METHODS ANNEX

TRACKING DEVELOPMENT ASSISTANCE FOR HEALTH

Research methods

RESEARCH METHODS

Part 1.0:
OVERVIEW OF DATA COLLECTION AND RESEARCH METHODS

This section provides a brief overview of the process of tracking development assistance for health (DAH). Each section that follows describes the sources of data and the estimation techniques employed. Development assistance for health is defined as all financial and in-kind contributions from global health channels that aim to improve health in developing countries. Since the goal of this research was to measure development assistance for the health sector and not for all sectors that influence health, assistance to allied sectors, such as water and sanitation and humanitarian aid, were not included. The set of developing countries covered in this research were defined by the World Bank's classification of low- and middle-income countries. Per IHME's definition of DAH, funds to high-income countries are not tracked or reported. The year-specific set of low- and middle-income countries are defined in eTable 1.

All known, systematically reported, available data on health-related disbursements and expenditures were extracted, as well as income and revenue from existing project databases, annual reports, and audited financial statements. The channels included in the study and the corresponding data sources are summarized in eTable 2. Data sources obtained via personal correspondence are summarized in eTable 3.

DAH for bilateral agencies included all health-related disbursements from bilateral donor agencies, excluding funds that they transferred to any of the other channels we tracked in order to avoid double-counting. This information was extracted from the Creditor Reporting System (CRS) and Development Assistance Committee (DAC) databases of the Development Assistance Committee of the Organisation for Economic Co-operation and Development (OECD-DAC). In some cases, donor agencies did not report disbursement data to the CRS. A method for predicting disbursements from commitment data was implemented to address this challenge (see Part 1.1).

For other grant- and loan-making institutions, their annual disbursements on health grants and loans were similarly included, excluding transfers to any other channels and ignoring any repayments on outstanding debts (see Part 1.2 for development banks, Part 1.3 for public-private partnerships, and Part 1.5 for foundations). The annual disbursements for grant- and loan-making institutions only reflect the financial transfers made by these agencies. Therefore, in-kind transfers from these institutions in the form of staff time for providing technical assistance and the costs of managing programs were estimated separately (see Part 1.7).

Estimates of DAH for the United Nations (UN) agencies included annual expenditures on health both from their core budgets and from voluntary contributions. Calculating DAH for the United Nations Children's Fund (UNICEF) involved estimating the fraction of its total expenditure spent on health prior to 2001 (see Part 1.4).

Non-governmental organizations (NGOs) DAH estimates utilized data from US government sources and a survey of health expenditure for a sample of NGOs to estimate DAH from US-based and internationally based NGOs receiving support from the US government. We were unable to include other NGOs due to the lack of audited and comparable data.

This research also included an analysis of the composition of health funding by recipient country, as well as of health focus area. The analysis of health focus areas included assessments of development assistance for HIV/AIDS; tuberculosis (TB); malaria; maternal health; newborn, and child health; other infectious diseases; non-communicable diseases; and SWAps and health sector support using keyword searches within the descriptive fields (see Part 1.8).

These were chosen as the areas of focus because of their relevance to current policy debates about global health financing and data availability.

For many channels, reporting-time lags prevent primary disbursement data for the most recent year(s). For those years, the values of DAH were predicted, using channel-specific time trends. The methods employed to obtain these predictions are summarized in eTable 4 and will be discussed for each channel alongside the primary estimation strategy. In general, these methods depend on data availability. The estimates are based on channel-specific budget, commitment, and appropriations data, and in many cases assume the most recent disbursement patterns persist. Due to the lack of more detailed disaggregated data, estimates are not provided by recipient.

All results are presented in real 2014 US dollars. All disbursement sequences were converted into real 2014 US dollars by taking disbursements in nominal US dollars in the year of disbursement and adjusting these sequences into real 2014 US dollars using US gross domestic product (GDP) deflators.[1] All analyses were conducted in Stata (version 13.0).

