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Section 1: Development assistance for health

OVERVIEW OF DATA COLLECTION AND RESEARCH METHODS

We extracted all available data on health-related disbursements and expenditures, as well as income from existing project databases, annual reports, and audited financial statements. The channels included in the study and the corresponding data sources are summarized in Table 1.1. We constructed two integrated databases from the data: one reflecting aggregate flows, the IHME DAH Database 2011; and a second, the IHME DAH Database (Country and Regional Recipient Level) 2011, for channels that provided information on country- and/or regional-level allocation, namely bilateral agencies, the European Commission (EC), the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), the GAVI Alliance (GAVI), the World Bank, the Asian Development Bank (ADB), the African Development Bank (AfDB), the Inter-American Development Bank (IDB), and the Bill & Melinda Gates Foundation (BMGF).

We counted as development assistance for health (DAH) all health-related disbursements from bilateral donor agencies, excluding funds that they transferred to any of the other channels tracked to avoid double-counting. We extracted this information from the Creditor Reporting System (CRS) database of the Development Assistance Committee of the Organisation for Economic Co-operation and Development (OECD-DAC). Most donor agencies did not report disbursement data to the CRS prior to 2002. Consequently, we developed a method for predicting disbursements from observed data (see Part 1).

For other grant- and loan-making institutions, we similarly included their annual disbursements on health grants and loans, excluding transfers to any other channels and ignoring any repayments on outstanding debts (see Part 2 for development banks, Part 3 for public-private partnerships, and Part 5 for foundations). The annual disbursements for grant- and loan-making institutions only reflect the financial transfers made by these agencies. Therefore, we estimated separately in-kind transfers from these institutions in the form of staff time for providing technical assistance and the costs of managing programs (see Part 7).

For the United Nations (UN) agencies, we included their annual expenditures on health both from their core budgets and from voluntary contributions. For UNICEF, we also estimated the fraction of its total expenditure spent on health prior to 2001 (see Part 4).

For non-governmental organizations (NGOs), we used data from US government sources and a survey of health expenditure for a sample of NGOs to estimate DAH from NGOs registered in the US. The 2009 amount, which was incomplete when this analysis was conducted, was estimated based on available data and trends from previous years (see Part 6). We were unable to include NGOs and foundations registered in other countries due to data limitations.

We used the IHME DAH Database (Country and Regional Recipient Level) 2011 to analyze the composition of health aid by recipient country. Next, we assessed development assistance for HIV/AIDS; maternal, newborn and child health; tuberculosis; malaria; noncommunicable diseases; and health sector support using keyword searches within the descriptive fields (see Part 8). We chose to focus on these areas because of their relevance to current policy debates about global health financing. We extracted separately from the CRS data on general budget support and debt relief and estimated total disbursements for both (see Part 1).

We also explored the relationship between health assistance and the burden of disease measured in DALYs,[1] as well as between per capita health assistance[2] and income measured by the gross domestic product of recipient countries.[3-5] We present all results in real 2009 US dollars by adjusting nominal dollar sequences into real 2009 US dollars.[3]

This year's report also includes preliminary estimates of DAH for 2010 and 2011. To obtain these preliminary estimates, we implemented a variety of methods dependent on data availability and validated estimates based on the consistency of recent trends in DAH. Generally, estimates are based on channel-specific budget data, assuming disbursements track with program commitments. When budget data were unavailable, we imputed budgets using other measures such as income or assets or estimated trends based on recent years or other channels. Due to the lack of more detailed disaggregated data, estimates are provided only by channel. Furthermore, the preliminary estimates may include some double-counting due to missing data on transfers between channels of assistance. We have sought to minimize the degree of double-counting in these estimates by estimating DAH in 2010 and 2011 based on prior years' disbursements adjusted for double-counting whenever possible.

All analyses were conducted in Stata 11.0 and R 2.7.1.

Table 1.1
Summary of data sources

Bilateral agencies in OECD-DAC member countries	OECD-DAC aggregates database and the Creditor Reporting System (CRS)[6]
EC	OECD-DAC and CRS[6] databases and annual reports[7]
UNAIDS	Financial reports and audited financial statements[8]
UNICEF	Financial reports and audited financial statements[9,10]
UNFPA	Financial reports and audited financial statements[11]
PAHO	Financial reports and audited financial statements[12]
WHO	Financial reports and audited financial statements[13]
World Bank	Online project database[14]
ADB	Online project database[15]
AfDB	Online project database,[16] compendium of statistics,[17] and correspondence
IDB	Online project database[18]
GAVI	GAVI annual reports,[19] OECD-CRS,[6] country fact sheets,[20,21] and correspondence
GFATM	Online grant database[22,23]
NGOs registered in the US*	USAID Report of Voluntary Agencies (VolAg),[24] tax filings,[25] annual reports, financial statements, RED BOOK Expanded Database,[26] WHO's Model List of Essential Medicines,[27] and correspondence
BMGF	Online grant database,[28] IRS 990 tax forms,[29] and correspondence[30]
Other private US foundations*	Foundation Center's grants database,[31] tax forms,[32] and custom research for years 1990-2004

*Non-US private foundations and NGOs were not included because data were unavailable.

Part 1:

TRACKING DEVELOPMENT ASSISTANCE FOR HEALTH FROM BILATERAL AID AGENCIES AND THE EC USING DATA FROM THE OECD-DAC

OECD-DAC maintains two databases on aid flows: 1) the DAC annual aggregates database, which provides summaries of the total volume of flows from different donor countries and institutions, and 2) the CRS, which contains project- or activity-level data.[6]

These two DAC databases track the following types of resource flows:[33]

a. Official development assistance (ODA), defined as "flows of official financing administered with the promotion of the economic development and welfare of developing countries as the main objective"[34] from its 24 members (Austria, Australia, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, South Korea, Spain, Sweden, Switzerland, the United Kingdom, the United States, and the EC).

ODA includes:

- Bilateral ODA, which is given directly by DAC members as aid to recipient governments, core contributions to NGOs and public-private partnerships, and earmarked funding to international organizations.
- Multilateral ODA, which includes core contributions to multilateral agencies such as WHO, UNFPA, GFATM, GAVI, UNAIDS, UNICEF, PAHO, the World Bank, and other regional development banks. Only regular budgetary contributions to these institutions can be reported to the OECD-DAC; hence, extrabudgetary funds, including earmarked contributions that donors can report as bilateral ODA, are not included as multilateral ODA. Only 70% of core contributions to WHO can be counted as multilateral ODA.

b. Official development finance (ODF), which includes grants and loans made by multilateral agencies.

The DAC aggregate tables include all multilateral development banks, GFATM, operational activities of UN agencies and funds, and a few other multilateral agencies. The project-level data in the CRS cover a smaller subset of multilateral institutions, including UNAIDS, UNFPA, UNICEF, public-private partnerships including GAVI and GFATM, some development banks, and BMGF, but do not reflect the core-funded operational activities of WHO, disbursements by GAVI prior to 2007 and BMGF prior to 2009, or all loans from the World Bank.

For the purposes of tracking bilateral DAH, we relied principally on the CRS. This is because the DAC aggregate tables do not report detailed project-level information about the recipient country and disease focus of the flows. We identified all health flows in the CRS using the OECD sector codes for general health (121), basic health (122), and population programs (130).

To avoid double-counting, we subtracted from bilateral ODA all identifiable earmarked commitments and disbursements made by DAC members via GAVI, International Finance Facility for Immunisation (IFFIm), GFATM, WHO, UNICEF, UNAIDS, UNFPA, and PAHO using the channel of delivery fields as well as keyword searches in the descriptive project fields (project title, short description, and long description). Research funds for HIV/AIDS channeled by the US government through the National Institutes for Health (NIH) were also removed from the total since they do not meet our definition of DAH as contributions from institutions

whose primary purpose is development assistance. We did not count ODF from the CRS due to the fact that we collected data on multilateral institutions relevant to our study and BMGF directly from their annual reports, audited financial statements, and project databases. We also disregarded multilateral ODA. To avoid double-counting, we only counted as health assistance flows *from* multilateral institutions to low- and middle-income countries and not transfers *to* multilateral institutions.

Both the DAC tables and the CRS rely on information reported by DAC members and other institutions to the OECD-DAC. Hence, the quality of the data varies considerably over time and across donors. There were two main challenges in using the data from the CRS for this research. The first was the underreporting of aid activity by DAC members to the CRS. Prior to 1996, the sum of the project-wise flows reported to the CRS by donors was less than the total aggregate flows they reported to the DAC aggregate tables. OECD uses total CRS commitments as a fraction of DAC aggregate commitments to construct a coverage ratio for the CRS database.[35] Figure 1.1 displays total health commitments from the DAC and the CRS, disbursements from the CRS (the DAC does not report disbursements), and the aggregate coverage ratio of health commitments in the CRS to health commitments in the DAC from 1990 to 2009. The coverage in the CRS was well below 100% prior to 1996, but it has improved considerably since then. In some years, notably 2006, members appeared to be reporting more commitments to the CRS than the DAC. The second problem relates to the underreporting of disbursement data to the CRS. Several donor countries did not report their annual disbursements and only reported project-wise commitments to the CRS prior to 2002. The orange line for observed disbursements in Figure 1.1 shows that the variable is more complete in recent years, but it drops well below commitments in years prior to 2002.

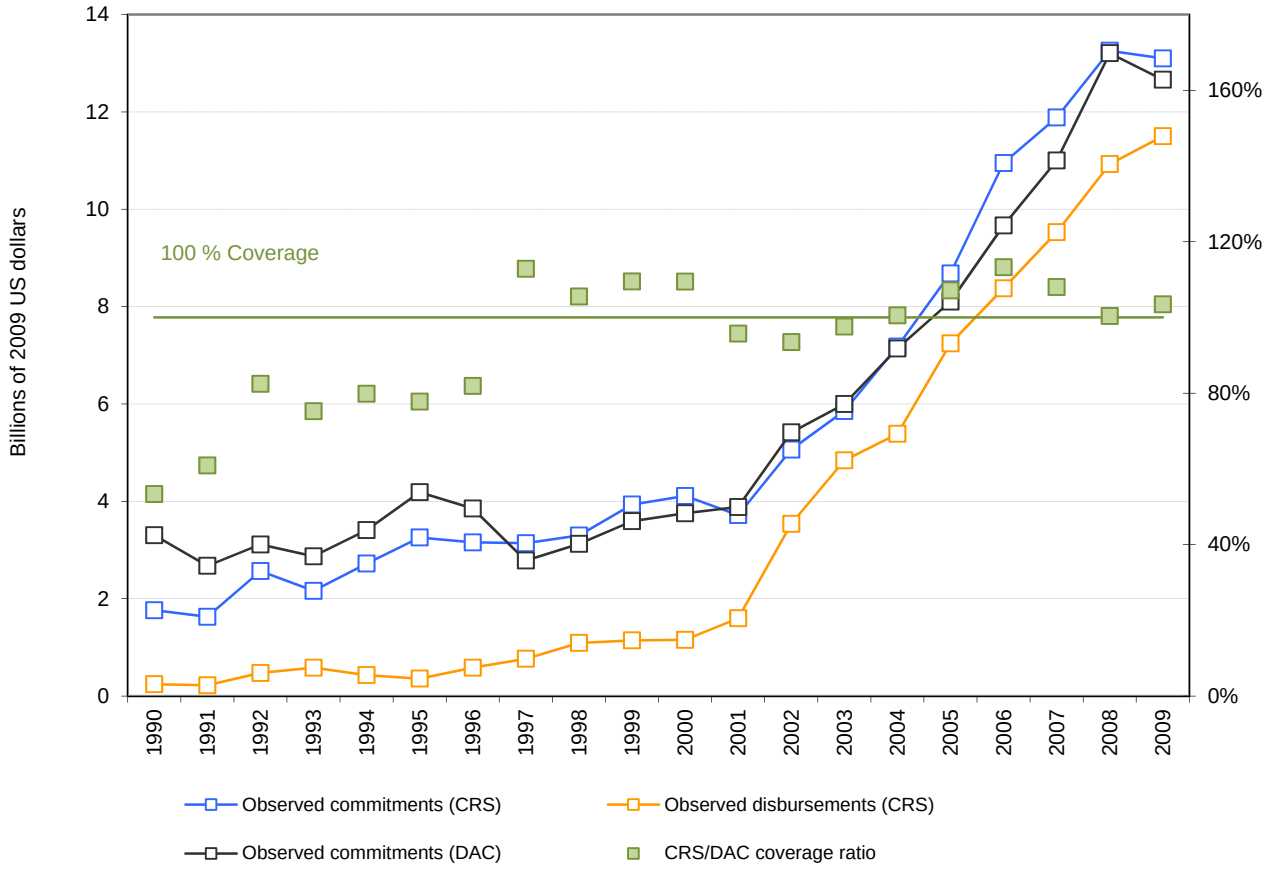
We developed methods for accounting for both these sources of discrepancy and arrived at consistent estimates of disbursements. Since the method followed for the EC differed from that followed for the 23 member countries of the DAC, they are described in different sections below. The final section describes how we estimated disbursements for general budget support and debt relief. Refer to Part 7 for details on how we estimated the cost of providing technical assistance and program support for these institutions.

We converted all disbursement sequences into real 2009 US dollars by taking disbursements in nominal US dollars in the year of disbursement and adjusting these sequences into real 2009 US dollars using US GDP deflators. We also explored converting disbursements from current to constant local currency units using local currency deflator sequences, and then to US dollars using exchange rates in a single year. The alternative methods led to significant differences in the case of some currencies. We picked the first method to make bilateral flows comparable with other flows in the study that are all denominated in dollars.

Figure 1.1

Commitments and disbursements by bilateral agencies

The graph compares estimates from the CRS and DAC tables from 1990 to 2009. "Observed" refers to the fact that these quantities are taken as reported by donors to the OECD, without any corrections for missing data or discrepancies between the CRS and the DAC.

