reasons may explain the discrepancies in the results. Mishra and Newhouse (2009) and Chauvet, Gubert, and Mesplé-Somps (2008) use aid commitments, instead of disbursements, over 5-year periods, and confine their analysis to health aid. The authors use the total of the OECD-defined health sectors as their aid variable, which includes "Basic Health" but excludes "Population programs" and "Food aid." (Disbursements of "Basic health" accounts for over 40% of total health aid since 1973).[15]

B. Robustness Checks

1. Additional Controls

In this section, we address the robustness of the results to changes in some aspects of the estimation approach. In the previous regressions we ignored additional possible determinants of child mortality. If one of our instruments—aid trends or total GDP—correlates with some variable which itself is correlated with mortality shocks then the estimates would be biased. There are several reasons that could lead one to imagine that this sort of simultaneity may be present in the regressions, even though Hansen tests do not reject the null hypothesis that the instruments are uncorrelated with the error term. For instance, it could be the case that donors give more aid to countries with better governance and improved governance may be related to lower mortality. Similarly, the presence of conflict in recipient countries may simultaneously affect donors' aid decisions and mortality. Likewise, it is possible that trade openness is associated with lower mortality as it implies improved access to foreign technologies, which would also imply biased estimates if openness is correlated with total GDP. Similar arguments may be given for the effects of omitting other variables such as per capita income (or its growth), urbanization rates, etc.

In order to verify that the estimated coefficients are not the result of some omitted variable bias, we have explored the consequences of introducing additional controls.[16] The results are presented in Table 5. The focus here is not on why a particular variable is or is not correlated with child mortality but rather on the effect that the insertion of that variable has on the aid coefficient. The variables considered are per capita income, income growth, an index of domestic governance, trade openness, the urbanization rate, and a measure of conflict. The main result of this exercise is that the insertion of additional controls does not significantly affect the coefficients on aid. Indeed, the aid coefficient remains remarkably stable after the introduction of these controls across columns 1–6.

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[14] The results are not always directly comparable. Mishra and Newhouse (2009) and Chauvet, Gubert, and Mesplé-Somps (2008) assume a constant aid-mortality elasticity, while in Table 3 we assume a constant linear relation between the two variables. However, we can locally compare the estimates at any level of aid and mortality and at the sample means the elasticity from our estimates is more than twice as large as in those papers.

[15] Gomanee, Sourafel, and Morrissey (2005) also find an effect of aid on infant mortality using a smaller panel of 38 countries and four 4-year periods. But they actually find correlations between aid and "domestic pro-poor spending", which would have positive consequences on health. The exercise seems to be subject to serious endogeneity problems.

[16] For space considerations we only report regressions for the sum of the three aid sectors that display a significant effect on mortality in Table 4.

Table 5. Effect of Additional Controls
Dependent variable: Under-5 Mortality Rate

Lag of:	(1)	(2)	(3)	(4)	(5)	(6)
Aid (Basic Health + Pop. Programmes + Food)	0.981***	0.959***	0.930***	0.976***	0.932***	0.911***
	(0.253)	(0.256)	(0.240)	(0.267)	(0.249)	(0.246)
Log(Per capita GDP)	0.361	0.713	1.370	1.159	2.049	1.960
	(5.246)	(5.087)	(5.809)	(5.371)	(5.285)	(5.127)
Change of Log(Per capita GDP)		2.319	3.186	3.314	2.981	2.220
		(5.605)	(5.379)	(6.035)	(5.849)	(5.750)
Government Efficiency			0.759	0.582	0.509	0.833
			(2.076)	(2.031)	(1.960)	(1.848)
Log ((Exports+Imports)/GDP)				0.301	0.157	0.344
Urbanization rate				(3.017)	(2.963)	(2.867)
(% of total population)					0.948** (0.443)	1.051** (0.431)
Revolutions						4.407** (2.123)
Observations	1,137	1,131	871	841	841	839
Number of countries	131	131	128	126	126	126
F test for instruments in first stage regression	24.50	24.59	28.00	26.62	23.28	25.15
Hansen i test p value	0.210	0.220	0.293	0.286	0.774	0.969

Notes:

Robust standard errors in parentheses. Instruments for lagged per capita aid are trend aid and total GDP. See Section III for a detailed explanation of the instruments.

*** p<0.01, ** p<0.05, * p<0.1.

Time and country effects included in all regressions.

Source: Authors' estimates.

Regarding the effects of the various controls on child mortality, columns 1 and 2 show that the income level and its growth are both uncorrelated with mortality. (The results do not change if we include the level of income instead of its natural logarithm). This is in line with the results from earlier literature, which do not find per capita income or income growth to be relevant determinants of health improvements in poor countries (Cutler, Deaton, and Lleras-Muney 2006 and Soares 2007). In column 3, we control for "Government Effectiveness" which is a recently published indicator of the quality of public policies by Kaufmann, Kraay, and Mastruzzi (2010). This variable does not enter significantly for the whole sample although as we will see later it is significant for a more restricted group of countries. Likewise, trade openness is uncorrelated with child mortality (column 4).[17] In contrast, the urbanization rate is significant and negatively correlated with child mortality (column 5). This is consistent with earlier evidence in some developing countries (Haines and Avery 1982, Merrick 1985, McGuire and Frankel 2005). According to these authors, residence in urban areas facilitates access to clean water, vaccination programs and medical services. The point estimates indicate that a 1% increase in the urban population rate is associated with a reduction by about 1 per thousand of the child mortality rate. Finally, as an additional control we include a measure of domestic 17 conflict.[18] This variable enters with a positive coefficient and is significant at a 5% level. As stressed

[17] Owen and Wu (2007) find that trade openness is significantly correlated with child mortality, albeit in a sample that includes both developing and developed countries and over the 1960–1995 period. In our sample we do not find any correlation.