eTable 1

Countries eligible to receive DAH

Recipient Country	ISO-3	Years Eligible
Afghanistan	AFG	1990-2014
Albania	ALB	1990-2014
Algeria	DZA	1990-2014
American Samoa	ASM	1990-2014
Angola	AGO	1990-2014
Antigua and Barbuda	ATG	1990-2001; 2003-2004; 2009-2011
Argentina	ARG	1990-2014
Armenia	ARM	1990-2014
Aruba	ABW	1991-1993
Azerbaijan	AZE	1990-2014
Bahrain	BHR	1990-2000
Bangladesh	BGD	1990-2014
Barbados	BRB	1990-1999; 2001; 2003-2005
Belarus	BLR	1990-2014
Belize	BLZ	1990-2014
Benin	BEN	1990-2014
Bhutan	BTN	1990-2014
Bolivia	BOL	1990-2014
Bosnia and Herzegovina	BIH	1990-2014
Botswana	BWA	1990-2014
Brazil	BRA	1990-2014
Bulgaria	BGR	1990-2014
Burkina Faso	BFA	1990-2014
Burundi	BDI	1990-2014
Cabo Verde	CPV	1990-2014
Cambodia	KHM	1990-2014
Cameroon	CMR	1990-2014
Cayman Islands	CYM	1990-1992
Central African Republic	CAF	1990-2014
Chad	TCD	1990-2014
Chile	CHL	1990-2011
China	CHN	1990-2014
Colombia	COL	1990-2014
Comoros	COM	1990-2014
Congo, Dem. Rep.	COD	1990-2014
Congo, Rep.	COG	1990-2014
Costa Rica	CRI	1990-2014
Croatia	HRV	1990-2007
Cuba	CUB	1990-2014
Curaçao	CUW	1990-2009

Recipient Country	ISO-3	Years Eligible
Czech Republic	CZE	1990-2005
Czechoslovakia (former)	CSK	1990-2014
Côte d'Ivoire	CIV	1990-2014
Djibouti	DJI	1990-2014
Dominica	DMA	1990-2014
Dominican Republic	DOM	1990-2014
Ecuador	ECU	1990-2014
Egypt, Arab Rep.	EGY	1990-2014
El Salvador	SLV	1990-2014
Equatorial Guinea	GNQ	1990-2006
Eritrea	ERI	1990-2014
Estonia	EST	1990-2005
Ethiopia	ETH	1990-2014
Fiji	FJI	1990-2014
Gabon	GAB	1990-2014
Gambia, The	GMB	1990-2014
Georgia	GEO	1990-2014
Ghana	GHA	1990-2014
Gibraltar	GIB	1990-2008; 2011-2014
Greece	GRC	1990-1995
Grenada	GRD	1990-2014
Guam	GUM	1990-1994
Guatemala	GTM	1990-2014
Guinea	GIN	1990-2014
Guinea-Bissau	GNB	1990-2014
Guyana	GUY	1990-2014
Haiti	HTI	1990-2014
Honduras	HND	1990-2014
Hungary	HUN	1990-2006; 2012-2014
India	IND	1990-2014
Indonesia	IDN	1990-2014
Iran, Islamic Rep.	IRN	1990-2014
Iraq	IRQ	1990-2014
Isle of Man	IMN	1990-2001
Jamaica	JAM	1990-2014
Jordan	JOR	1990-2014
Kazakhstan	KAZ	1990-2014
Kenya	KEN	1990-2014
Kiribati	KIR	1990-2014
Korea, Dem. Rep.	PRK	1990-2014
Korea, Rep.	KOR	1990-1994; 1998-2000
Kosovo	KSV	1990-2014

Recipient Country	ISO-3	Years Eligible
Kyrgyz Republic	KGZ	1990-2014
Lao PDR	LAO	1990-2014
Latvia	LVA	1990-2008; 2010-2011
Lebanon	LBN	1990-2014
Lesotho	LSO	1990-2014
Liberia	LBR	1990-2014
Libya	LBY	1990-2014
Liechtenstein	LIE	1990-1993
Lithuania	LTU	1990-2011
Macao SAR, China	MAC	1990-1993
Macedonia, FYR	MKD	1990-2014
Madagascar	MDG	1990-2014
Malawi	MWI	1990-2014
Malaysia	MYS	1990-2014
Maldives	MDV	1990-2014
Mali	MLI	1990-2014
Malta	MLT	1990-1997; 1999; 2001
Marshall Islands	MHL	1990-2014
Mauritania	MRT	1990-2014
Mauritius	MUS	1990-2014
Mayotte	MYT	1991-2014
Mexico	MEX	1990-2014
Micronesia, Fed. Sts.	FSM	1990-2014
Moldova	MDA	1990-2014
Monaco	MCO	1990-1993
Mongolia	MNG	1990-2014
Montenegro	MNE	1990-2014
Morocco	MAR	1990-2014
Mozambique	MOZ	1990-2014
Myanmar	MMR	1990-2014
Namibia	NAM	1990-2014
Nepal	NPL	1990-2014
Netherlands Antilles (former)	ANT	1990-1993; 2010-2014
New Caledonia	NCL	1990-1994
Nicaragua	NIC	1990-2014
Niger	NER	1990-2014
Nigeria	NGA	1990-2014
Northern Mariana Islands	MNP	1990-1994; 2002-2006
Oman	OMN	1990-2006
Pakistan	PAK	1990-2014
Palau	PLW	1990-2014
Panama	PAN	1990-2014