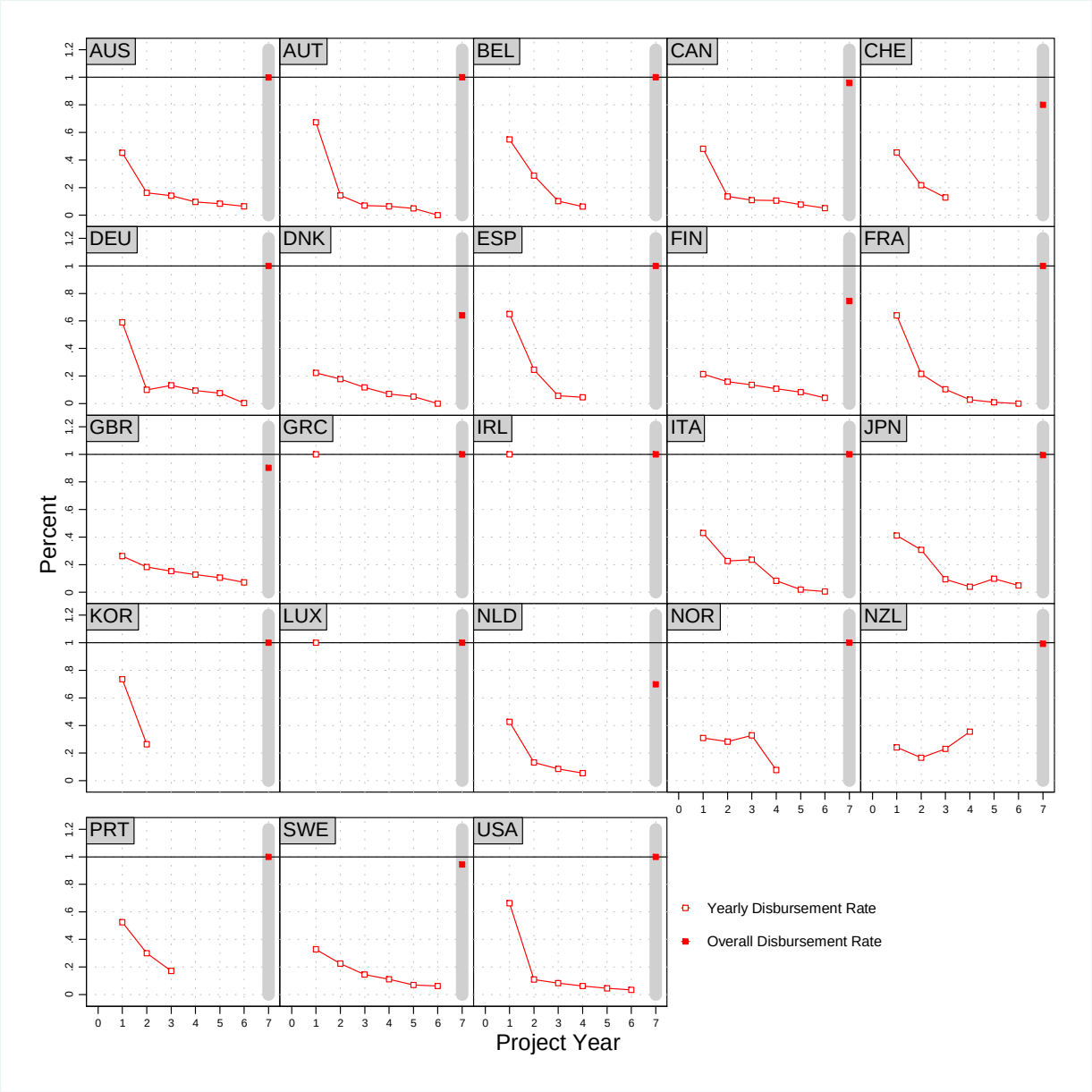


Source: OECD-DAC aggregate tables and OECD Creditor Reporting System

Figure 1.2

Disbursement schedules for the 23 DAC member countries

AUS = Australia, AUT = Austria, BEL = Belgium, CAN = Canada, CHE = Switzerland, DEU = Germany, DNK = Denmark, ESP = Spain, FIN = Finland, FRA = France, GBR = Great Britain, GRC = Greece, IRL = Ireland, ITA = Italy, JPN = Japan, KOR = South Korea, LUX = Luxembourg, NLD = the Netherlands, NOR = Norway, NZL = New Zealand, PRT = Portugal, SWE = Sweden, USA = United States of America



Source: OECD Creditor Reporting System

Estimating disbursements for 23 DAC member countries

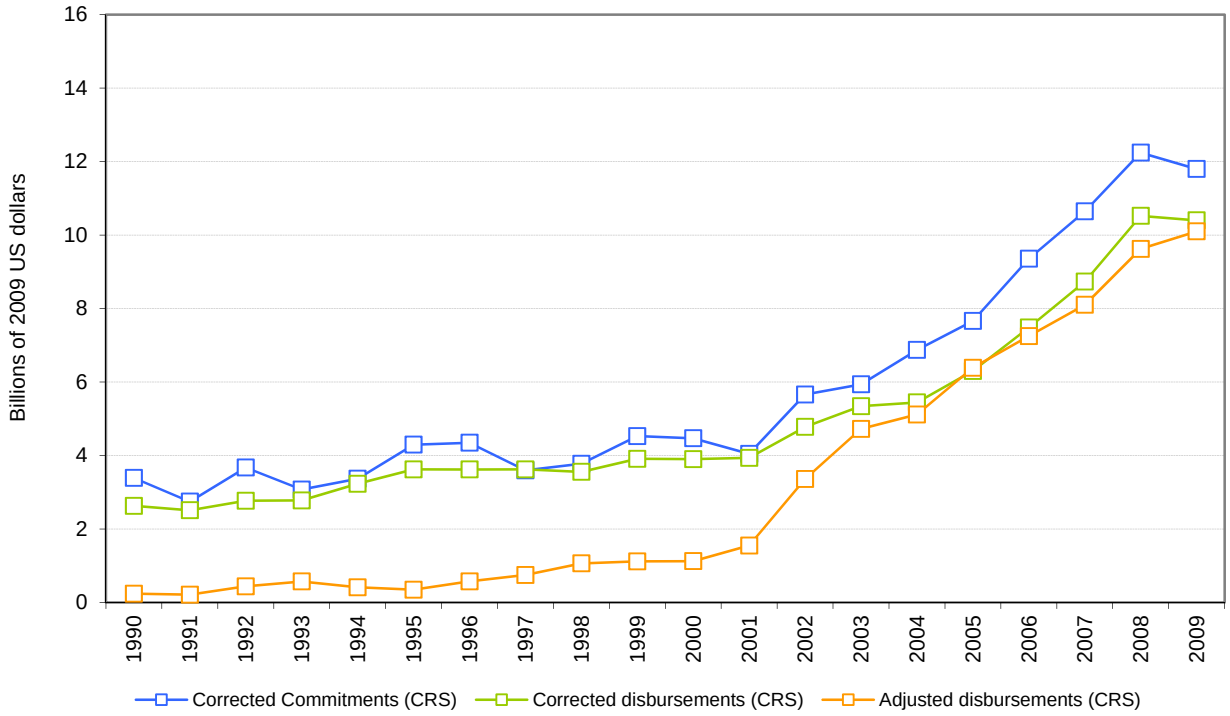
Given the low coverage of commitments in the CRS between 1990 and 1996, we adjusted all CRS commitments for the health sector upward using the coverage ratios observed for each donor. In cases where CRS coverage exceeded 100%, CRS commitments were used as observed. To correct for missing disbursements, we pooled completed projects in the CRS for each donor and computed both yearly project disbursement rates (the fraction of total commitments disbursed for each observed project year) and overall project disbursement rates (the fraction of total commitments disbursed over the life of each project). We

produced six-year disbursement schedules by taking the median yearly disbursement rates for each donor and normalizing the yearly rates using the median overall disbursement rates. Figure 1.2 shows the disbursement schedules and overall disbursement rates for each of the 23 member countries. To estimate yearly disbursements, we applied the disbursement schedule to each donor's observed commitments net of grants through IHME's channels of assistance.

Figure 1.3

Commitments and estimated disbursements by bilateral agencies

Total commitments net of transfers to other channels, after correction for low coverage in the CRS, are shown in blue; total disbursements reported in the CRS net of transfers to other channels, are in orange; and the corrected disbursement series based on the corrected commitment sequence and the estimation model are shown in green.



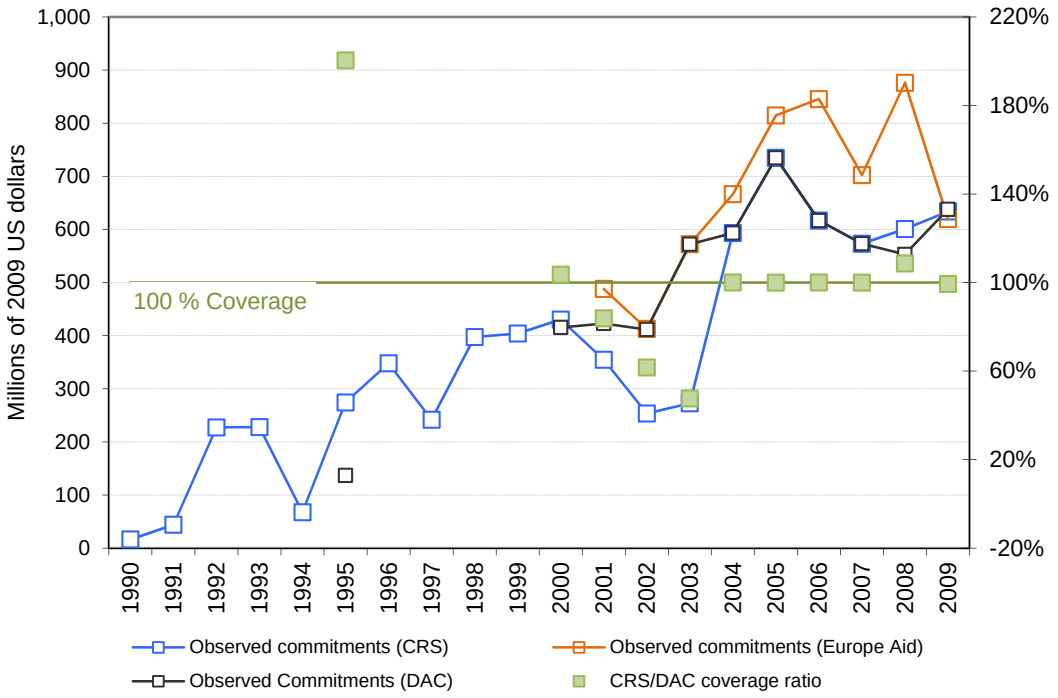
Source: IHME DAH Database 2010

Figure 1.3 shows the results. The blue "corrected commitments" line corresponds to aggregate commitments both net of transfers to other institutions tracked by this project and corrected for coverage deficits prior to 1996. The orange "adjusted disbursements" line shows disbursements from the CRS after adjusting for funds transferred to other global health channels of assistance. The green "corrected disbursement" line corresponds to our estimate of annual disbursements modeled from the corrected commitments. Prior to 2002, the corrected disbursements are well above adjusted disbursements, reflecting the underreporting of disbursements in the CRS; after 2002, adjusted disbursements and corrected disbursements track each other closely.

Figure 1.4

EC's commitments

Commitments as reported by the EC to 1) the CRS, 2) the DAC tables, and 3) in its annual reports are in blue, gray, and orange, respectively. The discrepancy between the CRS and the DAC tables is shown by the coverage ratio shown in green.



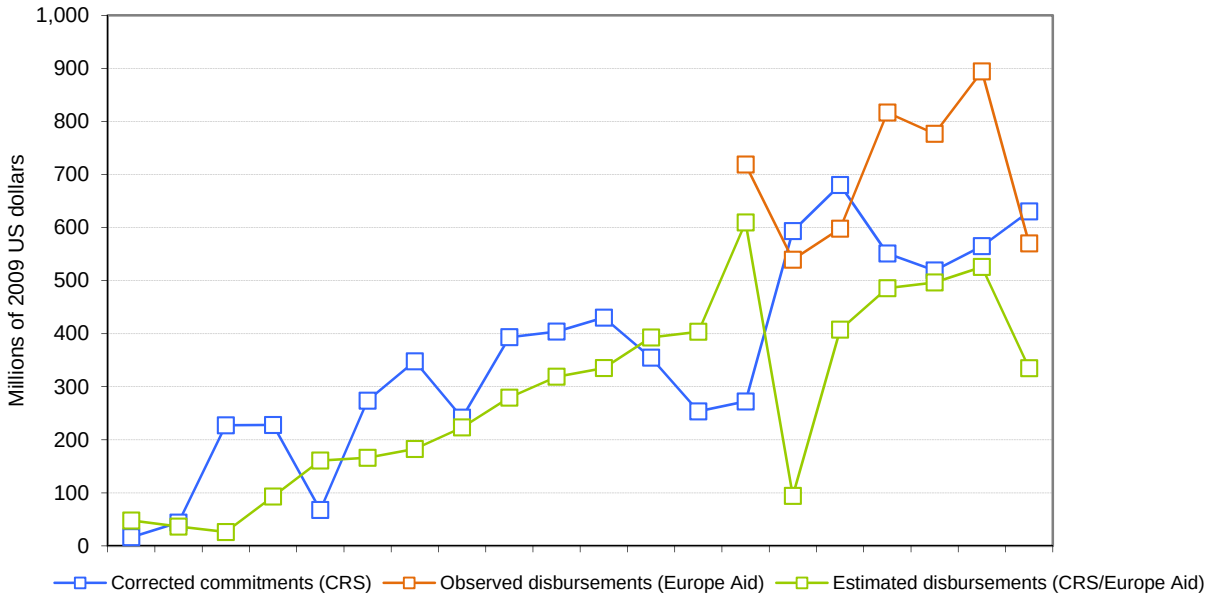
Source: OECD-DAC, OECD Creditor Reporting System, and Europe Aid Annual Reports

Estimating disbursements for the EC

Europe Aid annual reports released by the EC are available online from 2001 onward.[7] Starting in 2003, the reports included data on annual disbursements. Figure 1.4 shows commitment time series from different sources. Flows shown in the EC report include regular and extrabudgetary contributions to multilateral agencies, resulting in numbers that are larger than those in the CRS for the same years. We applied a hybrid approach to generate a time series of disbursements for the EC, combining data from both sources.

Specifically, from 1990 to 2003, we started with the sequence of commitments from the CRS, net of any transfers to other channels of assistance in our study. This is shown in Figure 1.5 in blue. We estimated disbursements using a three-year moving average of past commitments, shown in this figure in green from 1990 to 2003. From 2003 onward, we used disbursements reported by the EC in its annual reports (shown in orange) and subtracted from it any transfers to other channels of assistance, as reported by the channels. The green line from 2003 to 2009 shows the result of this calculation. The dip in 2004 is the result of EC's grant of $270 million to GFATM as well as $188 million in extrabudgetary contributions to WHO and UNFPA that year.

Figure 1.5
Estimated disbursements by the EC
The green line shows the complete time series included in the estimates of DAH.



Source: OECD Creditor Reporting System, Europe Aid Annual Reports, and IHME DAH Dataset 2011

Estimating disbursements for GBS and debt relief

To estimate aggregate disbursements on general budget support (GBS) commitments, disbursement schedules were estimated for each donor as described above. The disbursement schedules were applied to observed commitments to predict disbursements prior to 2002 when reported disbursements were highly incomplete. The CRS database tracks seven types of debt relief operations: debt forgiveness, rescheduling and refinancing, relief of multilateral debt, debt for development swap, other debt swap, debt buy-back, and other action related to debt. All debt relief commitments, except for other action related to debt, were pooled. As debt relief commitments are reported in a lump sum amount that is equivalent to the forgiven principal and interest due in the future, we estimated the stream of yearly principal and interest payments due each year in the future by assuming an average duration of forgiven loans at 10 years. We uniformly allocated debt relief commitments evenly over this duration to obtain estimates of yearly disbursements.

Preliminary estimates for bilateral aid agencies and the EC as channels of assistance

For each bilateral channel, data were extracted from a variety of sources, which are presented in Table 1.2. These data were used to estimate DAH for 2010 and 2011, assuming that trends in budgeting reflect trends in disbursements. We attempted to obtain global health budgetary data whenever possible, but these detailed data were not available for all years and bilateral channels. For most bilateral channels, general ODA budgets were used due to lack of global health ODA budget data. When budget data were unavailable or of poor predictive quality, alternative measures of planned expenditures were used.

We regressed the disbursement series for all available years (1990-2009) on these budget measures using a natural-log transformed linear model. We then used the regression coefficients and observed budget data to predict DAH for 2010-2011. In addition, we tested not only disbursements based on current budgets, but also

lagged budgets of one to four years, based on the idea that expenditures may lag reported budgets. Model choice and preliminary estimates were based not only on model fit, but more importantly, on validity and consistency between trends in recent years' DAH and 2010-2011 trends. Model choices are also presented in Table 1.2.

We were unable to locate budget data for Greece. Budget data for the EC were inconsistent and did not match the disbursement series. For these channels, we estimated DAH from 2010 to 2011 by applying annual percentage changes in aggregate DAH for the remainder of the bilateral universe, or a selected subset of relevant channels (presented in Table 1.2). Budget data for Austria were also inconsistent. In this case, we regressed DAH/GDP on GDP per capita for all bilateral agencies and all available years and then used the regression coefficients and Austria's GDP per capita to predict DAH for 2010-2011.