[18] The conflict variable refers to the number of revolutions in the past 5 years and is from Banks (2009). We tested other conflict measures provided by Banks (guerrilla fighting, political assassinations, etc.) but none of them was significant.

before, however, the inclusion of these variables does not significantly affect the coefficient on aid.

2. Heterogeneity and Initial Conditions

So far we have constrained aid to having the same (linear) impact across countries. But aid effectiveness is not likely to be homogeneous in our sample. Countries may experience different causes of mortality or different environmental conditions that may require specific interventions which, in turn, may entail their own degrees of effectiveness. By regions, Sub-Saharan Africa (SSA) has consistently performed very poorly with respect to the reduction of child mortality, and this may be due to a peculiar (adverse) mix of these factors. In other words, one may ask whether there is an “African” factor encompassing these conditions, which may have a distinctive effect on the effectiveness of aid in the region. Or perhaps there is no such “African” factor, but aid is still more effective on average in SSA simply because aid effectiveness is related to the level of mortality. Indeed, in a low-mortality environment it may be harder to achieve further reductions in children’s deaths. On the contrary, in countries where mortality is high, a small amount of aid may potentially trigger a sizeable improvement in health conditions and eventually have a substantial impact on mortality.

In Table 6 (Panel A) we present the results of different regressions for SSA (columns 1–4) and the rest of the world (columns 5–8). The point estimates are always larger in SSA. In particular “Basic health” and “Population policies” aid are significant only in the SSA region.[19] “Food aid” has a large coefficient but is significant only at a 10% level (p-value of 6.8%) in SSA. The coefficient for the sum of the three sectors taken together (column 4) is about twice as large in SSA as in non-SSA countries (column 8). Thus, aid indeed seems more effective in reducing child mortality in SSA than in other developing regions. Then, we split the sample not according to geographical regions but according to the mortality rate at the beginning of the sample period. Defining high initial mortality as a rate above 75 per thousand in year 2000, all countries in the SSA region fall into the high mortality category.[20] In addition, 11 countries outside SSA belong to that category. In panel B of Table 6, we present the results for these two subsamples. As before, point estimates for all three aid sectors are larger for the high-mortality group and the coefficients are always significant. The sum of the three aid sectors provides qualitatively similar results. In contrast, no aid variable is significant for the low-mortality group. So, the main message of this exercise is that there seems to be no “African” factor with respect to the effectiveness of aid, i.e., we cannot reject the null hypothesis that estimates in columns 1–4 in panel A are equal to the corresponding estimates in panel B. What seems to drive aid effectiveness is the mortality level rather than specific geographical characteristics of countries.

It is also worth mentioning an additional point. The literature has discussed the negative effects of food aid from the United States to developing countries. Nunn and Qian (2010) argue that this sort of aid represents a significant source of resources for governments in recipient countries and so it may lead to inefficient political incentives, nepotism or domestic conflict.

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[19] This may be explained by the fact that countries in this region have the highest infectious disease prevalence rates (including HIV) and thus interventions tackling these diseases such as prevention and treatment may have a larger impact there than in the rest of the world, on average.

[20] The sample average rate in 2000 was 76.

Table 6: The Effect of Aid by Region. Dependent Variable: Under-5 Mortality Rate

Panel A

	Sub Saharan Africa				Other Developing Countries			
	Aid Variable is:				Aid Variable is:			
	Basic Health	Population Programs	Food aid	Health + Population + Food	Basic Health	Population Programs	Food Aid	Health + Population + Food
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged Aid	3.233**	0.935***	3.973*	0.973**	0.823	0.147	1.621***	0.466*
	(1.424)	(0.356)	(2.177)	(0.386)	(0.544)	(0.233)	(0.321)	(0.278)
Observations	408	400	365	412	721	701	647	729
Number of countries	46	46	46	46	86	86	86	86
F test for instruments in first stage regression	90.63	6.113	63.66	9.913	10.53	1105	743.5	67.66
Hansen i test p value	0.671	0.746	0.210	0.616	0.162	0.228	0.149	0.127

Panel B

	High Initial Mortality (>=75 per thousand in 2000)				Low Initial Mortality			
	Aid Variable is:				Aid Variable is:			
	Basic Health	Population Programmes	Food Aid	Health + Population + Food	Basic Health	Population Programmes	Food aid	Health + Population + Food
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged Aid	2.117**	0.748**	1.997**	0.766***	0.0473	0.0296	0.552	0.0840
	(0.928)	(0.331)	(1.008)	(0.297)	(0.297)	(0.0701)	(0.346)	(0.120)
Observations	499	487	442	502	621	606	561	630
Number of countries	56	56	56	56	73	73	73	73
F test for instruments in first stage regression	146.2	31.04	110.0	54.96	4.910	5275	97.06	29.50
Hansen i test p value	0.437	0.605	0.912	0.315	0.189	0.212	0.146	0.182

Notes:

Robust standard errors in parentheses. Instruments for lagged per capita aid are trend aid and total GDP. See Section III for a detailed explanation of the instruments.