Recipient Country	ISO-3	Years Eligible
Papua New Guinea	PNG	1990-2014
Paraguay	PRY	1990-2014
Peru	PER	1990-2014
Philippines	PHL	1990-2014
Poland	POL	1990-2008
Portugal	PRT	1990-1993
Puerto Rico	PRI	1990-2001
Romania	ROU	1990-2014
Russian Federation	RUS	1990-2011
Rwanda	RWA	1990-2014
Samoa	WSM	1990-2014
San Marino	SMR	1990; 1994-1999
Saudi Arabia	SAU	1990-2003
Senegal	SEN	1990-2014
Serbia	SRB	1990-2014
Serbia and Montenegro (former)	YUG	1990-2014
Seychelles	SYC	1990-2014
Sierra Leone	SLE	1990-2014
Sint Maarten (Dutch part)	SXM	1990-2009
Slovak Republic	SVK	1990-2006
Slovenia	SVN	1990-1996
Solomon Islands	SLB	1990-2014
Somalia	SOM	1990-2014
South Africa	ZAF	1990-2014
South Sudan	SSD	1990-2014
Sri Lanka	LKA	1990-2014
St. Kitts and Nevis	KNA	1990-2010
St. Lucia	LCA	1990-2014
St. Martin (French part)	MAF	1990-2009
St. Vincent and the Grenadines	VCT	1990-2014
Sudan	SDN	1990-2014
Suriname	SUR	1990-2014
Swaziland	SWZ	1990-2014
Syrian Arab Republic	SYR	1990-2014
São Tomé and Principe	STP	1990-2014
Tajikistan	TJK	1990-2014
Tanzania	TZA	1990-2014
Thailand	THA	1990-2014
Timor-Leste	TLS	1990-2014
Togo	TGO	1990-2014
Tonga	TON	1990-2014
Trinidad and Tobago	TTO	1990-2005

Recipient Country	ISO-3	Years Eligible
Tunisia	TUN	1990-2014
Turkey	TUR	1990-2014
Turkmenistan	TKM	1990-2014
Turks and Caicos Islands	TCA	1990-2008
Tuvalu	TUV	1990-2014
USSR (former)	SUN	1990-2014
Uganda	UGA	1990-2014
Ukraine	UKR	1990-2014
Uruguay	URY	1990-2011
Uzbekistan	UZB	1990-2014
Vanuatu	VUT	1990-2014
Venezuela, RB	VEN	1990-2014
Vietnam	VNM	1990-2014
West Bank and Gaza	PSE	1990-2014
Yemen, Rep.	YEM	1990-2014
Yugoslavia (former)	YUGf	1990-2014
Zambia	ZMB	1990-2014
Zimbabwe	ZWE	1990-2014

eTable 2

Summary of primary data sources

Channel	Source
Bilateral agencies	OECD-DAC and CRS databases[2]
European Commission	OECD-DAC and CRS databases[3]
Joint United Nations Programme on HIV/AIDS (UNAIDS)	Financial reports and audited financial statements[4]
United Nations Children's Fund (UNICEF)	Financial reports and audited financial statements[5, 6, 7]
United Nations Population Fund (UNFPA)	Financial reports and audited financial statements[8]
Pan American Health Organization (PAHO)	Financial reports and audited financial statements[9]
World Health Organization (WHO)	Financial reports and audited financial statements[10]
World Bank	Online project database and correspondence[11, 12]
Asian Development Bank (ADB)	Online project database[13]
African Development Bank (AfDB)	Online project database and compendium of statistics[14, 15]
Inter-American Development Bank (IDB)	Online project database[16]
Gavi, the Vaccine Alliance	Online project database, cash received database, International Finance Facility for Immunisation (IFFIm) annual reports, and annual reports[17,18,19,20]
The Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM)	Online grant database, contributions report and annual reports[21,22,23]
NGOs registered in the US	United States Agency for International Development (USAID) Report of Voluntary Agencies (VolAg), tax filings, annual reports, financial statements, RED BOOK Expanded Database, and WHO's Model List of Essential Medicines[24,25,26,27]
Bill & Melinda Gates Foundation (BMGF)	Online grant database, IRS 990 tax forms, and correspondence[28,29,30]
Other private US foundations	Foundation Center's grants database [31]

eTable 3

Data sources received via personal correspondence

Channel	Data received
World Bank	Health project-level disbursement data, 1990 - 2014
UNFPA	Aggregated expenditures for 2013 and 2014
UNICEF	Aggregated health expenditures, 2001-2013