Table 1.2:
Summary of additional data sources and model choices used for preliminary estimates of DAH

Channel	Data source	Variables used	Years used	Model used
Australia	Australia's International Development Assistance (2008-2011); Australia's Overseas Aid Program (1998-2008)[36]	Health ODA: International development assistance budget	1998-2011	4-year lagged budget
Austria	International Monetary Fund GDP series; United Nations population series	GDP in constant 2009 USD; population numbers by country	1990-2011	Estimated DAH/GDP based on GDP per capita
Belgium	Project Budget General – general expenses[37]	General ODA: Foreign affairs, foreign trade development and cooperation;	2000-2011	Current budget
Canada	Canadian International Development Agency – Report on Plans and Priorities[38]	General ODA: Financial summary – planned spending	1996-2011	3-year lagged budget
Denmark	Correspondence[39,40]	General ODA: Budgeted expenditures on overseas development assistance	2000-2011	Current budget
EC	General budget[41]	Data not used as they were inconsistent with disbursements	–	Estimated bilateral trends of European channels
Finland	Document Assembly in budget years 1998-2011[42]	General ODA: Ministry of Foreign Affairs' administrative appropriations, international development	2002-2011	Current budget
France	Finance bills 2004-2011, general budget[43,44]	General ODA: Finance bill's ODA development – solidarity with developing countries	2004-2011	1-year lagged budget
Germany	Plan of the Federal Budget[45-47]	General ODA: Development expenditure	2001-2011	Current budget
Greece	Unable to locate budget data	–	–	Estimated DAH trends of all bilateral channels
Ireland	Department of Finance – budget 2000-2004; Estimates for Public Services and Summary Public	General ODA: Summary of adjustments to gross current estimates – international co-	2002-2011	Current budget

	Capital Programme, 2005-2011[48]	operation		
Italy	Ordinary Supplement to "Official Journal" – Ministry of Foreign Affairs[49-50]	General ODA: Provision for Ministry of Foreign Affairs – development and management challenges global	2006-2011	1-year lagged budget
Japan	Highlights of the Budget for FY1999-2011[51,52]	General ODA: Major budget expenditures	2003-2011	2-year lagged budget
Korea, South	Korea International Cooperation Agency (1991-2010)[53]	General ODA: Total bilateral aid expenditure	1991-2010	2-year lagged budget
Luxembourg	Gazette Grand Duchy of Luxembourg[54]	General ODA: Ministry of Foreign Affairs – budgeted international development cooperation and humanitarian aid	2001-2011	1-year lagged budget
Netherlands	Netherlands International Cooperation Budget (2001-2011)[55]	General ODA: Total annual official development assistance expenditure	2001-2011	1-year lagged budget
New Zealand	Vote Foreign Affairs and Trade (1998-2001); VOTE Official Development Assistance (2002-2011)[56]	General ODA: Total annual official development assistance expenditure	1998-2011	3-year lagged budget
Norway	Correspondence[57]	General ODA: ODA budget	2006-2009	Current budget
Portugal	Ministry of Finance and Public Administration State Budget 2003-2011[58]	General ODA: Integrated service expenditure – external cooperation budget	2003-2011	Current budget
Spain	Annual Plan of International Cooperation[59]	General ODA: Net Spanish ODA instruments and modalities	2003-2011	Current budget
Sweden	Correspondence[60,61]	General ODA: Ministry for Foreign Affairs budgets for expenditure – international development cooperation	2000-2011	Current budget
Switzerland	Foreign Affairs (2001-2006); Budget – Further Explanations and Statistics (2008-2011)[62,63]	General ODA: Direction of development and cooperation (2000-2006); foreign affairs – international cooperation, development aid (in the South and East) (2008-2011)	2000-2011	Current budget
United Kingdom	Budget[64]	General ODA: Department expenditure limits – resource/ current and capital budgets	1998-2011	1-year lagged budget
United States	President's Budget[65]	Global health ODA: Global health appropriations from international assistance programs (2002-2006); global health appropriations from Department of State and other international programs (2007-2011) and the Department of Health and Human Services	2004-2011	Current appropriations

UN agencies				
WHO	Financial Reports[66]	Total disbursements: Statement of performance by major funds – total operating expenses; program budget utilization (2008-2011)	2001-2011	Current budget
UNAIDS	Unified Budget and Workplan, bienniums 2002-2011[67]	Total commitments: Distribution of resources by agency	2002-2011	Two-part model: UBW and non-UBW, current imputed budget
UNICEF	Financial report and audited financial statements;[68] 2009 Annual Report[69]	Total income	2001-2010	2-year lagged income
UNFPA	Estimates for the biennial support budget, 2002-2011	Total use of resources	2002-2011	Current budget
PAHO	Proposed program budget[70]	Total regular budget, estimated voluntary contributions	2000-2011	Two-part model: voluntary and regular, 2-year lagged imputed budget
Development banks				
World Bank	Projects database (online)[14]	Commitments and disbursements for health sectors	1990-2011	Smoothed disbursements
African Development Bank	Online projects database[16] and Compendium of Statistics[17]	Health disbursements and commitments	1990-2011	Smoothed disbursements
Asian Development Bank	Online projects database[15]	Health disbursements and commitments	1990-2011	Smoothed disbursements
Inter-American Development Bank	Online projects database[18]	Health disbursements and commitments	1990-2011	Smoothed disbursements
Private organizations				
BMGF	Correspondence	2009 and 2010 global health disbursements; 2011 grant payout target	–	–
NGOs	VolAg (1990-2008),[24] GuideStar (2009), sample of top NGOs (2009-2010)[25]	Revenue breakdowns for: US public, non-US public, private, in-kind, BMGF; total overseas expenditures	1990-2009	Two-part model: DAH financed from US public, non-US
Foundations	Foundation Center database[31]	Total assets	1997-2011	Proxy trends in

				DAH by trends in assets
Public-private partnerships				
GAVI	Correspondence	2009 and 2010 total disbursements; 2011 estimated disbursements	–	–
GFATM	Records of disbursements	Disbursements from January to August; full-year disbursements	2001-2011	Ratio of full-year disbursements to disbursements from January to August

Part 2:

TRACKING DEVELOPMENT ASSISTANCE FOR HEALTH FROM THE DEVELOPMENT BANKS

The World Bank

In our original *Financing Global Health* report two years ago, we considered using multiple sources of information for tracking DAH from the two arms of the World Bank, the International Development Association (IDA) and the International Bank for Reconstruction and Development (IBRD). Ultimately we decided to rely on the online loans database for our DAH estimates to make our estimates replicable by others.[14] Last year, the World Bank provided us with aggregated annual health disbursement data for years 1990-2010, leading us to consider the possibility of utilizing these newly obtained data in an attempt to best estimate the World Bank's DAH for 2009 and 2010. Figure 2.1 shows the annual health disbursement data supplied by the World Bank compared to our estimates based on the online database. We ultimately chose to use data from the online database as it included more detailed project-level data and was more consistent with past analysis. This year, we continue utilizing this methodology.

The online database contains up to five sector codes and five theme codes that can be assigned to each project. Sector codes represent economic, political, or sociological subdivisions, while theme codes represent the goals or objectives of World Bank activities. These codes are summarized in Table 2.1. We used the sector codes in the database to calculate what fraction of the loan was for the health sector. We divided the cumulative disbursement for the loan by the observed duration of the loan to estimate annual disbursements on a calendar year basis. Projects that reported as ongoing did not contain disbursement data in the online database. To best track what was received directly from the World Bank, the cumulative commitment data for ongoing projects was divided by the known project length for the projects listed as active for 2006 onward.

Figure 2.1 shows annual commitment totals from the online database and annual disbursement data received from the World Bank. The discrepancy between them is a cause for concern and is an example of the data quality challenges that plague this work. Differences in commitments are likely a result of either or both of the following: 1) whether sector codes or theme codes (or a combination) are used to identify health projects and 2) for projects spanning multiple sectors or themes, whether the loan dollars for a project are fully assigned to each sector or theme, or whether the dollars are distributed according to the relative share of the project that was for each sector or theme. We used the sector codes in the online projects database to identify health loans and assigned dollars based on World Bank estimates of the share of the loan going to the health sector. Additionally, we used both keyword searches of project descriptions and project theme codes to assign disbursements to health focus areas.

Table 2.1
World Bank's health sector and theme codes

Health sector codes (Sector codes represent economic, political, or sociological subdivisions within society. World Bank projects are classified by up to five sectors.)	**Health theme codes** (Theme codes represent the goals or objectives of World Bank activities. World Bank projects are classified by up to five themes.)
Historic (prior to 2001): (1) Basic health (2) Other population health and nutrition (3) Targeted health (4) Primary health, including reproductive health, child health, and health promotion **Current (as of 2001):** (1) Health (2) Compulsory health finance (3) Public administration – health (4) Noncompulsory health finance	Current: (1) Child health (2) HIV/AIDS (3) Health system performance (4) Nutrition and food security (5) Population and reproductive health (6) Other communicable diseases (7) Injuries and noncommunicable diseases (8) Malaria (9) Tuberculosis

The database distinguishes between loans from IDA and IBRD. Figures 2.2 and 2.3 show estimated disbursements for each of the arms of the World Bank, compared to the annual disbursement data that we received from the World Bank. In order to disaggregate IDA flows by source, we obtained data on yearly government contributions from the DAC statistics.[6] We also collected information on debt repayments and IBRD transfers to IDA from the audited financial statements.[71] Refer to Part 7 for details on how we estimated the cost of providing technical assistance and program support for these institutions.

Regional development banks

The ADB, AfDB, and IDB all maintain their own loan databases, which we used to estimate disbursements. The ADB reports only commitments for all projects. Hence, we estimated its annual disbursements by dividing each commitment reported in its loan database[15] by the duration of the project, and then summing the amounts in each year. The IDB's project database[18] provides cumulative disbursements. We divided those by the duration of the project to obtain annual disbursements. In 2010, the AfDB began providing an online project-level database[16] that provides cumulative commitment data for all projects and cumulative disbursement data for closed projects. To estimate annual disbursements for closed projects, we divided cumulative disbursements by the project length, and for ongoing projects, we divided cumulative commitment data by the average project length of all closed projects. However, when analyzing this new source, we found the disbursements for years prior to 2007 surprisingly low in comparison to previously gathered data from its Compendium of Statistics.[17] Due to this concern, we used the detailed data in the project-level database but also included the difference between what was reported in the Compendium of Statistics and the project-level database in our estimates of DAH. Table 2.3 summarizes the data sources. Figures 2.4, 2.5, and 2.6 summarize commitment and disbursement time series for each of the three banks. Refer to Part 7 for details on how we estimated the cost of providing technical assistance and program support for these institutions.

Preliminary estimates for the development banks

The methodology used to generate preliminary estimates for the development banks are identical to the methods used to estimate disbursements from 1990-2009. For the World Bank, IDB, and ADB, we obtained project-level commitments and disbursements for the years 1990-2011 from their respective online projects databases. We used health disbursement data from the AfDB's Compendium of Statistics and its online projects database. We applied a smoothed disbursement model, using the methods described in the previous section to estimate DAH for years 2010-2011. While all development banks have reported their complete 2010 project commitments, 2011 project commitments may be incomplete due to lags in reporting. Thus, preliminary estimates of DAH in 2011 are potentially underestimated.

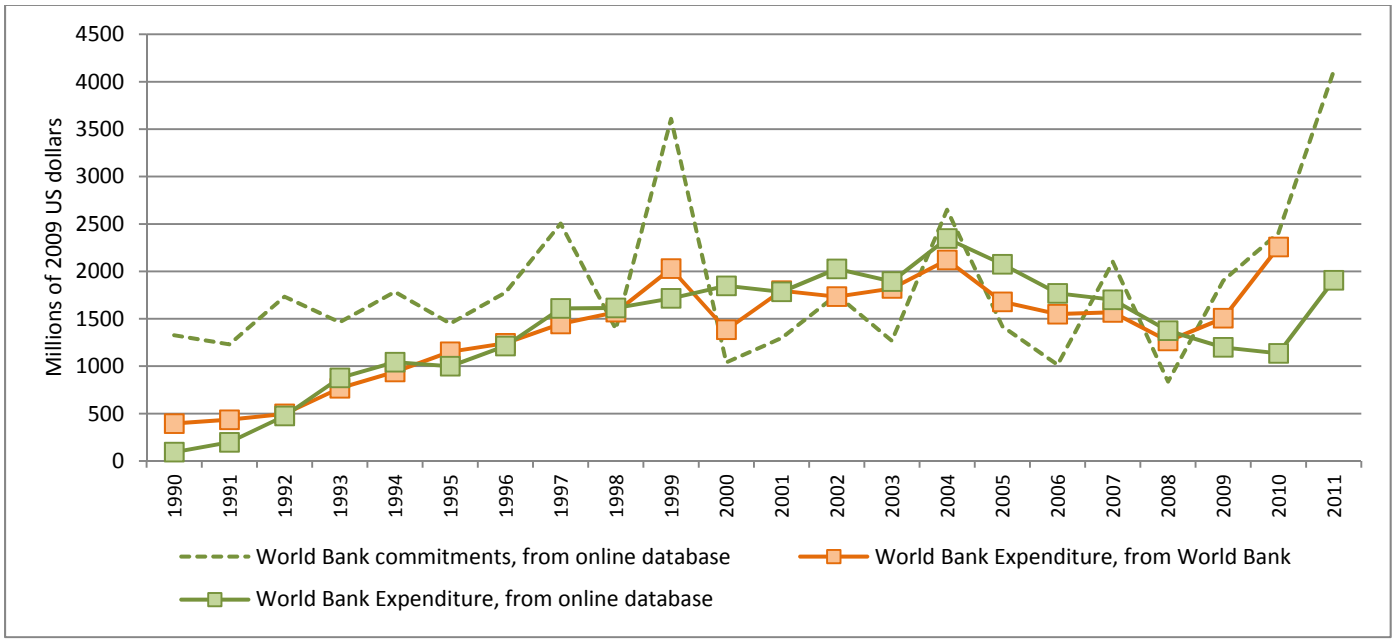
Projects reported as currently active do not report cumulative disbursements, and thus commitments are used to estimate disbursements. We assumed the length of active projects to be the average length of closed projects and divided cumulative disbursements by the average project length to estimate yearly disbursements.

For the World Bank, we used commitment data as a proxy for disbursements for active projects from 2006 onward as this method produced more consistent estimates when compared to yearly disbursement amounts that we received from the World Bank.

Figure 2.1

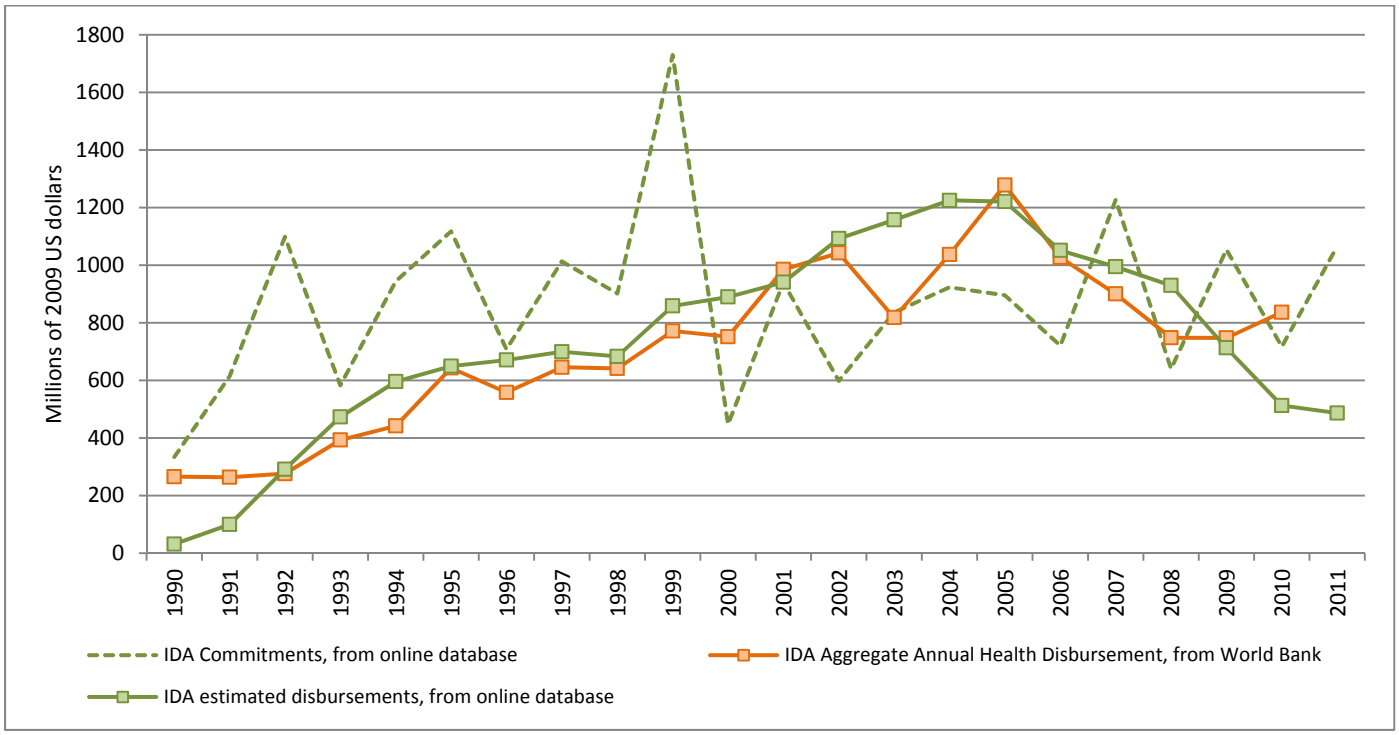
World Bank's annual commitments and disbursements

The graph shows health sector loan commitments and disbursements in green from the online database. The orange line shows annual health disbursements data received from the World Bank.