*** p<0.01, ** p<0.05, * p<0.1.

Time and country effects included in all regressions.

Source: Authors' estimates.

Although the cases of some countries support this view,[21] we find that food aid in general has significantly reduced child mortality in Africa and other high mortality countries elsewhere.

3. The Role of Governance

The empirical evidence on the link between domestic governance and aid effectiveness is still subject to debate. This controversy is best illustrated by the exchange initiated by the paper by Burnside and Dollar (2000) and the reply by Easterly, Levine, and Roodman (2004) on the issue of whether aid has a higher impact on growth in developing countries with good policies.[22]

We have previously mentioned that in our sample of aid recipient countries "government efficiency" is uncorrelated with mortality and the inclusion of this index in the regressions does not affect the coefficients on aid. Now we investigate whether governance, as measured by this index, plays any role in the high mortality group. There are a number of reasons to believe that this could be the case. First, government effectiveness is more likely to make a difference in an environment where health conditions are adverse. An effective government is more able to achieve better results with scarce resources than an inefficient one, both in underdeveloped and developed countries. But higher efficiency is likely to lead to better health outcomes if improving health is cheaper. In contrast, in a context where reducing mortality is expensive, government effectiveness is less likely to make a significant difference in terms of mortality progress. In the previous subsection, we already discussed indications that aid is more effective in high mortality countries, and so it may well be the case that reducing mortality is cheaper in those countries. Is government effectiveness important in this more responsive group of recipients?

We test the role of governance for the subsample of high-mortality countries in Table 7. Column 1 introduces the Kaufmann, Kraay, and Mastruzzi's (2010) indicator of government efficiency (the same one that we used in Table 5). Now governance enters significantly and with a negative sign. To illustrate magnitudes, a one standard deviation increase in government efficiency (equal to 0.537 for the high mortality sample) is associated with a reduction in the child mortality rate of 3.3 per thousand. In column 2, we introduce an interaction term between governance and aid. The negative sign implies that better governance improves aid effectiveness. Note however that governance's main effect and the interaction term are significant at the 10% level only. Column 3 includes only the interaction variable which is now significant at a 5% level. Finally, columns 5–8 replicate the regressions by substituting government efficiency with an indicator of corruption.[23] The results are qualitatively similar except for the fact that when both the main effect and the interaction term are included, none is significant. Overall, our findings favor the hypothesis that governance improves aid effectiveness in countries where mortality is high.

Note, on the other hand, that the inclusion of indexes of governance does not affect the qualitative results with respect to the effect of aid on child mortality, i.e., aid has significantly reduced child mortality in those countries characterized by high child mortality rates at the beginning of our sample period. If that is so, what does this tell us about the prospects of MDG–4? Will they be attainable through scaling up as suggested in previous studies? We turn to this final question in the following section.

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[21] Nunn and Qian (2010) cite the experiences of Rwanda and Somalia in the early 1990s and Zimbabwe in 2003.
[22] 0ne of the most recent contributions to the debate is Brückner (2011).
[23] To do this we use the indicator "corruption control" by Kaufmann, Kraay, and Mastruzzi (2010). A higher magnitude in the indicator implies less corruption.

Table 7: Governance and Aid Effectiveness
Dependent Variable: Under 5 Mortality Rate

Lag of:	(1)	(2)	(3)	(4)	(5)	(6)
Aid (Basic Health + Pop. Programs + Food)	0.639***	0.714***	0.776***	0.631***	0.630***	0.674***
	(0.194)	(0.235)	(0.244)	(0.184)	(0.176)	(0.184)
Government efficiency	6.149*** (2.386)	4.486* (2.730)				
Government efficiency * Aid		0.326*	0.398**			
		(0.192)	(0.189)			
Corruption Control				5.344**	3.733	
				(2.272)	(2.572)	
Corruption Control * Aid					0.264	0.350**
					(0.177)	(0.168)
Observations	334	334	334	334	334	334
Number of countries	56	56	56	56	56	56
F test for instruments in first stage regression	75.57	6.910	4.527	44.21	11.12	7.950
Hansen j test p value	0.816	0.877	0.522	0.441	0.649	0.430

Notes:

Robust standard errors in parentheses. Instruments for lagged per capita aid are trend aid and total GDP. See section 3 for a detailed explanation of the instruments.

(2) *** p<0.01, ** p<0.05, * p<0.1.Time and country effects included in all regressions.

Source: Authors' estimates.