Written permission to use data from these correspondents are included in sections 2.0 through 2.2 of this Supplement.

eTable 4

Additional data sources and model choices used for preliminary estimates of DAH

Channel	Data source	Variables used	Years of budget data used for modeling*	Years underlying DAH data not available; thus modeled*	Model used
National agencies					
Australia	Australia's International Development Assistance (2008-2014); Australia's Overseas Aid Program (1998-2008)[32]	Health official development assistance (ODA): International development assistance budget	1998-2014	2013- 2014	Weighted average of actual DAH/budgeted DAH
Austria	Austria Federal Ministry of Finance budget[33]	General ODA: Federal ODA budget	2007-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Belgium	Project Budget General – general expenses[34]	General ODA: Foreign affairs, foreign trade development and cooperation	2000-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Canada	Canadian International Development Agency – Report on Plans and Priorities[35]	General ODA: Financial summary – planned spending	1996-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Denmark	Danish Ministry of Foreign Affairs Budget; Correspondence[36,37]	General ODA: Budgeted expenditures on overseas development assistance	2000-2014	2013- 2014	Weighted average of DAH/budgeted ODA
European Commission	General budget[38]	Data not used as they were inconsistent with disbursements	–	2013- 2014	Based on weighted average of trends in member countries
Finland	Document Assembly in budget years 1998-2014[39]	General ODA: Ministry of Foreign Affairs' administrative appropriations, international development	2002-2014	2013- 2014	Weighted average of DAH/budgeted ODA

Channel	Data source	Variables used	Years of budget data used for modeling*	Years underlying DAH data not available; thus modeled*	Model used
France	Finance bills 2004-2014, general budget[40]	General ODA: Finance bill's ODA development – solidarity with developing countries	2004-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Germany	Plan of the Federal Budget[41]	General ODA: Development expenditure	2001-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Greece	Ministry of Finance Budget (2013-2014); OECD Data (1996-2012)[42,43]	General ODA; ODA commitments	1996-2013	2013- 2014	Weighted average of DAH/budgeted ODA
Ireland	Department of Finance – budget 2000-2004; Estimates for Public Services and Summary Public Capital Programme, 2005-2014[44]	General ODA: Summary of adjustments to gross current estimates – international co-operation	2002-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Italy	Ministry of Foreign Affairs Budget[45]	General ODA: Development corporation	2006-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Japan	Highlights of the Budget for FY1999-2014[46,47]	General ODA: Major budget expenditures	2003-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Korea, South	ODA Korea comprehensive implementation plan[48]	General ODA: Plan for international development cooperation	2008-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Luxembourg	Gazette Grand Duchy of Luxembourg[49]	General ODA: Ministry of Foreign Affairs – budgeted international development cooperation and humanitarian aid	2001-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Netherlands	Netherlands International Cooperation Budget (2001-2014)[50]	General ODA: Total annual official development assistance expenditure	2001-2014	2013- 2014	Weighted average of DAH/budgeted ODA

Channel	Data source	Variables used	Years of budget data used for modeling*	Years underlying DAH data not available; thus modeled*	Model used
New Zealand	Vote Foreign Affairs and Trade (1998-2001); VOTE Official Development Assistance (2002-2014)[51]	General ODA: Total annual official development assistance expenditure	1998-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Norway	Norwegian Ministry of Finance National Budget (2014); Correspondence (2000-2013) [52]	General ODA: ODA budget	2000-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Portugal	Ministry of Finance and Public Administration State Budget 2003-2014[53]	General ODA: Integrated service expenditure – external cooperation budget	2003-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Spain	Annual Plan of International Cooperation[54]	General ODA: Net Spanish ODA instruments and modalities	2003-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Sweden	Correspondence (2000-2010); Ministry of Foreign Affairs Budget (2010-2014)[55,56]	General ODA: Ministry for Foreign Affairs budgets for expenditure – international development cooperation	2000-2014	2013- 2014	Weighted average of DAH/budgeted ODA
Switzerland	Foreign Affairs (2000-2006); Budget – Further Explanations and Statistics (2007-2014)[57]	General ODA: Direction of development and cooperation (2000-2006); foreign affairs – international cooperation, development aid (in the South and East) (2007-2014)	2000-2014	2013- 2014	Weighted average of DAH/budgeted ODA
United Kingdom	Budget[58]	General ODA: Department expenditure limits – resource/ current and capital budgets	1998-2014	2013- 2014	Weighted average of DAH/budgeted ODA