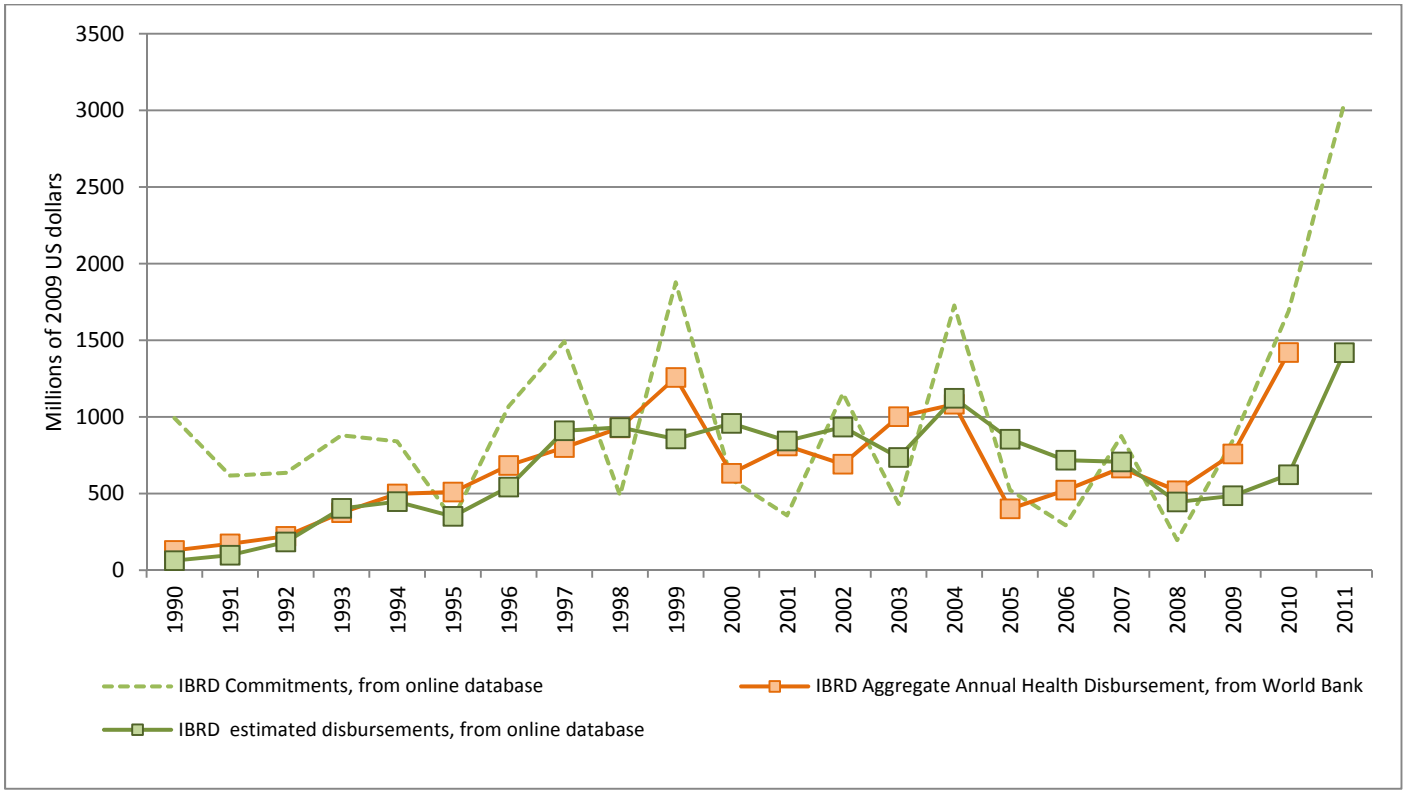
Source: IHME DAH Database 2011 and correspondence with World Bank

Figure 2.2
IDA's estimated commitments and disbursements



Source: IHME DAH Database 2011 and correspondence with World Bank

Figure 2.3
IBRD's estimated commitments and disbursements



Source: IHME DAH Database 2011 and correspondence with World Bank

Table 2.2

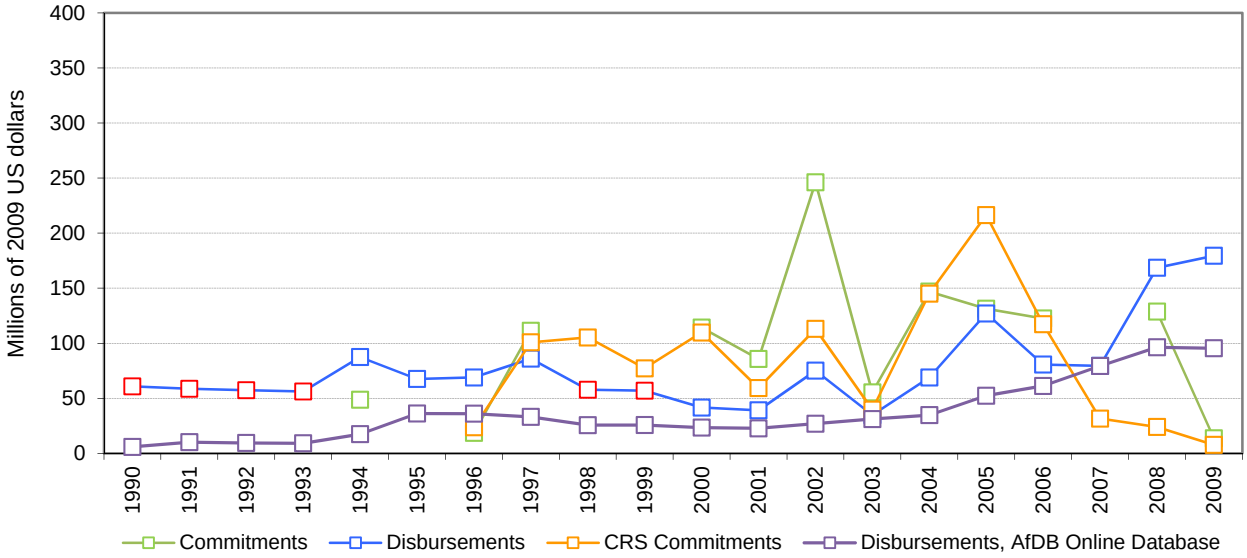
Summary of data sources for the regional development banks

Institution	Data source	Commitments	Cumulative disbursements	Yearly disbursements	Notes
African Development Bank	Compendium of Statistics	X	–	X (Aggregate - not at the project level)	The compendium of statistics was not available for 1990-1993, 1995, and 1998-1999; we estimated yearly disbursements using the average of neighboring disbursements.
	Online Projects Database	X	X	–	As yearly disbursement amounts are not provided in the online database, we estimated yearly disbursements by uniformly allocating commitments over each year of the project.
	OECD - Creditor Reporting System	X	–	X	To maintain continuity with previous estimates, yearly disbursement amounts from the CRS were not used.
Asian Development Bank	Online Projects Database	X	X	–	As yearly disbursement amounts are not provided in the online database, we estimated yearly disbursements by uniformly allocating commitments over each year of the project.
	OECD - Creditor Reporting System	X	–	–	
Inter-American Development Bank	Online Projects Database	X	X	–	As yearly disbursement amounts are not provided in the online database, we estimated yearly disbursements by uniformly allocating cumulative disbursements over each year of the project.
	OECD - Creditor Reporting System	X	–	X	Yearly disbursement amounts only began to be reported in 2009, so the CRS was not a viable source.

Figure 2.4

Commitments and disbursements by AfDB

The green lines show data from AfDB's compendium of statistics, while commitment data from the CRS are shown in orange. The red squares correspond to years in which disbursement data from the compendium of statistics were missing and were estimated from neighboring values. The purple line shows the online project database. A combination of compendium of statistics and online project database was used in the DAH estimates.

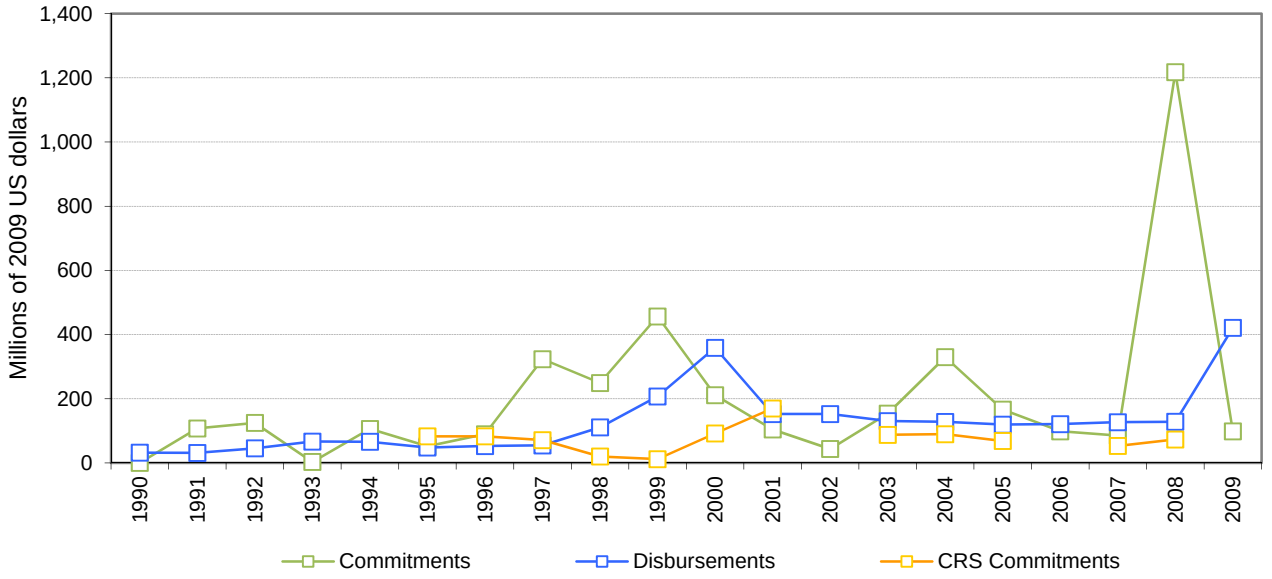


Source: IHME DAH Database (2011) and OECD-CRS

Figure 2.5

Commitments and disbursements by ADB

Disbursement data from ADB's project database, shown here in blue, were the basis for our DAH estimates.

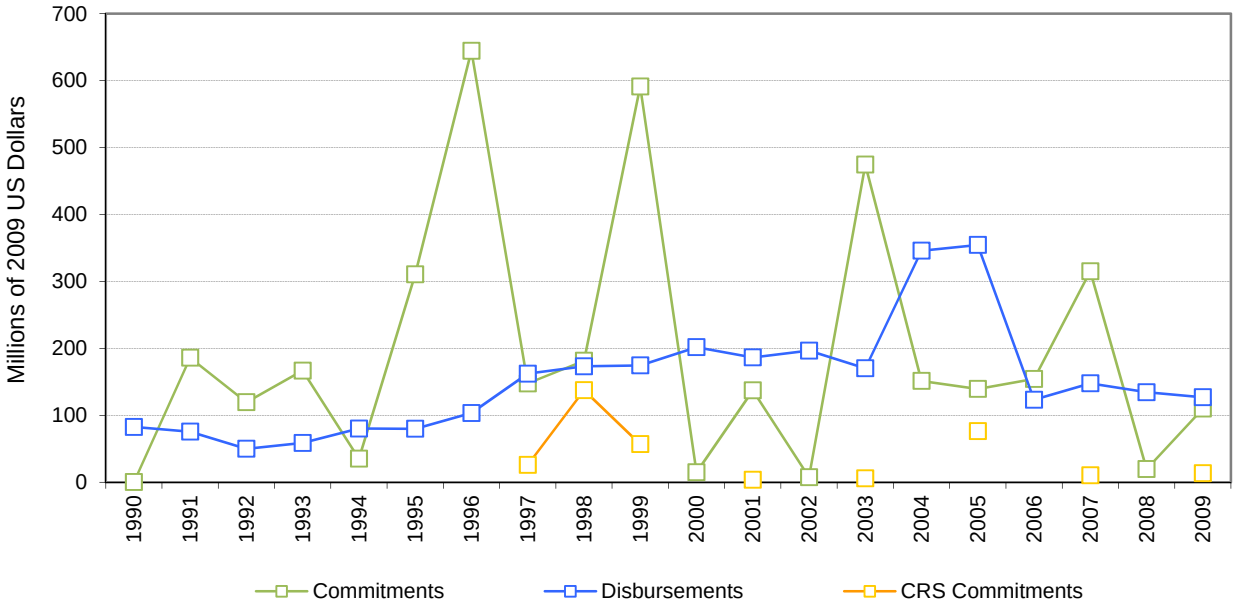


Source: IHME DAH Database (2011) and OECD-CRS

Figure 2.6

Commitments and disbursements by IDB

Disbursement data from IDB's project database, shown here in blue, were the basis for our DAH estimate.