V. THE PROSPECTS FOR MDG–4

Two important conclusions emerge from the previous exercises. First of all, some sectors of aid activity seem to have significantly contributed to the reduction in child mortality in developing countries. Second, there is some evidence that aid has been more effective in high mortality countries, i.e., precisely where reducing child mortality is most urgent. In this section we will present projections of under-5 mortality for high-mortality countries for the year 2015, the year for which the MDG's set targets. We will also discuss the relative size of the effect of aid on mortality implied by our estimates in the previous sections.

We should be quick to recognize the limitations in the prediction power of the exercises we are about to present. Particularly important is the fact that our projections take steps beyond marginal changes in the variables involved. Once these limitations are accepted, it is also clear that some estimates of this kind necessarily underlie any assessment of the expected progress of the millennium initiative. The goal of this section is to offer one estimate, arguably the most firmly rooted in data, of what can be expected for 2015 considering the way things are going.

It makes sense to confine attention to high-mortality countries as defined in the previous section. As we have mentioned, this includes SSA and other countries where most analysts expect the MDG–4 (and others) to be missed by a large margin. Also, we have found that this is the region where aid has had a more marked impact, and so it is the one where aid seems to have a clearer role in improving things.

We begin by obtaining the best point prediction of child mortality for 2015 assuming the latest aid levels in the sample (2008). We do that by projecting a child mortality equation estimated with 2000–2008 data. For that purpose, we need to introduce some notion of (exogenous to the process we are illustrating) dynamics in child mortality. Time dummies were sufficient to take care of that in observed data, but we cannot project the effect of those variables into the future. So, we will start by estimating a modified equation (1) that includes a time trend common to all countries but does not include time dummies (or other controls). That is,

$$m_{it} = \mu_i + \alpha \bullet t + \delta\left(\frac{A_{it-1}}{N_{it-1}}\right) + e_{it}, \tag{4}$$

where, m is child$_{it}$mortality in country i and year t, $\frac{A_{it-1}}{N_{it-1}}$ is (instrumented) lagged aid per capita, and Q will represent the time trend in child mortality.

We have estimated this equation setting A_{it} as the total of the three aid sectors that do have a significant effect on child mortality. We have also estimated the same model but using each of the three sectors as a different covariate. In each of the estimations, we have considered the sample of high mortality countries. As could be expected, the results are almost identical to those obtained in previous sections for each of the specifications of aid. In Table 8, we present these estimates.

Table 8. Regressions for Forecasts (high mortality countries)
Dependent Variable: Under-5 Mortality Rate

				Aid variable is:
Variables	**Basic Health (1)**	**Population Programs (2)**	**Food aid (3)**	**Health + Population + Food (4)**
Lagged Aid	2.117** (0.929)	0.746** (0.334)	1.957** (0.995)	0.766*** (0.297)
	2.691*** (0.346)	2.805*** (0.346)	3.144*** (0.293)	2.449*** (0.396)
Year				
Observations	499	487	442	502
Number of countries	56	56	56	56
F test for instruments in first stage regression	171.0	34.03	147.6	68.52
Hansen i test p value	0.437	0.587	0.937	0.314

Notes:

Robust standard errors in parentheses. Instruments for lagged per capita aid are trend aid and total GDP.

*** p<0.01, ** p<0.05, * p<0.1.

Time and country effects included in all regressions.

Source: Authors' estimates.

Using these point estimates we can now extrapolate the values of child mortality throughout 2015 for each country in the subsample. The results of this exercise are presented in Table 9. We also include the MDG–4 target for each country, and also a hypothetical, less ambitious target of a 50% reduction in the 1990 level of child mortality, instead of the MDG's two-thirds reduction target.