Channel	Data source	Variables used	Years of budget data used for modeling*	Years underlying DAH data not available; thus modeled*	Model used
United States	Foreign Assistance Dashboard (2006-2014); Budget of the US Government (2005-2014); [59,60]	Global health ODA: Planned foreign assistance for health; Department of Health and Human Services global health budget	2005-2014	2013- 2014	Weighted average of actual DAH/budgeted DAH
UN agencies					
WHO	Programme budget[61]	DAH budget: Programme budget	2002-2014	2013- 2014	Weighted average of DAH/budget
UNAIDS	Unified Budget and Workplan, bienniums 2002-2013[62]	DAH budget: Unified Budget and Workplan	2002-2014	2013- 2014	Weighted average of DAH/Core Budget
UNICEF	Financial report and audited financial statements; correspondence[63,64]	Total expenditure; Total health expenditure	2001-2014	2014	Weighted average of DAH/budget
UNFPA	Correspondence[65]	Total health expenditure	2002-2014	2014	-
PAHO	Proposed program budget[66]	Total regular budget, estimated voluntary contributions	2000-2014	2014	Weighted average of DAH/budget
Development banks					
World Bank	Project database (online); correspondence[12,13]	Commitments and disbursements for health sectors	1990-2014	2014	Regression on lagged commitments and disbursements
African Development Bank	Project database (online)[15,16]	Health disbursements and commitments	1990-2014	-	-
Asian Development Bank	Project database (online)[14]	Health disbursements and commitments	1990-2014	-	-
Inter-American Development Bank	Project database (online)[17]	Health disbursements and commitments	1990-2014	-	-

Channel	Data source	Variables used	Years of budget data used for modeling*	Years underlying DAH data not available; thus modeled*	Model used
Private organizations					
BMGF	Correspondence (2012); market indicators and Foundation Trust financial statements (2013)[30][1,67]	Total health expenditure; US GDP per capita, market indicators, Foundation Trust assets	1990-2014	2013-2014	Regression on DAH, US GDP, lagged market indicators and lagged BMGF Trust assets
Foundations	Foundation Center database[32]	US GDP per capita	1992-2012	1990- 1992; 2013-2014	Regression on aggregate DAH and US GDP per capita
NGOs	VolAg (1990-2010), GuideStar (2013), sample of top NGOs (2010-2011)[25,26]	Revenue breakdowns for: US public, non-US public, private, in-kind, BMGF; total overseas expenditures	1990-2011	2012-2014	Regression on DAH, US GDP, and USAID and private voluntary organization (PVO) revenue
Public-private partnerships					
Gavi	Online project database; Pledges and contributions[17]	DAH; total pledges	2000-2014	2014	Pledges
GFATM	Online project database; Progress Update on the New Funding Model report[22 72]	Planned spending	2002-2014	2014	Estimated percent change in planned spending by health focus area category

* **Years of budget data used for modeling** versus **years underlying DAH data unavailable thus modeled:** The data used to estimate DAH by channel vary across channels. eTable 2 reports our primary data used for each channel. Due to reporting lags there are some years we need to estimate disbursement using additional data sources. These additional data sources, the years in which the primary data is modeled, the years the additional data is available, and the methods for this estimating these modeled years are reported in eTable 4. **Years of budget data used for modeling** are the years of additional data available to us. We rely on historic trends to inform our estimates so we rely on many years of additional data despite only modeling a few years of primary data. **Years underlying DAH data unavailable thus modeled** are the years the primary data is incomplete and thus estimated using additional data. See example below for more details for Australia.

EXAMPLE. Australia's primary and additional data sources

Project-level data for health-related projects funded by Australia's bilateral aid agencies are available from the OECD's **CRS database** through 2012**.** This is the primary data source used to estimate DAH channeled by Australian aid agencies, as described in eTable 2. **2013-2014 are incomplete because of lags in reporting.** To estimate DAH disbursed for 2013 and 2014, a**dditional data are available from Australia's International Development Assistance budget (2008-2014) and Australia's Overseas Aid Program budget (1998-2008)**, as described in eTable 4**. These sources provide health-specific official development assistance (ODA)** budgeted by **Australia, 1998-2014.** To estimate DAH disbursed **2013-2014,** we calculated the ratio of disbursed **DAH (from the CRS database)** relative to **budgeted DAH (from the International Development Assistance and Overseas Aid Program budges) for 1998-2012**. We combine the most recent three ratios into a single estimate by taking **a weighted average, weighting substantially higher the most recent year.** We multiply this ratio – the estimated disbursed DAH to budgeted DAH – by the 2013 and 2014 budgeted DAH **to** estimate disbursed **DAH in those years.** These methods are described more fully in Part 1.1.