Source: IHME DAH Database (2011) and OECD-CRS

Part 3:

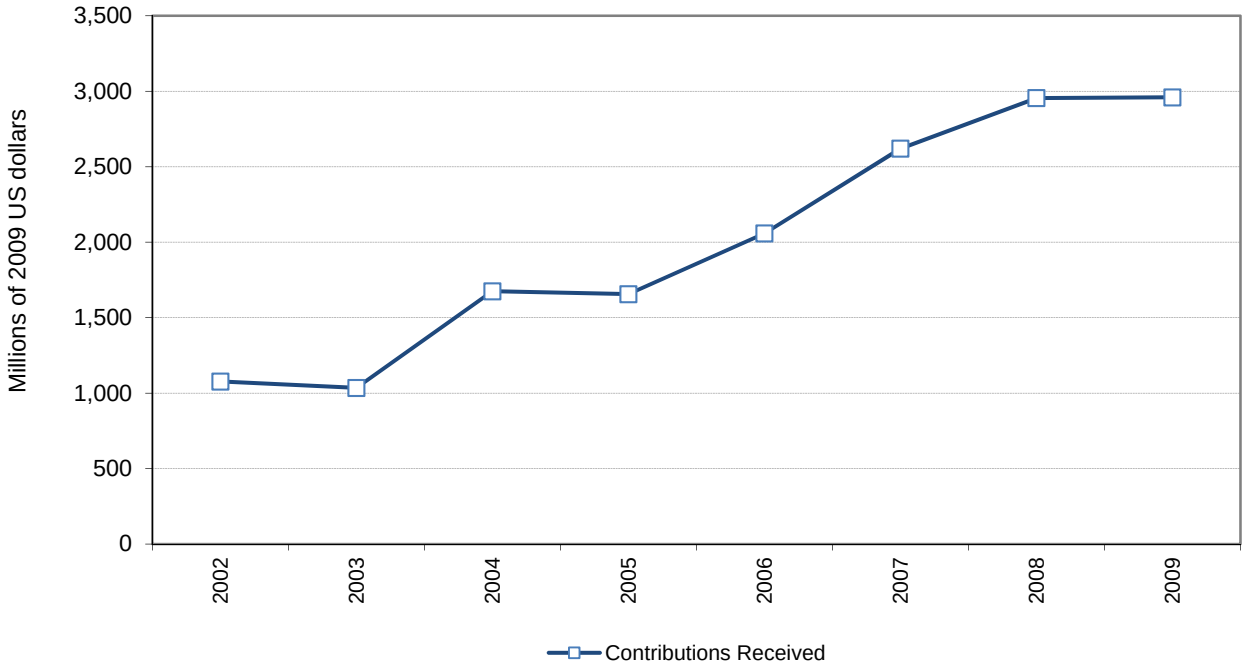
TRACKING CONTRIBUTIONS FROM GFATM AND GAVI

GFATM

The grants database made available online by GFATM provides grant-wise commitments and annual disbursements.[22] In addition, we used the contributions dataset that can also be found on the GFATM website to compile data on the source of funding for GFATM.[23] Finally, we extracted information on annual income and expenditure from GFATM's audited financial statements.

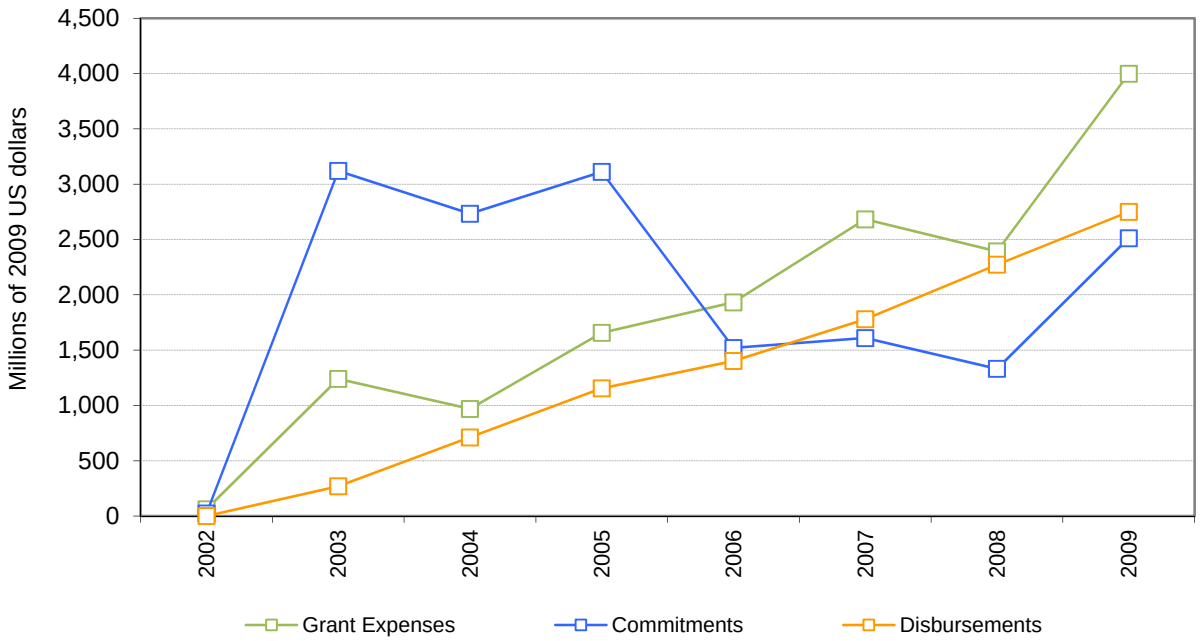
Figure 3.1 shows GFATM's annual contributions received from public and private sources. Figure 3.2 shows GFATM's annual commitments and disbursements from its project database and total grant expenses reported by GFATM in its financial statements. Grant expenses, shown in the graph in green, include both grants disbursed in that year as well as movements in undisbursed grants (which represent the portion of approved grants that had not been disbursed as of the date of the financial statement). Due to the accrual basis of accounting, grant expenses are consistently higher than actual grants disbursed during the year, shown in orange in the graph, which is the quantity we counted toward DAH. Refer to Part 7 for details on how we estimated the cost of providing technical assistance and program support for GFATM.

Figure 3.1
Contributions received by GFATM



Source: GFATM pledges and contributions

Figure 3.2
GFATM's commitments, disbursements, and grant expenses



Source: IHME DAH Database 2011

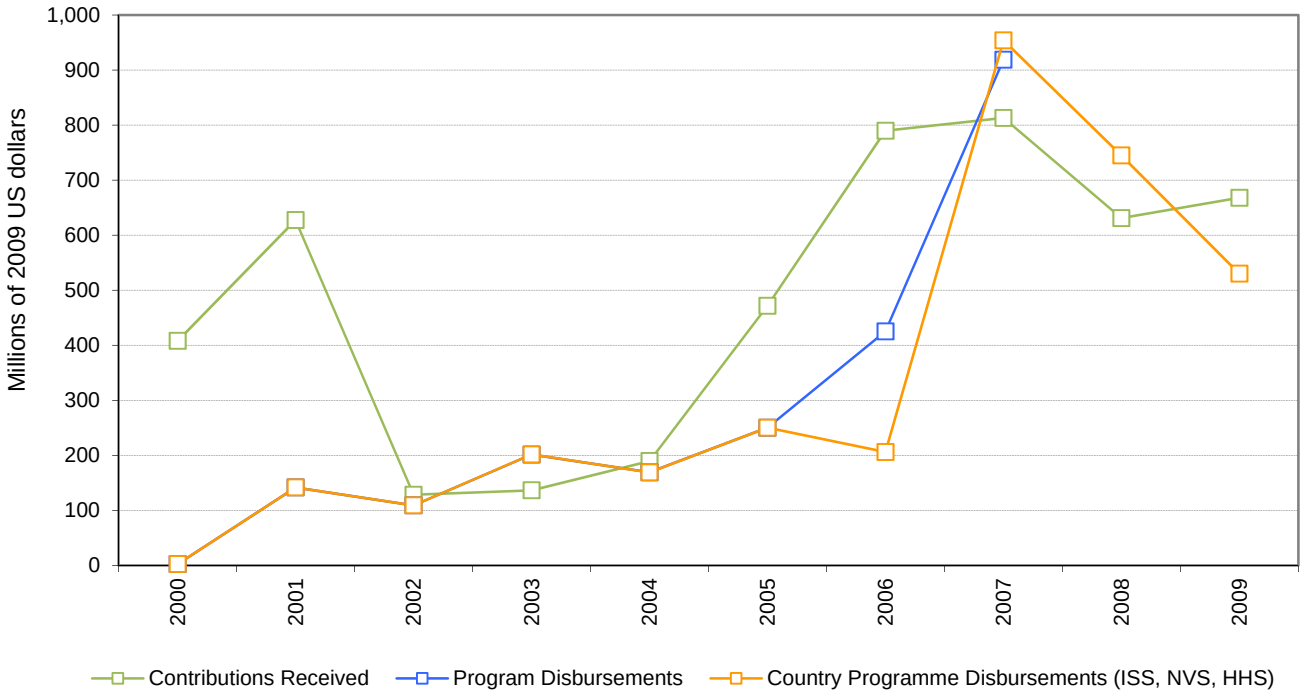
GAVI

From GAVI's annual report in 2007, we drew its program disbursements for every year since 2000.[19] GAVI provides data on contributions received from different sources on its website.[21] The country fact sheets[20] provided on the website also report GAVI's disbursements for each recipient country; however, the transfers are shown graphically, and the underlying data were not provided. From 2000 to 2005, we were able to obtain the underlying data from GAVI upon request. For 2006, we constructed estimates of country-wise GAVI disbursements from the graphs contained in the country fact sheets. For 2007 through 2009, we were able to obtain the underlying data from the CRS.[6] There are differences in the accounting method (cash versus accrual) among these various sources, complicating the assessment. The different data sources for GAVI are summarized in Table 3.1.

Figure 3.3

GAVI's income and disbursements

Contributions received by GAVI, its country disbursements, and its total program disbursements are shown. Country program disbursements from 2007 to 2009 are derived from the CRS.



Source: IHME DAH Database 2011, GAVI Alliance Progress Report

Table 3.1
Summary of data sources for GAVI

Source document/ database	Contributions by donor	Expenditure	Disbursements	Notes/ modification to data
Annual progress reports	–	X	X	
Contributions data available on GAVI website	X	–	–	
Country fact sheets on GAVI website	–	–	X	Disbursements are only shown graphically. Our annual estimates are based on the underlying data, provided upon request.
Country reports on GAVI website	–	–	X	Disbursements reported in dollars for Immunization Support Services; for new and underused vaccine support, the number of vaccine doses delivered is reported.
Financial statements	–	X	–	–
OECD Creditor Reporting System (CRS)	–	–	X	Disbursements reported to OECD-CRS began in 2007

GAVI's income from contributions and disbursements is shown in Figure 3.3. Total program disbursements, shown in blue, were the same as country program disbursements until 2005. Since then, using funds made available through IFFIm, GAVI has scaled up support to GAVI partners (for new initiatives such as Global Polio Eradication and Measles) and funds for Pentavalent vaccine procurement. We believe that this explains the gap between total program expenditure and country-based expenditure in 2006. This gap was greatly reduced in 2007. This is due to the fact that the 2007 data reported by GAVI to the CRS seem to be more comprehensive than the data we used to approximate 2006 country disbursements (derived from country fact sheets). We were unable to obtain total program expenditure past 2007.

Preliminary estimates for GFATM and GAVI

For GFATM, in order to account for changing trends in disbursement rate within a calendar year, we regressed GFATM disbursements from January to December on GFATM disbursements from January to August using data from years 2003 to 2010. We then used the regression coefficients and GFATM disbursements from January to August in 2011 to predict full-year GFATM disbursements in 2011. Next, we up-adjusted these numbers to account for in-kind DAH and remove double-counting. We did this by regressing IHME's GFATM DAH sequence from 2002 to 2009 that includes corrections for these issues on the predicted full-year GFATM and then using the regression coefficients to predict for 2010-2011. The results demonstrated validity and consistency between trends in recent years' DAH and 2010-2011 trends.

We did not model preliminary estimates of 2010-2011 DAH for GAVI, as we were able to obtain 2010 disbursements and expected 2011 disbursements through correspondence. Refer to Part 7 for details on how we estimated the cost of providing technical assistance and program support for GAVI.

Part 4:

TRACKING EXPENDITURE BY UN AGENCIES ACTIVE IN THE HEALTH DOMAIN

For the purposes of this research, we collected data on income and expenditures for five UN agencies: WHO, UNICEF, UNFPA, UNAIDS, and PAHO. The data sources and calculations for each are described in detail below.

WHO

We used annual reports and audited financial statements released by WHO to compile data on its budgetary and extrabudgetary income and expenditure.[13] Specifically, we extracted data on its assessed and voluntary contributions on the income side and both budgetary and extrabudgetary spending on the expenditure side from these documents. As the financial statements represent activities over a two-year period, both income and expenditure data were divided by two to approximate yearly amounts. Dollars were deflated using the US GDP deflator specific to the reporting year. We excluded expenditures from trust funds, regional offices tracked separately, and associated entities not part of WHO's program of activities, such as UNAIDS and GFATM trust funds. We also excluded expenditures from supply services funds, as these expenditures pertain to services provided by WHO but paid for by recipient countries.

UNFPA

We extracted data on income and expenditure for UNFPA from its audited financial statements.[11] As these statements represent activities over a two-year period, income and expenditure data were divided by two to approximate yearly amounts. Dollars were deflated using the US GDP deflator specific to the reporting year. The only exceptions to this rule were years 2006 through 2009, for which annual data were available. We excluded income and expenditures associated with procurement and cost-sharing activities from our estimates of health assistance. UNFPA uses cost-sharing accounts when a donor contributes to UNFPA for a project to be conducted in the donor's own country. Since this money can be considered domestic spending that goes through UNFPA before being returned to the country in the form of a UNFPA program, we do not include it in our totals. UNFPA's additional expenditures for these projects come from trust funds or regular resources and are therefore captured in our estimates. By excluding cost-sharing expenditures, we exclude only the amount spent on UNFPA projects that originally came from the recipient country. Income and expenditure for procurement services relate to services provided by UNFPA and WHO but paid for by recipient countries, and hence are excluded from our totals.

UNICEF

We extracted data on income and expenditure for UNICEF from its audited financial statements.[9,10] As these statements represent activities over a two-year period, income and expenditure data were divided by two to approximate yearly amounts. Dollars were deflated using the US GDP deflator specific to the reporting year.

Since UNICEF's activities are not limited to the health sector, we attempted to estimate the fraction of UNICEF's expenditure that was for health. UNICEF's annual reports in the early 1990s reported this number, but reporting categories changed over time, making it difficult to arrive at consistent estimates of health expenditure. For the years 2001 onward, we received health expenditure data from UNICEF directly.

We calculated the average fraction of expenditure for health for regular and supplementary funds from the most recent five years of these data and applied them to the expenditure reported in the financial reports for those years where health expenditure data were missing. In those years, we assumed that, on average, 13% of regular funds and 32% of extrabudgetary funds were utilized for health.

UNAIDS

UNAIDS income and expenditure data for both its core and noncore budgets were extracted from its audited financial statements.[8] As financial data are provided on a biennium basis, we divided the quantities by two to obtain yearly amounts. Dollars were deflated using the US GDP deflator specific to the reporting year.

PAHO

The Pan American Regional Office for WHO, PAHO, reports its income and expenditure in its biennial financial report.[12] Correspondence with WHO revealed that it reports only a small subset of the overall funds received by PAHO. According to the financial reports, WHO funds made up 12% and 11% of PAHO's total expenditures in the 2006-2007 and 2008-2009 bienniums. We excluded the funds transferred through the "Rotating Fund" as developing countries fund this procurement of health commodities, and it therefore does not fit our definition of DAH.

As the financial data are provided on a biennium basis, we divided the quantities by two to obtain yearly amounts. Dollars were deflated using the US GDP deflator specific to the reporting year.

Preliminary estimates for UN agencies

Similar to the bilateral channels, we extracted budget measures for the UN agencies. Model choice and budget measures for UN agencies are presented in Table 1.2. For WHO, UNICEF, and UNFPA, the budget measures were consistent with estimated disbursement sequences. Thus, we regressed disbursements (2002-2010 for WHO, 1990-2009 for UNICEF, 2000-2009 for UNFPA) on budget measures using a natural-log transformed linear model. We then used the regression coefficients and observed budget data to predict DAH for unknown years. Again, preliminary estimates were chosen based not only on model fit, but more importantly, on consistency and validity of estimates relative to recent trends in DAH.

For UNAIDS and PAHO, budget measures were available only for a subset of reported total disbursements. UNAIDS reports total expenditure, combining Unified Budget and Workplan (UBW) and non-UBW components, but only UBW budget data were available. PAHO reports disaggregated expenditures of voluntary and regular programs, but only regular budget data were available. Thus, a two-stage model was required to first impute unavailable budget measures, which were then used to estimate DAH in 2010-2011.