Table 9: Child Mortality Forecasts by 2015

Country	Basic Health	Population Programmes	Food Aid	Health + Population + Food	Target	50% Target	On Target
Angola	153.3	156.7	153.4	159.1	86.0	129.0	No
Bangladesh	40.4	40.3	35.9	43.5	49.2	73.8	Yes
Benin	98.0	100.9	98.2	103.3	61.5	92.2	No
Bhutan	65.8	61.9	54.4	64.7	49.3	74.0	No
Bolivia	38.6	37.3	35.0	41.1	40.7	61.1	Yes
Botswana	47.7	35.7	42.6	34.4	19.9	29.8	?
Burkina Faso	143.8	146.0	141.5	147.5	67.0	100.5	No
Burundi	135.3	141.5	134.4	139.9	63.1	94.7	No
Cambodia	65.0	65.3	63.9	67.9	38.9	58.4	No
Cameroon	124.6	126.0	125.9	128.0	49.3	73.9	No
Central African Rep.	147.1	144.9	138.4	145.6	58.2	87.3	No
Chad	177.1	176.9	177.1	179.6	67.1	100.6	No
Comoros	84.5	78.3	75.7	84.1	42.6	63.9	No
Congo, Dem. Rep.	163.2	167.0	163.3	168.5	66.2	99.3	No
Congo, Rep.	90.3	89.2	91.7	91.5	34.6	51.9	No
Cote d'Ivoire	100.3	97.6	96.8	100.5	50.8	76.2	No
Djibouti	59.9	68.6	63.9	66.7	40.9	61.4	No
Equatorial Guinea	106.5	123.3	123.6	119.0	65.9	98.9	No
Eritrea	43.2	40.6	36.8	44.3	49.9	74.9	Yes
Ethiopia	95.5	94.3	86.7	95.0	69.8	104.8	No
Gabon	47.3	45.9	43.1	49.3	30.9	46.4	No
Gambia	82.6	87.7	70.6	84.2	51.0	76.6	No
Ghana	53.1	57.2	53.7	58.9	40.0	60.0	No
Guinea	134.6	133.8	128.9	136.9	77.0	115.5	No
Guinea Bissau	173.3	174.6	161.9	172.8	80.0	120.0	No
Haiti	66.8	64.6	62.1	65.1	50.8	76.2	No
India	50.3	48.9	45.3	52.8	39.4	59.1	No
Kenya	63.8	60.0	59.6	62.8	33.0	49.5	No
Lao PDR	38.6	41.9	37.8	43.7	52.4	78.6	Yes
Lesotho	79.5	73.5	75.3	73.3	30.8	46.2	No
Liberia	114.6	115.0	101.1	115.4	82.3	123.5	No
Madagascar	47.1	47.0	44.4	50.8	55.6	83.4	Yes
Malawi	102.3	104.2	101.0	103.5	72.7	109.1	No
Mali	170.1	172.9	168.8	173.9	83.2	124.8	No
Mauritania	88.2	87.9	78.7	88.4	43.0	64.5	No
Mozambique	133.1	130.4	128.4	131.9	77.5	116.2	No
Namibia	36.6		32.5	20.7	24.3	36.5	?
Nepal	36.3	35.8	31.4	38.9	47.3	71.0	Yes
Niger	160.2	163.9	155.5	163.7	101.7	152.6	No
Nigeria	133.8	133.2	129.0	136.3	70.6	105.9	No
Pakistan	67.1	67.2	64.2	70.6	43.5	65.2	No
Papua New Guinea	43.6	41.1	38.3	45.1	30.4	45.6	No
Rwanda	105.6	109.1	111.6	107.8	56.9	85.4	No
Senegal	71.8	75.7	70.5	76.7	50.3	75.4	No
Sierra Leone	188.6	190.7	183.9	190.9	95.0	142.5	No
South Africa	46.2	40.2	43.2	43.8	20.6	30.9	No
Sudan	78.9	80.5	78.6	82.7	41.2	61.8	No
Swaziland	70.7	61.0	62.0	62.6	30.8	46.2	No
Tajikistan*	43.4	45.9	42.9	48.4	38.7	58.0	No
Tanzania	89.5	91.2	90.5	92.2	54.0	81.0	No
Timor-Leste**	42.4	47.0	26.4	40.7	49.7	74.5	Yes
Togo	77.1	80.5	77.2	82.7	50.1	75.2	No
Uganda	111.0	108.2	106.4	110.7	61.4	92.1	No
Yemen	53.2	52.4	48.3	56.0	41.6	62.4	No
Zambia	120.6	114.3	120.2	114.4	59.5	89.3	No

Lao PDR = Lao People's Democratic Republic.

* Target computed based on 1992 mortality rate.

** Target computed based on 1995 mortality rate.

Source: Authors' estimates.

The projections reinforce the widespread view that the MDG–4 will be missed by a large number of countries, particularly those of SSA. According to these projections, of the 55 high-mortality countries considered,[24] only seven are clearly on track. Of those, five are among the 13 high-mortality countries not in Africa. That is, of the 42 high-mortality countries in SSA, only two, Madagascar and Eritrea, are on track. In addition, two more countries, Botswana and Namibia, may also attain the target, depending on the projection used.[25] Together, these four countries represent only 3.5% of the SSA population.

Perhaps even more important, most of these countries will not only miss the target but will do so by a wide margin. Indeed, most of them will miss the target by more than 50%. In other words, they will not see their child mortality rate fall to half its 1990 level. In the last column, we have added the figure corresponding to this less ambitious target. We can see that the list of countries that will meet this lowered aspiration in SSA includes only four new countries (Ethiopia, Ghana, Malawi, and Liberia), perhaps seven (Gabon, Gambia, and even Djibouti may join the list, according to some of the projections). In other words, 31 out of 42 Sub-Saharan countries will miss the MDG–4 target by more than 50%. For the rest of the world, the prospects are less gloomy. Indeed, only two high-mortality countries, Cambodia and Pakistan, will most probably miss this less ambitious target.

Is there any hope that, by simply scaling up aid, the MDG-4 will be attained? This has been a much debated question. We may contribute to the discussion by performing what is merely a first order approximation—undoubtedly a very rough approximation in this case—of how much more aid would be required for each high mortality country to reach the goal. We can do so by computing what the (constant) term $\frac{A_{it-1}}{N_{it-1}}$ *1* would have to be in equation (4) for each of those countries, in order to reach their target. Depending on the projection used, these estimations of aid needs add up to something between $130 billion and $360 billion, if we restrict attention to the three sectors that were found to have a significant effect on child mortality. Compare that total to the level of aid in 2008 accruing to these countries under these three sectors: slightly above $9 billion. The figures seem to support those who believe that scaling up aid will not suffice, unless that scaling up is accompanied by a much improved focus and efficiency.