Part 1.1:

TRACKING DEVELOPMENT ASSISTANCE FOR HEALTH FROM BILATERAL AID AGENCIES AND THE EUROPEAN COMMISSION

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.[3]

These two DAC databases track the following types of resource flows:[68]

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"[69] 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). The CRS also now includes some private ODA, such as that funded by BMGF and GFATM, as well as assistance from the United Arab Emirates, Kuwait, the Czech Republic, and Iceland.

   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.
c. Other official flows (OOF), which refers to transactions that "do not meet the conditions for eligibility as Official Development Assistance or Official Aid, either because they are not primarily aimed at development, or because they have a Grant Element of less than 25 percent."[68]

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 prior to 2009, disbursements by Gavi prior to 2007 and BMGF prior to 2009, or all loans from the World Bank.

This research utilized the CRS as the principal source for tracking bilateral DAH. This is because the DAC aggregate tables do not report detailed project-level information about the recipient country and health focus area. The OECD sector codes for general health (121), basic health (122), and population programs (130) were used to identify health flows in the CRS.

To avoid double-counting, 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 were subtracted from bilateral ODA. The channel of delivery fields as well as keyword searches in the descriptive project fields (project title, short description, and long description) were used to identify potential sources of double-counting. 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 the definition of DAH as contributions from institutions whose primary purpose is development assistance. Official development finance (ODF) from the CRS was not counted because these expenditures were included elsewhere, either in the analysis of multilateral institutions relevant to the study or in the assessment of health spending by BMGF, the data for which was obtained via correspondence and from their annual reports, audited financial statements, and project databases. To avoid double-counting, only health assistance flows *from* multilateral institutions to low- and middle-income countries were counted, and not transfers *to* multilateral institutions.

Estimating disbursements for the 23 bilateral channels and the EC

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. Three variables were used to estimate yearly donor disbursements: CRS commitments, CRS disbursements, and DAC commitments. There were two main challenges in using the data from the CRS for this research:

1. underreporting of aid activity to the CRS compared to what is reported to the DAC, and
2. underreporting of disbursement data to the CRS compared to commitment data reported to the CRS.

These issues are highlighted in eFigure 1. Methods developed to account for both these challenges are discussed below. Refer to Part 1.7 for details on how we estimated the cost of providing technical assistance and program support for these institutions.

To address these two challenges, we determined a cutoff point for each channel. We defined this channel-specific cutoff year as when the ratio of total CRS disbursements to commitments was greater than 50% and did not drop subsequently below 30%. eFigure 2 below shows each donor's CRS disbursement to commitment ratio in green and the estimated cutoff year is marked with a vertical red line. For years after cut-off year, DAH is measured using the unadjusted disbursement data. For the time prior to the cut-off year, it was determined that the disbursement data is not high enough quality, and adjusted commitments were used instead.

Two adjustments were made to commitments to estimate disbursements before each donor-specific cutoff point:

I. The first adjustment addressed underreporting of aid activity to the CRS (relative to the DAC). To address this challenge, all CRS commitments for the health sector were adjusted upward using the DAC commitment to CRS commitment coverage ratio. The coverage ratio of the CRS was well below 10% before 1996, but has improved steadily over time.

II. The second adjustment addressed underreporting of disbursements data to the CRS (relative to commitments reported to the CRS). To address this challenge, we pooled completed projects in the CRS that have disbursement data for each channel and computed yearly project disbursement rates (the fraction of total commitments disbursed for each year of a project) and overall project disbursement rates (the fraction of total commitments disbursed over the life of each project) by project length. Yearly disbursement schedules were calculated for projects with a lengths of 1, 2, 3, 4, 5, and 6 years. When an observed project length was more than six years, all expenditure after the sixth year was aggregated and assumed to be expended in the sixth year. This does not happen often. Yearly disbursement rates were the median of these shares, averaged across projects for every donor in each project year. The sum of these averages equals one, so that all the disbursements were expended over the lifetime of a project. The product of these donor-specific yearly disbursement rates and the donor-specific overall disbursement rates produced the donor-specific disbursement schedules. The donor-specific disbursement schedules were applied to project level DAC-adjusted commitments reported in the CRS. eFigure 3 shows the yearly

disbursement rates and overall disbursement rates for projects with 1- to 6-year lifespans for each of the 23 member countries and the EC.