To impute the UNAIDS budget, we assumed the income ratio of UBW to non-UBW approximated the ratio of UBW to non-UBW budget. Thus, we applied this UBW / non-UBW income ratio to the UBW budget to impute the non-UBW budget. For PAHO, we used a LOESS time-smoothing model to estimate the voluntary budget in 2011, as income data were not available. We then regressed disbursements for all available years (1998-2009 for UNAIDS, 2002-2009 for PAHO) on imputed total budgets, again using a natural-log transformed linear model. We used the regression coefficients and imputed budget data to predict DAH for missing years. Preliminary estimates were chosen based on consistency and validity of estimates relative to recent trends in DAH.

Part 5:

TRACKING DEVELOPMENT ASSISTANCE FOR HEALTH FROM PRIVATE FOUNDATIONS

Previous studies on foundations outside the US have documented the severe paucity of reliable time series data and lack of comparability across countries.[72] Hence, we focused our research efforts on tracking US foundations. The Wellcome Trust, a foundation based in the United Kingdom, is reputed to be the single largest non-US foundation active in the area of health. However, since the Wellcome Trust is principally a source of funding for technology, including drugs and vaccine research and development, it does not meet our definition of a channel of development assistance. Other studies have estimated that the amount of resources contributed by non-US foundations for global health is small in comparison to resources from US-based foundations.[73] Therefore, we do not think excluding them significantly impacts the overall estimate of health aid. In future years, we hope to find better sources of data for tracking the contributions of non-US foundations.

The Foundation Center maintains a database of all grants of US $10,000 or more awarded by over 1,000 US foundations.[31] The Foundation Center codes each grant by sector and international focus and, therefore, is able to identify global health grants regardless of whether the principal recipient was located in the US or in developing countries. We received a customized data feed from the Foundation Center with estimates of total international health grant-making for each year from 1990 to 2004.[31] We obtained data on the top 50 US foundations giving to international health and total US foundation grants for international health for years 2005 to 2009 from the Foundation Center's website.[31]

BMGF has been the single most important and influential grant-making institution in the health domain since 2000; hence, we undertook additional research to accurately capture its annual disbursements, described below. We used the estimate provided by the Foundation Center for all remaining US foundations. One limitation of using the Foundation Center's database is that it does not distinguish between commitments and disbursements. Thus, the total grant-making figure for US foundations, except BMGF, derived from these data is not a precise estimate of total disbursements by these foundations. However, since the Foundation Center draws most of its data from tax filings with the US Internal Revenue Service (IRS), it is likely to capture disbursement figures for most foundations.

We collected BMGF's IRS 990PF filings, which reports all global health grants disbursed for years 1990-2007, and obtained actual disbursement data via correspondence for years 2008, 2009, and 2010 as well as anticipated disbursement data for 2011.[30] We also collected information on annual commitments from BMGF's online grants database for the years 1990-2007 and through correspondence for years 2008, 2009, and 2010.[74] We then manually coded all BMGF grants disbursed by recipient type, distinguishing between awards to other foundations, NGOs, universities and research institutions, UN agencies, public-private partnerships, and governments.

Given the volume of the Bloomberg Family Foundation's contributions of DAH for noncommunicable diseases, we gathered additional data from its tax forms to better understand its funding of this particular health focus area.[32]

Refer to Part 7 for details on how we estimated the cost of providing technical assistance and program support for US foundations.

Preliminary estimates for private foundations

For private foundations, we estimated DAH in 2010-2011 using percent changes in aggregate foundation total assets, as budget data for individual foundations were unavailable. At the time of analysis, total assets from the Foundation Center were available only until 2009, and thus we estimated assets in 2010-2011. We assumed that economic trends in both the public and private sectors would predict foundation funding and assets. Thus, we regressed aggregate foundation total assets on US GDP per capita and the S&P 500 market close index, using a natural-log transformed linear model. The model specification is as follows:

$$LN(Foundation\ total\ assets_t) = \beta_1\ LN(US\ GDP\ per\ capita_t) + \beta_2\ LN(S\&P\ 500\ market\ index_t) + \varepsilon$$

We then used the regression coefficients from the above model and observed market data to predict total foundation assets in 2010-2011. Regressing DAH on total assets, similar to previous channels, produced implausible preliminary estimates of DAH for 2010-2011. As an alternative, we assumed percent changes in total assets would approximately reflect percent changes in DAH. Therefore, we calculated annual percent changes in observed assets from 2009-2010 and estimated assets from 2010-2011. Finally, we applied these yearly percent changes to observed foundation DAH in 2009 to produce estimates of DAH for 2010-2011.

Part 6:

TRACKING NON-GOVERNMENTAL ORGANIZATIONS

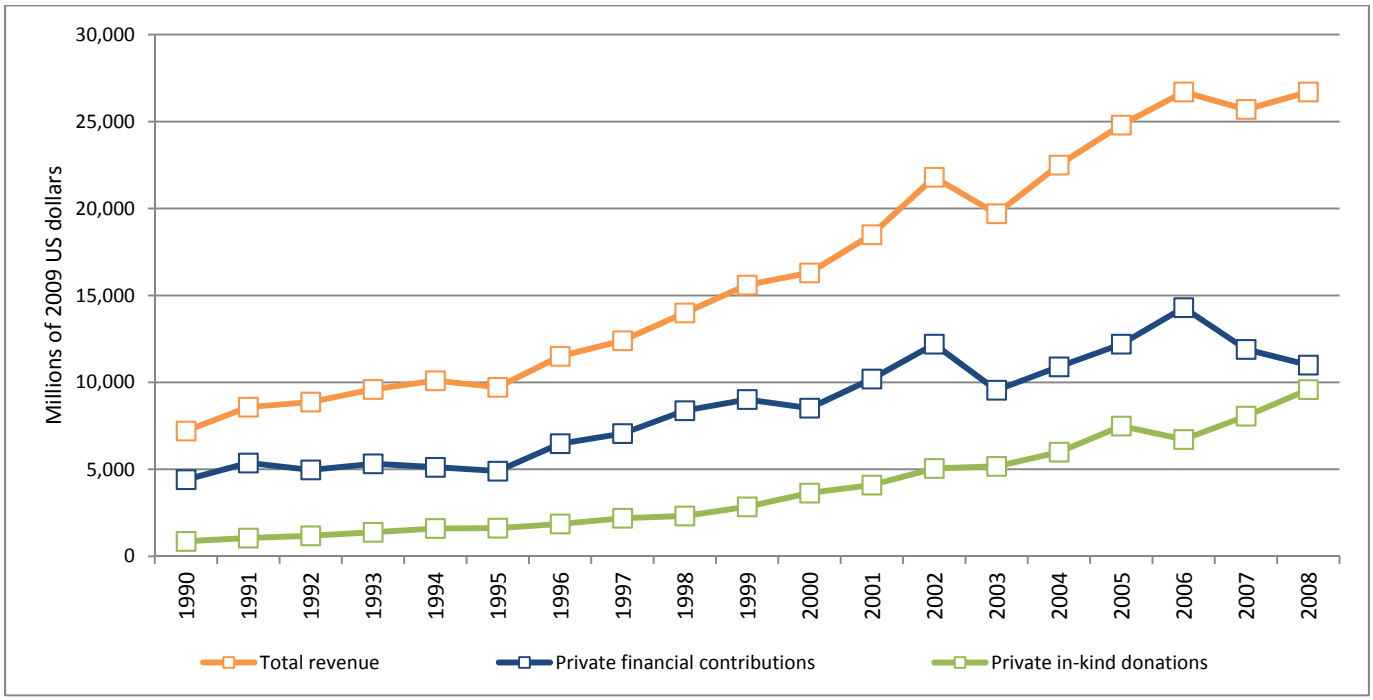
Currently, there is no centralized, easily accessible database for tracking the program expenses of the thousands of NGOs based in high-income countries that are active in providing development assistance and humanitarian relief worldwide. For this study, we relied on the only comprehensive data source we could identify for a large subset of these NGOs, namely the VolAG report[24] issued by USAID. The report, which includes NGOs incorporated in the US that received funding from the US government, provides data on domestic and overseas expenditures for these NGOs, as well as their revenue from US and other public sources, from private contributions, and from in-kind donations. In addition, this update includes total revenue and expenditure data obtained from 2009 NGO IRS tax forms through the GuideStar online database.[25] Unfortunately, more detailed revenue data for 2009 were not available at the time of analysis, and thus modified methods were required to estimate DAH in 2009.

We encountered three challenges in using these data. First, with the exception of BMGF, we were unable to track the amount of funding from US foundations routed through US NGOs, and that may have led to double-counting in our estimates of total health aid. The second relates to the incompleteness of the universe of NGOs captured through the USAID report. The report provides data on NGOs registered in the US that received funding from the US government. While this covers many of the largest US-based NGOs, it is not a comprehensive list. A related problem is that the report only includes NGOs that received funds in a given year. While many of the largest NGOs are consistently funded by the US government and are therefore in the report every year, not all NGOs have data every year. Finally, its coverage of NGOs registered in other donor countries only began in 1998. We attempted to compile data on the health expenditures of the top non-US NGOs in terms of overseas expenditure by searching their websites for financial documents and contacting them directly. Getting reliable time series data before 2000 proved to be extremely difficult for even this small sample of non-US NGOs. Consequently, only NGOs registered in the US for which data were available in the USAID VolAg reports from 1990 to 2008 are included in this study. Since USAID VolAG data for 2009 were unavailable while we were conducting our analysis, we implemented revised methods to impute missing NGO-year data and estimate DAH in 2009, concurrent with methods used to estimate DAH for 2010-2011.

Table 6.1
Summary of US NGOs in the study

Year	Number of US NGOs in VolAG report	Number of US NGOs in IHME sample	Number of US NGOs from sample for which we found data on health expenditures
1990	267	16	12
1991	334	19	15
1992	385	18	15
1993	411	17	13
1994	424	17	11
1995	416	16	12
1996	423	21	14
1997	425	23	18
1998	435	24	22
1999	438	41	37
2000	433	47	43
2001	442	46	43
2002	486	46	43
2003	507	55	49
2004	508	57	48
2005	494	60	54
2006	536	63	56
2007	555	62	56
2008	564	57	55

Figure 6.1
Total revenue received by US NGOs



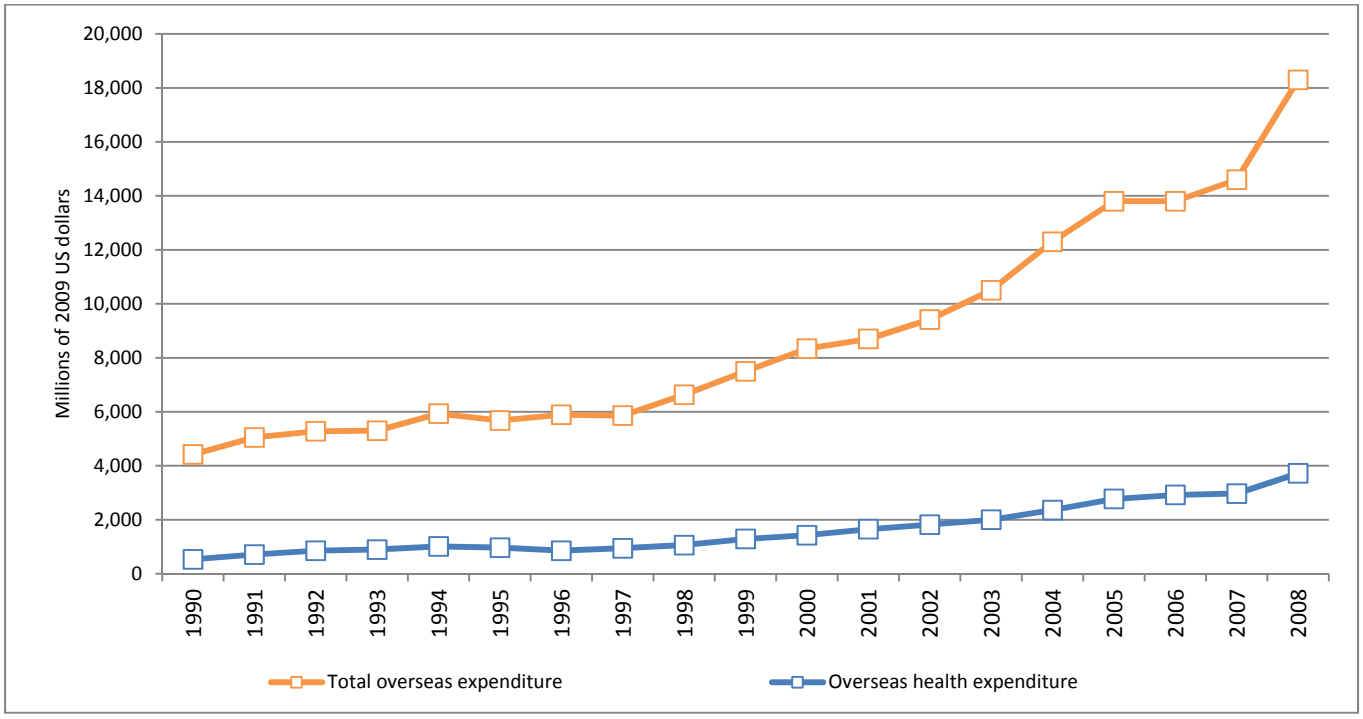
Source: IHME DAH (NGOs) Database 2011

While we hope to find data on non-US NGOs in future years, we do not think their exclusion from this study is a source of bias for the following reasons. First, many of the top non-US NGOs have US-based chapters that are registered in the US and with USAID, and are therefore covered by the USAID VolAg reports.[24] For example, Save the Children and International Planned Parenthood Federation both have arms registered in the US and receive funds from the US government. Second, the health expenditure numbers we were able to collect for the top non-US NGOs from 2000 onward suggest that they still account for a relatively small amount of development assistance in comparison to US-based NGOs; the top 10 non-US NGOs (Marie Stopes International, International Planned Parenthood Federation, Medical Emergency Relief International, International Union Against Tuberculosis and Lung Disease, GOAL, Save the Children UK, ActionAid International, Norwegian People's Aid, HelpAge International, and German Agro Action) accounted for $503.17 million in overseas health expenditure in 2008, while the top 10 US-based NGOs accounted for $1.65 billion (adjusted overseas health expenditure) in the same year. This comparison does not account for private in-kind adjustments for international NGOs due to lack of information on valuation of private in-kind donations and tax regulations outside of the US.

Figure 6.2

Expenditure by US NGOs

Total overseas expenditure and estimates of overseas health expenditure by US NGOs are shown in orange and blue, respectively.



Source: IHME DAH (NGOs) Database 2011

The third challenge in using the data from the USAID VolAG reports for this study relates to the fact that the reports do not break down overseas expenditure by sector. Collecting financial data on health expenditures for each NGO would have been prohibitively time consuming. Therefore, a sample of NGOs was drawn from the list each year; the sample included the top 10 NGOs in terms of overseas expenditure as well as additional top NGOs depending on data availability and 10 randomly selected NGOs from the remaining pool, with the probability of being selected set proportional to their overseas expenditure. Next, we collected health expenditure data for each NGO in our sample using annual reports, audited financial statements, 990 tax forms, websites, and personal communications. Health expenditure was carefully reviewed to ensure that expenditures on food aid, food security, disaster relief, and water and sanitation projects were not included. Table 6.1 summarizes the number of NGOs included each year in the USAID report, the number of NGOs in our sample from each year, and the number of NGOs for which we successfully found health expenditure data.

We fit a linear regression model for predicting health expenditure as a fraction of total expenditure using the data in the sample and used it to predict health fractions for the remaining NGOs. Since several NGOs in the sample were observed for multiple years, we included random effects for each NGO. Variables used to predict the health fraction were the fraction of revenue from in-kind donations, fraction of revenue from the US government, fraction of revenue from private financial contributions, overseas expenditure as a fraction of total expenditure, calendar year, and receipt of US government food aid. All these variables were drawn from the USAID reports. To ensure that the predicted health fractions were bounded between zero and 1, we used the logit-transformed health fraction as the dependent variable. As detailed revenue variables used to predict the health fraction were not available for 2009 from the USAID VolAg reports, we used the mean of

2004-2008 fractions to estimate overseas health expenditures for 2009, assuming trends in health spending for each NGO were relatively consistent in the most recent five years. In addition, 2009 expenditures financed from US public sources and non-US public sources were estimated separately to allow for plausible preliminary estimates of DAH from 2009-2011, detailed in the section below.