But, what is the quantitative impact of aid on child mortality? Our exercise allows an approximate answer to this question by computing a projection of child mortality in 2015 if all aid in the three sectors found to have a significant impact on child mortality was dropped, and comparing those figures with the figures obtained in our projections under the assumption that aid remains constant at the 2008 levels (see Table 10). In terms of attaining the MDG–4 goals, that would mean that Madagascar would still attain the goal, as probably would Eritrea, but not Namibia or Botswana. Outside Africa, Timor-Leste would miss the target and Bolivia would risk missing it too. If we consider the 50%-reduction target, then Gambia, Liberia, and Djibouti would lose all their chances of attaining it, and Gabon, Ghana, Malawi, Senegal, and Papua New Guinea would see their chances seriously reduced. So, it seems that some of the few success stories may indeed depend on aid.

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24 Zimbabwe is not in the projections because of missing data in 2008.

25 Actually, the projections using sector “Population policies/programs and reproductive health” as aid, result in a negative mortality rate for Botswana. That is due to the fact that in 2008 Botswana received an extraordinarily large amount of aid in this sector, amounting to $120 per capita compared to $20 the previous year, a record year itself. Remember that this aid sector includes aid directed to fight HIV, and that HIV prevalence in those years was above 25% in Botswana. Namibia was also a heavy recipient of aid in the years 2006 thru 2008 with totals for the three categories above $40 per capita, most of them in the “Population policies” sector.

Table 10: Child Mortality Forecasts by 2015, Assuming that Aid is Dropped

Country	Basic Health	Population Programmes	Food Aid	Health + Population + Food	On Target
Angola	161.5	158.1	154.4	164.0	No
Bangladesh	42.4	40.7	37.3	45.1	Yes
Benin	106.7	102.6	98.8	108.5	No
Bhutan	73.4	64.4	59.1	71.8	No
Bolivia	45.3	39.2	40.8	47.8	?
Botswana	50.1	54.5	42.6	59.1	No
Burkina Faso	151.0	148.2	145.5	154.0	No
Burundi	145.6	143.6	140.6	148.2	No
Cambodia	71.7	68.7	65.0	74.2	No
Cameroon	127.5	126.9	126.1	130.1	No
Central African Rep.	152.8	148.6	145.2	154.2	No
Chad	180.2	177.7	180.6	182.9	No
Comoros	86.7	79.6	75.7	86.2	No
Congo, Dem. Rep.	171.2	168.1	164.4	173.0	No
Congo, Rep.	93.2	91.1	96.3	96.3	No
Cote d'Ivoire	102.7	101.5	98.2	105.9	No
Djibouti	79.3	73.5	68.6	80.5	No
Equatorial Guinea	146.9	129.2	123.6	139.7	No
Eritrea	47.5	43.7	41.6	50.8	?
Ethiopia	100.5	97.5	94.6	103.1	No
Gabon	52.0	47.6	43.1	52.8	No
Gambia	93.3	89.7	86.1	96.1	No
Ghana	61.9	58.8	55.1	64.3	No
Guinea	136.7	135.0	131.9	140.2	No
Guinea Bissau	181.4	176.8	175.5	183.2	No
Haiti	73.5	73.7	72.6	81.0	No
India	50.7	49.1	45.4	53.2	No
Kenya	68.6	66.5	61.6	71.9	No
Lao, PDR	47.8	42.9	40.1	48.8	Yes
Lesotho	86.2	85.9	81.6	91.0	No
Liberia	130.7	118.7	120.3	132.5	No
Madagascar	52.6	48.0	47.1	54.9	Yes
Malawi	114.0	112.1	108.4	118.8	No
Mali	179.5	175.7	171.5	181.3	No
Mauritania	95.1	90.3	91.4	98.4	No
Mozambique	141.6	137.8	134.1	144.7	No
Namibia	40.7	Out	33.6	52.4	No
Nepal	38.9	37.1	32.6	41.7	Yes
Niger	168.1	165.0	163.3	170.8	No
Nigeria	137.0	135.3	129.0	139.6	No
Pakistan	69.2	67.4	64.4	71.7	No
Papua New Guinea	55.6	43.8	38.3	52.2	No
Rwanda	123.5	119.9	115.6	127.0	No
Senegal	81.7	77.4	73.6	83.2	No
Sierra Leone	197.2	193.3	191.7	199.7	No
South Africa	47.6	46.8	43.2	51.2	No
Sudan	84.2	81.2	81.1	86.3	No
Swaziland	71.8	75.8	68.6	80.7	No
Tajikistan*	50.8	46.8	47.8	54.0	No
Tanzania	99.4	96.8	91.7	102.0	No
Timor Leste**	62.8	50.6	52.0	61.8	No
Togo	84.2	81.6	77.3	86.3	No
Uganda	116.5	113.7	109.7	119.6	No
Yemen	55.7	53.1	50.7	58.7	No
Zambia	135.9	130.5	124.3	138.2	No

Lao PDR = Lao People's Democratic Republic.

* Target computed based on 1992 mortality rate.

** Target computed based on 1995 mortality rate.

Source: Authors' estimates.