Lastly, to address the challenge of underreporting of aid activity to the CRS compared to the DAC for all years, the difference between each donor's aggregate DAC health commitments and CRS health disbursements was added to each donor's yearly DAH. Since only aggregate commitments are reported to the DAC, several adjustments were made, based on more detailed CRS data:

I. First, each donor's yearly average project length was calculated by applying the donor-specific disbursement schedules described above to CRS projects that had disbursement in order to get adjusted DAC commitments.
II. Commitments for projects that have not opened yet were then subtracted, based on the open date reporting in the CRS. This ensured that future disbursements were not captured.
III. Lastly, these DAC adjusted commitments were compared to CRS disbursements, inclusive of transfers that were later dropped as double-counting.

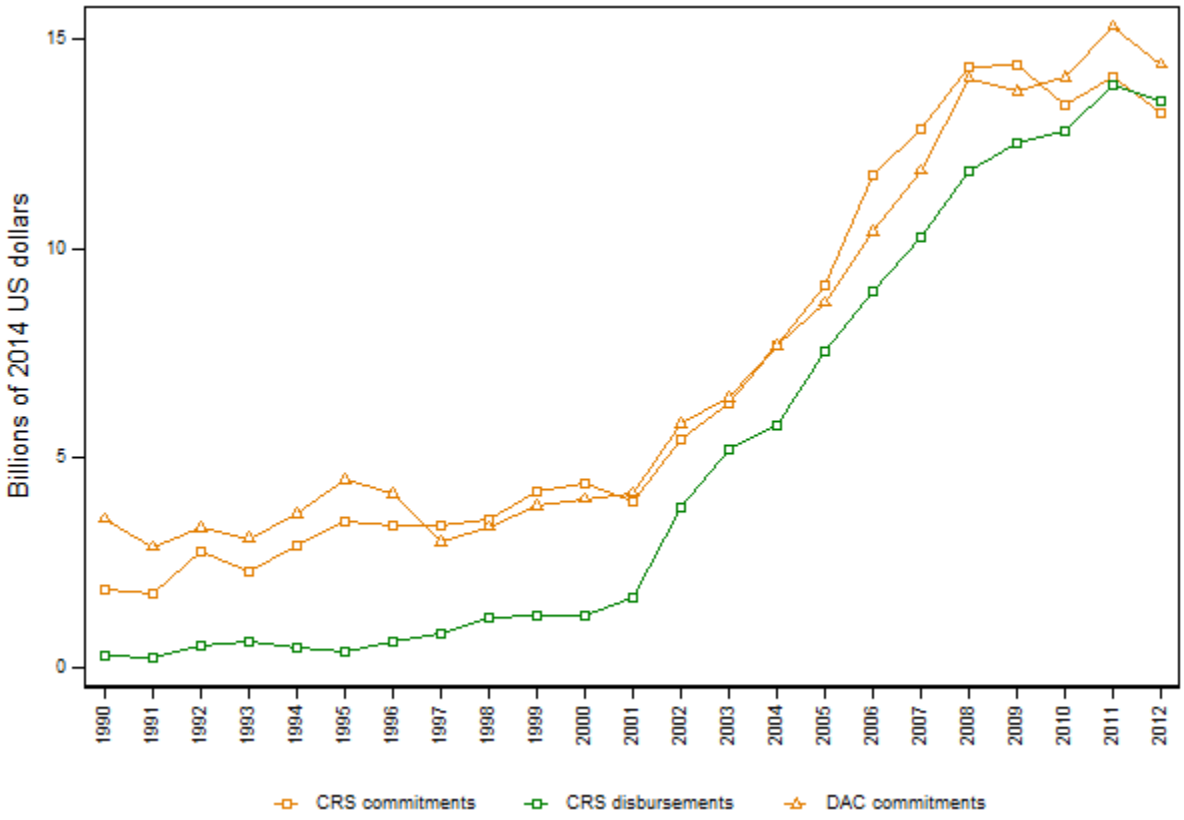
Transfers from donors to other global health channels that we already track were removed, including NGOs, GFATM, Gavi, PAHO, UNAIDS, UNFPA, UNICEF, WHO, the EC, and the regional development banks. The names of NGOs that were captured in IHME's NGO data were searched for in the CRS descriptive variables and tagged as double-counting. Transfers from the United States to the NIH were also excluded.