Overseas health expenditure was calculated for individual NGOs in each year by multiplying the health fraction and total overseas expenditure. Expenditures financed from specific revenue sources were then calculated by multiplying overseas health expenditure by NGO-specific revenue fractions. As a revision to previous estimates, expenditures from in-kind sources were deflated by a constant fraction. This was determined by comparing the federal upper limit and average wholesale price valuations of drugs on the WHO's Model List of Essential Medicines[27] from the RED BOOK Expanded Database.[26] Figure 6.1 shows the income of the NGOs in the universe of NGOs that we tracked in this study. Figure 6.2 shows estimated overseas health expenditure for these from 1990 to 2008 in constant 2009 US dollars.

Beginning in 2011, for the top 20 NGOs in terms of overseas health expenditure, we collected additional health expenditure data spanning the entire time period of the analysis. This allowed us to use actual health fractions instead of predicted health fractions for the most important drivers of NGO health expenditure, improving our analysis. Additionally, we examined the top 20 NGOs for either a "development" or "advancement" department, indicating that they are set up to receive private donations. In cases like Management Sciences for Health in which no such department existed, we subtracted out private contributions as a source of revenue for the NGO, leading to more valid estimates of revenue fractions.

Preliminary estimates for NGOs

Modeling preliminary estimates of 2010-2011 DAH for NGOs required multiple components and methods to produce consistent and plausible trends in NGO overseas health expenditures, given data availability. Based on the assumption that NGO financing from US public sources would be differentially affected by the economic downturn than other sources, we chose to model NGO expenditures financed by US public sources and non-US sources separately.

For the US public component, we assumed that NGO financing and expenditures from US public sources would follow economic trends. Thus, we regressed observed aggregate NGO overseas health expenditures from US public sources for 1990-2008 on US GDP per capita and US bilateral aid per capita, using a natural-log transformed linear model. We were able to obtain a sample of 2009 expenditure data from GuideStar, which compiles NGO tax returns. However, as this sample was incomplete, we decided to also estimate aggregate NGO overseas health expenditures from US public sources in 2009. The model specification is as follows:

$$LN(NGO\ overseas\ health\ expenditures\ from\ US\ public\ sources_t) = \beta_1\ LN(US\ GDP\ per\ capita_t) + \beta_2\ LN(US\ bilateral\ aid\ per\ capita_t) + \varepsilon$$

We then used the regression coefficients and observed market data to estimate aggregate NGO overseas health expenditures from US public sources for 2009-2011. Preliminary estimates using the same model at the individual NGO level were implausibly high, and therefore aggregate expenditures were used instead.

In order to estimate NGO overseas health expenditures from non-US sources, we implemented a random effect model to impute missing NGO-year observations, assuming that NGOs that reported disbursements in

the USAID VolAg data from 2007-2008 continued to disburse throughout 2009-2011. Unlike the US public component, we were able to use the incomplete observed 2009 expenditures from GuideStar, as missing NGOs in 2009 were imputed accordingly in this model. Assuming that NGO financing from other sources would also follow market trends, we regressed observed NGO overseas health expenditures from non-US sources on US GDP per capita and US bilateral aid per capita, using a natural-log transformed linear model. To account for systematic variation in expenditures among NGOs and across years, we included random effects on NGO (γ_i) and year (γ_t) separately. The model specification is as follows:

$$LN(NGO\ overseas\ health\ expenditures\ from\ nonUS\ sources_{it}) = \beta_1\ LN(US\ GDP\ per\ capita_t) + \beta_2\ LN(US\ bilateral\ aid\ per\ capita) + \gamma_i + \gamma_t + \varepsilon$$

We then used the regression coefficients, NGO and year random effect estimates, and observed market data to estimate individual NGO overseas health expenditures from non-US sources for 2009-2011. Further breakdowns of expenditures by more specific non-US financing sources were calculated by multiplying total expenditures from non-US sources by specific revenue fractions (non-US public, private other, in-kind, and BMGF). As detailed revenue data and fractions were not available for 2009-2011, we used the mean of the revenue fractions of the most recent five years (2004-2008). Finally, we combined estimates of expenditures financed by US public and non-US public sources to form preliminary estimates of NGO total overseas health expenditures by year.

Part 7:

CALCULATING THE TECHNICAL ASSISTANCE AND PROGRAM SUPPORT COMPONENT OF DAH FROM LOAN- AND GRANT-MAKING CHANNELS OF ASSISTANCE

We used the following methods to estimate the costs incurred by loan- and grant-making institutions for administering and supporting health sector loans and grants, which includes costs related to staffing and program management.

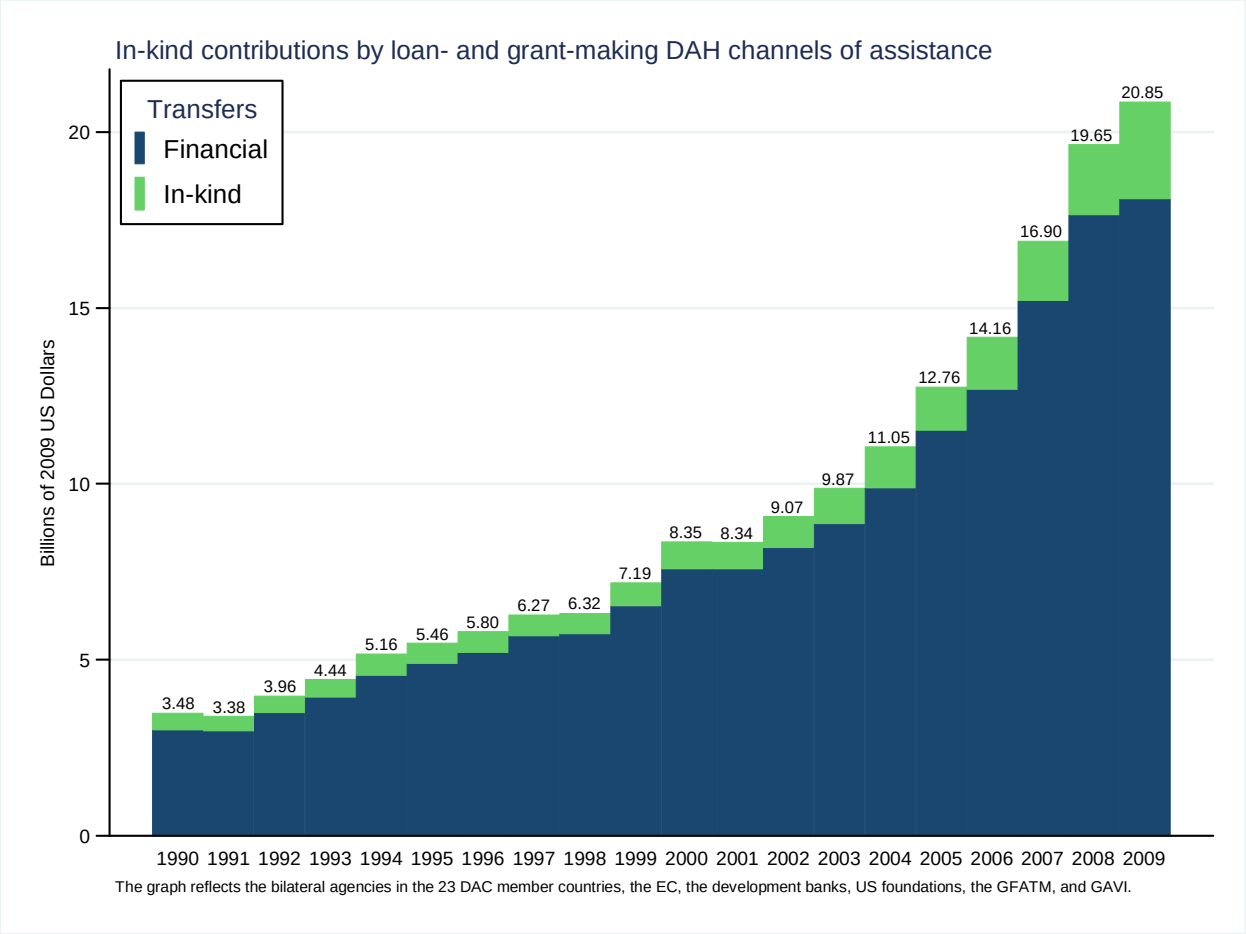
We collected data on the total administrative costs for a subset of institutions in our universe for which these data were readily available: IDA, IBRD, BMGF, GFATM, GAVI, USAID, and the UK Department for International Development (DFID). The sources of data for the institutions in our sample are summarized in Table 7.1. For each of them, we calculated the ratio of total administrative costs to total grants and loans by year. We assumed that the percentage of operating and administrative costs devoted to health would be equal to the percentage of grants and loans that were for health. In other words, if 20% of a foundation's grants were for health, we assumed that 20% of administrative costs of the foundation were spent on facilitating these health grants. Given this assumption, we used the observed administrative costs to grants/loans ratios to estimate the in-kind contribution made by each of these organizations toward maintaining their health grants and loans. For the institutions not in this sample, we used the ratio from the institution most similar to it to arrive at an estimate of in-kind contributions.

We used the average ratio observed for IDA and IBRD for all other development banks; the average of the ratios for BMGF for all other US foundations; the average ratio for DFID from 2002 to 2006 to calculate the in-kind component for DFID in other years; and the average ratio for USAID and DFID for all other bilateral agencies and the EC. Total in-kind contributions from all grant- and loan-making global health institutions are shown in Figure 7.1. It shows that the in-kind contributions by these channels ranged from 9.2% to 13.8% of the financial transfers between 1990 and 2009. These data mask considerable variation across institutions in the ratio of staffing and administrative costs to loans and grants extended in a year. At the high end, the ratio for USAID was on average 0.18 over the study period, while the comparable ratio for IBRD was 0.07 over the same time span.

Table 7.1
Summary of data sources for calculating in-kind contributions

Organization	Source	Notes
BMGF	990 tax returns	Used "cash basis" column to calculate ratio of total operating and administrative expenses to grants paid.
GFATM	Annual report financial statements	Calculated ratio of operating expenses to grants disbursed.
GAVI	Annual report financial statements	Calculated ratio of management, general, and fundraising expenses to program expenses.
USAID	US government budget database	Used outlays spreadsheet to calculate ratio of total outlays for USAID operating account to sum of outlays for bilateral accounts.
DFID	Annual report expense summary	Calculated ratio of DFID's administration expenses to DFID's bilateral program expenses from 2002 onward.
IDA	World Bank audited financial statements	Calculated ratio of management fee charged by IBRD to development credit disbursements.
IBRD	World Bank audited financial statements	Calculated ratio of administrative expenses to loan disbursements.

Figure 7.1
In-kind contributions by loan- and grant-making DAH channels of assistance



Source: IHME DAH Database 2011
Note: in-kind contributions not shown for 2010 and 2011 due to data limitations

Part 8:

KEYWORD SEARCHES

To identify health aid for HIV/AIDS; tuberculosis; malaria; health sector support; maternal, newborn, and child health (MNCH); and noncommunicable diseases, we searched for keywords associated with each in descriptive fields of our IHME DAH Database (Country and Regional Recipient Level), as shown in Table 8.1. This includes a subset of global health channels for which information on country and/or regional allocation was available, namely the bilateral development assistance agencies from the 23 DAC member countries, the EC, GFATM, GAVI, World Bank, ADB, IDB, AfDB, and BMGF. When a project was matched to two or more areas, the dollar value of the grant was divided evenly across the matched areas. For projects that matched to both MNCH and either HIV or malaria, MNCH was removed as a concurrent health focus, based on the observation that many project descriptions for HIV and malaria programs incorrectly appear MNCH-related.

Table 8.1
Terms for keyword searches

Project type	Search terms
HIV	HIV, HIV/AIDS, H.I.V., AIDS, human immunodeficiency virus, reverse transcriptase inhibitor, acquired immune deficiency syndrome, retroviral
Tuberculosis	TB, tuberculosis, anitubercular, tuberculostatic, DOTS, directly observed treatment, mycobacterium tuberculosis, XDR-TB, MDR-TB, rifampicin, isoniazid
Malaria	Malaria, paludisme, plasmodium falciparum, anopheles, bed nets, insecticide, artemisinin, indoor residual spraying
Health sector support	SWAP, sector wide approach in health, sector programme, sector program, budget support
Maternal, newborn, and child health	Antenatal, prenatal, maternal health, sante maternelle, maternal mortality, mortalite maternelle, maternal death, deces maternel, perinatal, neonatal, safe motherhood, antenatal care, soins prenatals, skilled birth attendant, sba, accoucheur qualifie, personnel de sante qualifie, vaccination, emergency obstetric care, soins obstetriques essentiels, soins obstetriques d'urgence, reproductive health, sante genesique, child health, newborn health, sante du nouveau-ne, mortalite infantile, sante de l'enfant, child mortality, mortalite des enfants, vitamin a, vitamine a, infant mortality, "maternal, newborn & child health", "sante de la mere, du nouveau-ne et de l'enfant", family planning, planification familiale, planning familial, postpartum, under-five mortality, mortalite des moins de cinq ans, sante reproductive, child survival, maternal and infant health, integrated management of childhood illness
Noncommunicable diseases	Cancer, chemotherapy, radiation, neoplasm, neoplasia, tumor, diabetes, diabetic, insulin, endocrine, mental health, behavioral, rheumatic, rheumatism, ischaemic, ischemic, circulatory, cerebrovascular, cirrhosis, digestive disease, other digestive, genitourinary, musculoskeletal, congenital, alcohol, alcoholism, addiction, tobacco, smoking, smokers, obesity, overweight, schizophrenia, neurotic, neurosis, psychological, psychology, psychiatric, emotional, ptsd, post-traumatic, glaucoma, hypertensive, hypertension, hernia, arthritis, cleft lip, cleft palate, phenylketonuria, pku, sickle cell, drepanocytosis, down syndrome, down's syndrome, hemophilia, disorder, thalassemia, genetic, heart disease, cardiovascular, chronic respiratory, sante mentale, comportement, chimiotherapie, rhumatismales, tumeur, neoplasie, neoplasme, rhumatisme, ischemique, diabete, diabetique, insuline, circulatoire, cerebro-vasculaire, cerebrovasculaire, vasculaire cerebral, vasculaires cerebraux, cirrhose, genito-urinaire, musculo-squelettiques, congenitale, alcool, toxicomanie, tabac, tabagisme, fumeurs, obesitesurpoids, schizophrenie, nevrose, alcoolisme, psychologique, psychologie, psychiatrie, emotionnel, stress post-traumatique, glaucome, hypertension, hernie, arthrite,

	phenylcetonurie, pcu, anemie falciforme, drepanocytose, syndrome de down, hemophilie, maladie sanguine, maladies sanguines, maladie de l'appareil digestif, maladies de l'appareil digestif, maladies digestives, thalassemie, genetique, cardio-vasculaire, cardiovasculaire, maladies du cœur, maladie cardiaque, affections respiratoires chroniques, noncommunicable, copd, stroke, cataract, chronic obstructive pulmonary disease, broncho-pneumopathie chronique obstructive, bronchopneumopathie chronique obstructive, bpco, asthma, asthme, skin disease, maladie de la peau

Note: When conducting the keyword search, we capitalized all project descriptions and search terms, which eliminated all accents from the text. Thus, our French search terms are listed without accents.

Section 2: Country spending on health

This appendix is divided into two components. The first component provides detail on the methods used to estimate regional levels of government health expenditure as source. The second component provides information regarding data sources, descriptive statistics, and country and regional groupings used when measuring the additionality of DAH.

Estimating regional levels of government health expenditure as source

To estimate regional levels of government health expenditure as source (GHE-S) we follow a five-step process described below. Additionally, we anticipate a forthcoming methods paper that will further elucidate this process and discuss a refined method that reports plausible country-level estimates.