In addition, we could assess the impact on the absolute number of child deaths that aid (at the 2008 levels) is expected to have. For that exercise, we may assume that the number of children born alive remains constant at its 2008 level throughout 2015. According to these assumptions and projections, aid would save between 104,000 and 253,000 children born in year 2015 from dying by the age of 5 in high mortality countries. This represents something between 1.85% and 4.5% of the children born that year that are expected to die by the age of five in the absence of aid.

VI. CONCLUDING REMARKS

In this paper we have assessed the effects of official development aid on the observed pattern of reduced child mortality over the 2000–2008 period. We have used a panel from the OECD's Creditor Reporting System on aid disbursements by sectors and recipient country. As an identification strategy, a time trend on aid for each recipient has been used to instrument aid. We have also used the size of real GDP of the recipient country as a second instrumental variable for per capita aid. That allowed us to identify three types of aid, all of which are related to health, that have had a significant impact on child mortality. The effect appears to have been larger in countries that started with a high rate of child mortality. In that regard, the paper carries good news: despite many shortcomings that can be suspected in the effectiveness of aid, some types of aid do seem to be contribute to reducing child mortality.

The dark side of this conclusion is that although aid flows have drastically increased in the last decade, the levels of child mortality cannot be expected to shrink sufficiently in the near future. In particular, the target set in the Millennium Declaration of reducing child mortality by 2015 to one-third of its level in 1990 will be missed in most high-mortality countries by wide margins, particularly in SSA.

APPENDIX

In the regressions we assume that mortality is affected only by one year lagged per capita aid a_{it-1}. Here we show that if further lags in aid also determine current mortality then the estimated parameter on a_{it-1} is the sum of all relevant lagged aid parameters. More specifically, assume that the past L aid lags determine mortality, The aid variable can be written as $a_{it} = c_{Oi} + c_{li}t + u_{it}$ where, c_{Oi} and c_{li} are country specific parameters obtained from a regression of aid on a time trend. Substituting into equation (5), we obtain:

$$m_{it} = \mu_i + \mu_t + \sum_{l=1}^{L} \delta_l a_{it-l} + e_{it}. \qquad (5)$$

$$\begin{aligned} m_{it} &= \mu_i + \mu_t + \Delta\left(c_{0i} + c_{1i}(t-1)\right) + e_{it} + \xi_{it} \\ &= M_i + \mu_t + \Delta\left(c_{1i}(t-1)\right) + e_{it} + \xi_{it}, \end{aligned} \qquad (6)$$

where, $\Delta = \sum_{l=1}^{L} \delta_l,\ M_i = \mu_i + \Delta c_{0i} - c_{1i} \sum_{l=2}^{L} (l-1)\,\delta_l,$ and $\xi_{it} \equiv \sum_{l=1}^{L} \delta_l u_{it-l}$. So the OLS estimate Δ of equation (6) (i.e., the second stage regression when the instrument for aid is a country-specific time trend) is unbiased, since $c_{li\,(t-1)}$ is uncorrelated with ξ_{it}.

Appendix Table A: Summary Statistics by Aid Sectors
(Disbursements in 2008 dollars)

Sector	Total 2008 ($ million) (1)	Per Capita, 2008 (Dollars) (2)	Per Capita, Average 2000 2008 (Dollars) (3)	Per Capita, Change 2000 2008 (Dollars) (4)
Education, Level Unspecified	2,233	9.65	7.38	6.2
Basic Education	3,156	4.67	2.35	1.43
Secondary Education	1,138	6.61	2.4	1.67
Post Secondary Education	4,010	3.22	3.13	1.62
Health, General	2,152	4.5	3.83	2.56
Basic Health	5,366	3.11	2.04	1.02
Popul. Pol./Progr. and Reproductive Health	8,228	3.98	1.84	1.59
Water Supply and Sanitation	5,402	3.63	2.89	0.7
Government and Civil Society general	12,172	10.93	7.96	5.53
Conflict, Peace and Security	3,350	1.81	1.4	0.52
Other Social Infrastructure and Services	5,991	8.63	4.28	2.56
Transport and Storage	7,588	9.73	6.82	1.38
Communications	525	0.55	0.45	0.21
Energy	5,237	3.3	1.99	0.56
Banking and Financial Services	2,905	1.06	0.71	0.21
Business and Other Services	1,985	1.21	0.98	0.76
Agriculture	4,734	4.75	2.63	1.09
Forestry	556	0.16	0.26	0.02
Fishing	344	1.85	3.06	0.66
Industry	1,393	0.83	0.62	0.21
Mineral Resources and Mining	241	0.24	0.29	0.01
Construction	35	0.02	0.02	00.0
Trade Policies and Regulations	849	0.33	0.42	1.56
Tourism	91	0.22	0.29	0.04
General Environment Protection	3,031	1.9	1.59	1.40
Other Multisector	5,765	15.05	9.32	8.06
General Budget Support	4,358	9.81	9.7	7.74
Develop. Food Aid/Food Security Assist.	1,986	1.65	1.03	0.67
Other Commodity Asssistance	243	0.04	0.08	0.06
Action Relating to Debt	11,929	13.86	10.18	8.48
Emergency Response	9,498	3.35	2.79	0.77
Reconstruction Relief and Rehabilitation	1,307	0.58	0.65	0.51
Disaster Prevention and Preparedness	343	0.18	0.08	0.08
Administrative Costs of Donors	6,483	0.39	0.3	0.28
Support to NGOs	1,590	0.53	0.61	0.60
Refugees in Donor Countries	2,509	0.02	0.36	0.20
Unallocated/Unspecified	3,197	1.3	2.5	1.71
Total	131,920	133.65	97.23	53.85

Per capita figures are simple averages across aid recipient countries.