1. We obtain government health expenditure as agent (GHE-A), general government expenditure (GGE), and GDP data from the WHO's National Health Accounts (NHA) database for the sample of 137 GBD developing countries for 1995-2009.[75]
2. Using the DAH country-recipient database, we translate GHE-A data into GHE-S data by removing development assistance for health channeled to governments (DAH-G). We measure each data point as a fraction of GDP to avoid using exchange rates.
3. Each country-year GHE-S data point is evaluated. In order to be considered a valid data point in our data set, the country-level data point must be both plausible and welll-documented. Plausible data are defined in relation to the rest of the data set. Undocumented data points are data points for which the WHO NHA does not provide a satisfactory source for at least 90% of the government health expenditure. Satisfactory sources for data are country level reports, while vaguely described models or projections are not considered well-documented data. Implausible and unsourced data are removed from our data set.
4. We use Amelia II: A Program for Missing Data to fill in the missing country-level government expenditure data points.[76] Amelia II is a reputable and fully replicable multiple imputation method and piece of software. To assist in our imputation we use an extensive set of covariates and priors. (Covariates are listed in Table 4 of the main report text.) Priors are constructed from the raw GHE-S data and reflect the initially reported values and the share of the expenditure data that is properly documented. In using these priors we utilize all available government health expenditure data without tainting our series with implausible data.
5. Finally, the complete set of country-level estimates are aggregated up to the Global Burden of Disease region level.

Detailed information for variables included in the additionality analysis

Table A1:

Data sources for variables used in the final analysis

Variables	Source
Government health expenditure as source/GDP	WHO[75]
DAH to government/GDP	IHME[77]
DAH to non-government/GDP	IHME[77]
Debt relief/GDP	IHME[77]
GDP per person	IHME[78]
General government spending/GDP	World Bank[79]
HIV prevalence rate	UNAIDS[80]

Table A2:

Descriptive statistics of variables for 112 developing countries included in the statistical analysis

Variable	N	Mean	Standard deviation	Minimum	Maximum
GHE-S/GDP, WHO	1650	0.02	0.01	0	0.07
DAH to government/GDP	1647	2.88E-03	4.83E-03	0	0.05
DAH to non-government/GDP	1647	1.38E-03	3.97E-03	0	0.06
Debt relief/GDP	1650	4.318-03	0.01	0	0.10
GDP per person	1650	2462	3211	110	21289
GGE/GDP	1650	0.15	0.07	0.02	0.51
HIV prevalence	1650	0.02	0.05	0	0.26

Table A3:

Correlation of variables for 112 developing countries used in the statistical analysis

Variable	GHE-S/GDP, WHO	DAH to government/GDP	DAH to non-government/GDP	Debt relief/GDP	GDP per person	GGE/GDP	HIV prevalence
GHE-S/GDP, WHO	1.00						
DAH to government/GDP	-0.19	1.00					
DAH to non-government/GDP	-0.07	0.52	1.00				
Debt relief/GDP	-0.11	0.29	0.31	1.00			
GDP per person	0.34	-0.32	-0.19	-0.23	1.00		
GGE/GDP	0.33	0.14	0.10	-0.·00	0.11	1.00	
HIV prevalence	0.04	0.30	0.21	0.08	-0.06	0.21	1.00

Table A4:

List of the 112 countries included in final analysis by Global Burden of Disease region (developing regions only)

Asia, Central	**Latin America, Andean**	Solomon Islands	Togo
Armenia	Bolivia	**Sub-Saharan Africa, East**	**Sub-Saharan Africa, Central**
Azerbaijan	Ecuador	Burundi	Central African Republic
Georgia	Peru	Comoros	Congo
Kazakhstan	**Latin America, Central**	Djibouti	Congo, Democratic Republic of the
Kyrgyzstan	Colombia	Ethiopia	Equatorial Guinea
Mongolia	Costa Rica	Kenya	Gabon
Tajikistan	El Salvador	Madagascar	
Turkmenistan (1995-2007)	Guatemala	Malawi	
Uzbekistan	Honduras	Mozambique	
Asia, East	Mexico	Rwanda	
China	Nicaragua	Sudan	
Asia, South	Panama	Tanzania	
Afghanistan (1995-2000)	Venezuela	Uganda	
Bangladesh	**Latin America, South**	Zambia	
Bhutan	Argentina	**Sub-Saharan Africa, South**	
India	Chile	Botswana	
Nepal	Uruguay	Lesotho	
Pakistan	**Latin America, Tropical**	Namibia	
Asia, Southeast	Brazil	South Africa	
Cambodia	Paraguay	Swaziland	
Indonesia	**North Africa / Middle East**	Zimbabwe (1995-2000)	
Laos	Algeria	**Sub-Saharan Africa, West**	
Malaysia	Bahrain	Benin	
Maldives	Egypt	Burkina Faso	
Mauritius	Iran	Cameroon	
Philippines	Jordan	Cape Verde	
Sri Lanka	Lebanon	Chad	
Thailand	Libya	Côte d'Ivoire	
Vietnam	Morocco	Gambia	
Caribbean	Oman	Ghana	
Bahamas (2004-2009)	Saudi Arabia	Guinea	
Barbados	Syria	Guinea-Bissau	
Belize	Tunisia	Liberia (1999-2009)	
Dominican Republic	Turkey	Mali	
Guyana	Yemen	Mauritania	
Haiti	**Oceania**	Niger	
Jamaica	Fiji	Nigeria	
Suriname	Papua New Guinea	Senegal	
Trinidad and Tobago	Samoa	Sierra Leone	

Measuring additionality of DAH-G: Regression and sensitivity analysis

We examine the sensitivity of our findings to three estimation methods and several alternative specifications. The first and preferred estimation method is System-GMM developed by Arellano and Bover (1995)[81] and Blundell and Bond (1998)[82] and described by Roodman (2006).[83] These are the findings reported in the main body of the report. System-GMM is well suited for this analysis, as it is designed for large cross sections that do not have many observations over time. Furthermore, it allows for a lag-dependent variable as a right-hand-side regressor and time-invariant country-level fixed effects, while also controlling for the Nichols bias.[84] Still, using System-GMM requires a number of nontrivial specification decisions, which are described and assessed below. To support these specification decisions and provide support for the general conclusions reported in the main text of the report, we include results from several differencing-GMM estimations and "with-in" fixed effects estimation.[85]

All the System-GMM estimates reported use the two-step method, include year dummies to control for idiosyncratic time shocks and autocorrelation, and use first-differencing, as opposed to orthogonal deviations, to expunge time-invariant country effects. In order to limit problems associated with over-instrumentation[86] we limit GMM-style instruments to include only the first and second lags of predetermined and endogenous variables. All standard errors reported are Windmeijer-corrected cluster-robust standard errors, which correct for a finite sample.[87] To control for the Nicholas bias, the lag dependent variable is always considered endogenous.

System-GMM also requires that an initial "H" matrix be specified.[83] The "H" matrix is used when constructing the weighting matrix for the first step of the two-step process. As long as the weighting matrix is consistent, the initial matrix used to construct the weighting matrix is arbitrary and System-GMM is efficient.[83] Two popular initial matrices exist. Doornik, Arellano, and Bond (2002)[88] propose a block diagonal matrix with the upper-right and lower-left quadrants zeroed out. This initial matrix is used in the Doornik, Arellano, and Bond's DPD package for OX and Stata's xtdpdsys command. It assumes that the covariances between the differenced residuals and the residuals are zero.[88] An alternative initial matrix is proposed by Roodman (2006) and empirically estimates these covariances.[83] While the choice between the two initial matrices is asymptotically trivial, Table A.5 compares estimates derived using each of these initial matrices and shows that the decision between the two is certainly not trivial in our finite sample.

Table A5 also shows that the coefficient estimates vary as the DAH specification varies. In columns 1 and 4, DAH-G and DAH-NG are considered to be exogenous. In columns 2 and 5 the two variables are considered predetermined, while in columns 3 and 6 the two variables are considered endogenous. Again, Table A.5 shows a wide range of estimates, indicating that this choice is far from trivial.

Column 2 of Table A5 reflects the regression results reported in *Financing Global Health2011*. This specification is our preferred specification for two reasons. First, at an intuitive level, we believe that DAH is most likely to be predetermined. While it may initially seem like DAH is distributed by donors to recipient countries in response to GHE-S, we believe that specific, contemporaneous government health expenditures are not well known by the people making DAH allocations. Rather, it is more likely donors have a very general level of understanding of what *past* government health expenditure has been, meaning that while contemporaneous DAH allocations could be correlated with past realization of the residual, it is not likely that contemporaneous DAH allocations are correlated with contemporaneous or future realizations. This is even

more likely when one considers that DAH is often committed well in advance and disbursed over time, making it even less likely that when the assistance is distributed it is somehow correlated with realizations of the contemporaneous residual. Our second argument for choosing specification represented in column 2 in Table A5 is that it is a relatively close match to the estimates derived from the other two estimation methods – differencing-GMM and "within" fixed effects. Differencing-GMM and "within" fixed-effects estimation are partially and completely immune to the specification decisions described above. The results from these estimation methods are presented in Table A6.

Table A5:

Regression results using system GMM (112 developing countries)

	(1)	(2)	(3)	(4)	(5)	(6)
	Doornik, Arellano, & Bond's Initial Matrix			Roodman's Initial Matrix		
Variable	**System-GMM**	**System-GMM**	**System-GMM**	**System-GMM**	**System-GMM**	**System-GMM**
Lag GHE-S†	0.697***	0.533***	0.673***	0.798***	0.775***	0.852***
	(0.071)	(0.061)	(0.070)	(0.077)	(0.047)	(0.048)
DAH-G†	-0.341***	-0.564***	-0.176**	-0.321***	-0.320***	-0.061
	(0.059)	(0.116)	(0.068)	(0.052)	(0.068)	(0.051)
DAH-NG†	0.150**	0.281***	0.060	0.181***	0.182***	0.068
	(0.048)	(0.067)	(0.045)	(0.047)	(0.050)	(0.045)
Debt Relief†	0.008	0.009	0.003	0.004	0.010	0.002
	(0.028)	(0.047)	(0.029)	(0.020)	(0.023)	(0.015)
GDP pc	0.000	0.000+	0.000*	0.000	0.000	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GGE†	0.020**	0.026***	0.019***	0.015**	0.016***	0.011**
	(0.006)	(0.006)	(0.006)	(0.005)	(0.004)	(0.003)
HIV Prevalence	0.007	0.012+	0.004	0.006+	0.005	-0.001
	(0.004)	(0.006)	(0.005)	(0.003)	(0.003)	(0.003)
Constant	0.005***	0.008***	0.006***	0.004***	0.004***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
DAH Treatment	Exogenous	Predetermined	Endogenous	Exogenous	Predetermined	Endogenous
Instruments	58	136	132	58	136	132
AB test for AR(1)‡	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR(2)‡	0.027	0.026	0.025	0.028	0.023	0.025
Observations	1,538	1,538	1,538	1,538	1,538	1,538
Countries	112	112	112	112	112	112

Dependent Variable: GHE-S as a share of GDP

Windmeijer-corrected cluster-robust standard errors in parentheses (*** p<0.001, ** p<0.01, * p<0.05, + p<0.1)

Time-dummy coefficient estimates surpressed

† Specified as a share of GDP to avoid the confounding effect of exchange rates

‡ AB test is Arellano Bond test for autocorrelation using first differences. Pr>z is reported

Table A6:

Regression results using differencing GMM and the "within" fixed effects estimator (112 developing countries)

Variable	(1) Diff-GMM	(2) Diff-GMM	(3) Diff-GMM	(4) Within FE
Lag GHE-S†	0.330+	0.138	0.291*	--
	(0.194)	(0.102)	(0.122)	--
DAH-G†	-0.739***	-0.597**	-0.510***	-0.455***
	(0.070)	(0.203)	(0.144)	(0.089)
DAH-NG†	0.144*	0.251***	0.095	0.229*
	(0.067)	(0.074)	(0.061)	(0.093)
Debt Relief†	0.048	0.034	0.044	0.044
	(0.031)	(0.027)	(0.028)	(0.027)
GDP pc	-0.000*	-0.000+	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
GGE†	0.026***	0.028***	0.027***	0.024***
	(0.004)	(0.004)	(0.004)	(0.006)
HIV Prevalence	-0.011	-0.015	-0.020	-0.011
	(0.017)	(0.017)	(0.013)	(0.013)
Constant	--	--	--	0.020***
	--	--	--	(0.001)
DAH Treatment	Exogenous	Predetermined	Endogenous	--
Instruments	44	94	92	0
AB test for AR(1)‡	0.045	0.059	0.008	--
AB test for AR(2)‡	0.036	0.019	0.027	--
Observations	1,426	1,426	1,426	1,647
Countries	112	112	112	112

Dependent variable: GHE-S as a share of GDP

Windmeijer-corrected cluster-robust standard errors in parentheses for Diff-GMM estimation, Huber/White robust standard error in parenthesis for the Witin FE estimation (*** p<0.001, ** p<0.01, * p<0.05, + p<0.1)

Time-dummy coefficient estimates surpressed

† Specified as a share of GDP to avoid the confounding effect of exchange rates

‡ AB test is Arellano Bond test for autocorrelation using first differences. Pr>z is reported

Tables A5 and A6 show that the coefficient estimates for DAH-G are consistently negative and significant across most model specifications. The values of these estimates range from -0.06 to -0.74. This is consistent with our reported findings, which says that $0.56 of every $1 of DAH is substituted away. The coefficients estimates for DAH to non-government sectors are consistently positive and generally significant, ranging from 0.06 to 0.28. Among the other variables, debt relief, HIV prevalence, and GDP per capita are not consistently statistically significant. The impact of government size, measured by GGE/GDP, is positive and statistically significant in all the specifications, with a $p<0.01$.

Table A7 presents the regression results for subgroups of countries: low- and lower-middle-income countries, as defined by the World Bank, and sub-Saharan African countries. The estimates reported use System-GMM, specify the DAH variables as predetermined, and use the initial weighting matrix from Doornik, Arellano, and Bond. The coefficients are consistent with those generated from the "all countries" analysis.

Table A7:

Regression results using system GMM (subgroup analyses)

	(1)	(2)	(3)
VARIABLES	**System-GMM**	**System-GMM**	**System-GMM**
Lag GHE-S†	0.527***	0.338*	0.405***
	(0.087)	(0.145)	(0.113)
DAH-G†	-0.487***	-0.489***	-0.463**
	(0.111)	(0.136)	(0.149)
DAH-NG†	0.279***	0.183*	0.234*
	(0.069)	(0.072)	(0.096)
Debt Relief†	0.039	0.034	-0.009
	(0.057)	(0.040)	(0.033)
GDP pc	0.000*	0.000	0.000
	(0.000)	(0.000)	(0.000)
GGE†	0.027***	0.010	0.027**
	(0.007)	(0.011)	(0.010)
HIV Prevalence	0.009	0.048*	0.026**
	(0.009)	(0.019)	(0.009)
Constant	0.004*	0.009**	0.007**
	(0.002)	(0.003)	(0.002)
Sample	Low and lower middle income countries	Low income countries	Sub-Saharan countries
DAH Treatment	Predetermined	Predetermined	Predetermined
Instruments	136	136	136
AB test for AR(1)‡	0.000	0.026	0.006
AB test for AR(2)‡	0.087	0.281	0.144
Observations	1,099	541	575
Countries	80	40	42

Dependent Variable: GHE-S as a share of GDP

Windmeijer-corrected cluster-robust standard errors in parentheses (*** p<0.001, ** p<0.01, * p<0.05, + p<0.1)

Time-dummy coefficient estimates surpressed

† Specified as a share of GDP to avoid the confounding effect of exchange rates

‡ AB test is Arellano Bond test for autocorrelation using first differences. Pr>z is reported

METHODS ANNEX REFERENCES

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