Source: Authors' estimates.

Appendix Table B: Summary Statistics by Aid Recipient Country
(2000–2008)

Country	Data Frequency	Under-5 Mortality	Per Capita Aid	Country	Data Frequency	Under-5 Mortality	Per Capita Aid
Albania	9	21	104	Lesotho	9	114	47
Algeria	9	39	10	Liberia	9	156	94
Angola	9	188	31	Libya	3	20	6
Antigua and Barbuda	9	16	58	Macedonia, FYR	9	15	111
Argentina	9	18	3	Madagascar	9	80	61
Armenia	9	29	82	Malawi	9	140	74
Azerbaijan	9	51	26	Malaysia	9	8	10
Bahrain	5	13	1	Maldives	9	31	98
Bangladesh	9	71	11	Mali	9	205	81
Barbados	4	14	9	Malta	3	7	3
Belarus	3	13	8	Mauritania	9	120	132
Belize	9	23	44	Mauritius	9	17	57
Benin	9	132	67	Mexico	9	22	2
Bhutan	9	93	108	Moldova	9	21	42
Bolivia	9	69	109	Mongolia	9	46	79
Bosnia Herzegovina	9	16	134	Montenegro	6	12	76
Botswana	9	78	75	Morocco	9	47	33
Brazil	9	28	2	Mozambique	9	166	88
Burkina Faso	9	178	61	Namibia	9	67	79
Burundi	9	173	47	Nepal	9	67	18
Cambodia	9	98	33	Nicaragua	9	34	172
Cameroon	9	156	76	Niger	9	195	48
Cape Verde	9	35	332	Nigeria	9	166	21
Central African Rep.	9	178	35	Oman	9	17	3
Chad	9	208	34	Pakistan	9	98	13
Chile	9	10	6	Panama	9	25	14
China, People's Rep. of	8	29	2	Papua New Guinea	9	73	65
Colombia	9	23	16	Paraguay	9	27	20
Comoros	9	110	66	Peru	9	31	23
Congo, Dem. Rep.	9	199	36	Philippines	9	36	13
Congo, Rep.	9	121	117	Rwanda	9	148	77
Costa Rica	9	12	17	Samoa	9	30	245
Cote d'Ivoire	9	131	33	Saudi Arabia	8	22	0
Croatia	9	7	37	Senegal	9	107	98
Djibouti	9	101	107	Serbia	9	10	166
Dominica	9	13	219	Seychelles	9	13	98
Dominican Republic	9	36	20	Sierra Leone	9	223	86
Ecuador	9	30	20	Slovenia	3	5	6
Egypt	9	34	19	Solomon Islands	9	36	355
El Salvador	9	25	40	South Africa	9	76	14
Equatorial Guinea	9	158	63	Sri Lanka	9	18	41
Eritrea	9	72	52	St. Lucia	9	18	109
Ethiopia	9	127	31	Sudan	9	112	29
Fiji	9	18	61	Suriname	9	33	184
Gabon	9	78	88	Swaziland	9	100	35
Gambia	9	118	54	Syria	9	19	9
Georgia	9	32	80	Tajikistan	9	78	24
Ghana	9	89	81	Tanzania	9	126	60
Grenada	9	17	139	Thailand	9	17	12
Guatemala	9	44	30	Timor-Leste	9	81	262
Guinea	9	165	33	Togo	9	112	23
Guinea Bissau	9	207	80	Tonga	9	20	262
Guyana	9	41	146	Trinidad and Tobago	9	35	8
Haiti	9	101	42	Tunisia	9	24	54

continued

Appendix Table B. *continued*

Honduras	9	35	100	Turkey	9	31	13
India	9	80	3	Turkmenistan	9	59	4
Indonesia	9	48	11	Uganda	9	142	59
Iran	9	40	2	Ukraine	3	16	11
Jamaica	9	32	48	Uruguay	9	16	8
Jordan	9	28	119	Uzbekistan	9	50	6
Kazakhstan	9	37	12	Vanuatu	9	21	242
Kenya	9	95	26	Venezuela	9	21	2
Kiribati	9	55	254	Viet Nam	9	27	23
Kyrgyz Republic	9	44	36	Yemen	9	84	17
Lao PDR	9	73	46	Zambia	9	157	123
Lebanon	9	18	81	Zimbabwe	7	109	19

Under-5 mortality per thousand children born alive. Aid is disbursements in 2008 dollars. 2000–2008 averages.

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Seeds of Hope: Assessing the Effect of Development Aid on the Reduction of Child Mortality

The authors study whether the massive increase in development aid can account for part of the reduction in child mortality observed in developing countries since 2000. They find that total aid has had no statistically significant effect on child mortality; however, a disaggregated analysis identifies certain sectors of aid that have had a significant impact.

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