In addition to tracking disbursements from the EC, gross disbursements from the DAC were used to compile data on the sources of funding for the EC.

eFigure 1

Comparing CRS commitments, CRS disbursements and DAC commitments

This figure compares commitments and disbursements from the Creditor Reporting System (CRS) and Development Assistance Committee (DAC) databases of the Development Assistance Committee of the Organisation for Economic Co-operation and Development (OECD-DAC) from 1990 to 2012. CRS disbursements are usually underreported when compared to both CRS and DAC commitments data, especially in earlier years. Because of this gap between CRS and DAC, CRS disbursements data were adjusted to fit DAC commitments data.

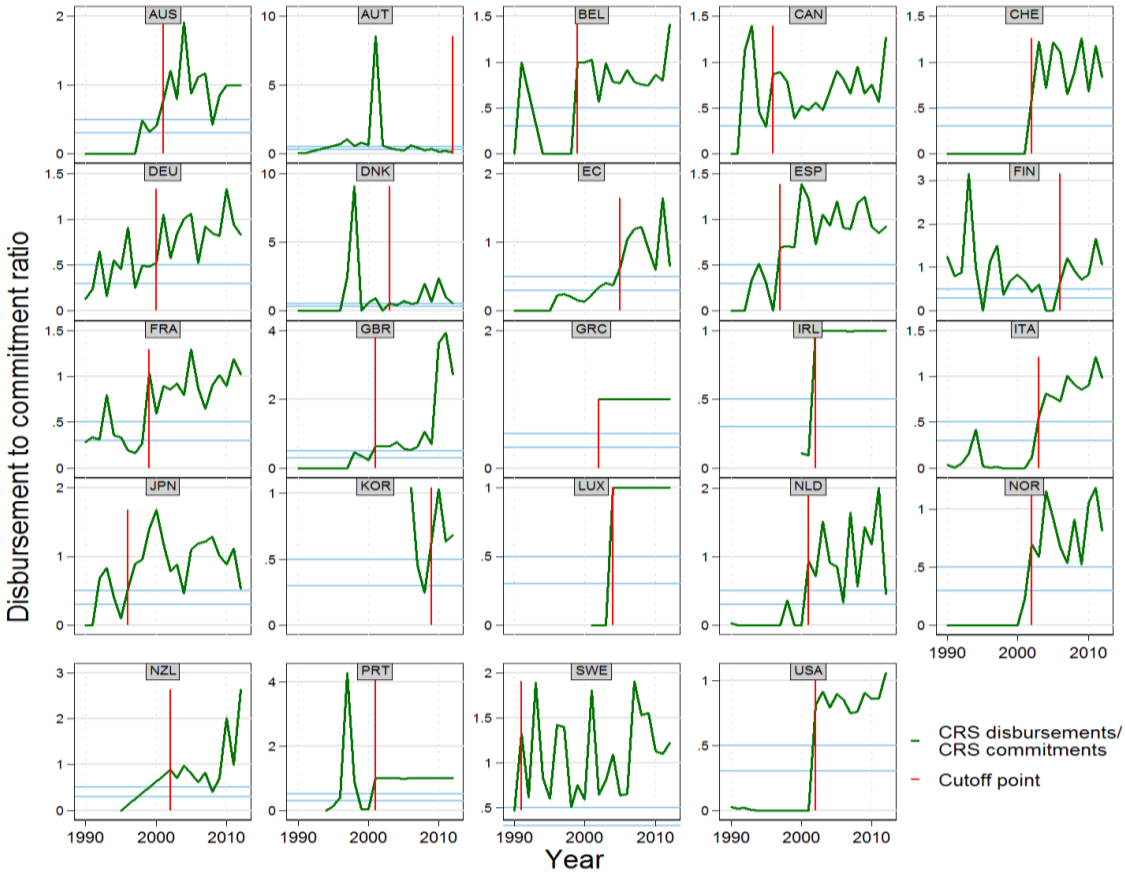


Source: OECD-DAC and OECD Creditor Reporting System

eFigure 2

CRS disbursement to commitment ratio and cutoff points by donor agency

This figure shows the channel-specific cut-off year. Before this year we adjust Creditor Reporting System (CRS) commitments using disbursement schedules. After this cut-off we rely on CRS reported disbursements. The total CRS disbursements to commitments ratio is in green and the cutoff year is marked with a vertical red line. The cut off year is determined to be when the ratio goes above 50% and does not fall back below 30%, marked with blue lines. The vertical axis represents the CRS disbursement to commitment ratio as a percentage. AUS = Australia, AUT = Austria, BEL = Belgium, CAN = Canada, CHE = Switzerland, DEU = Germany, DNK = Denmark, EC = European Commission, 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

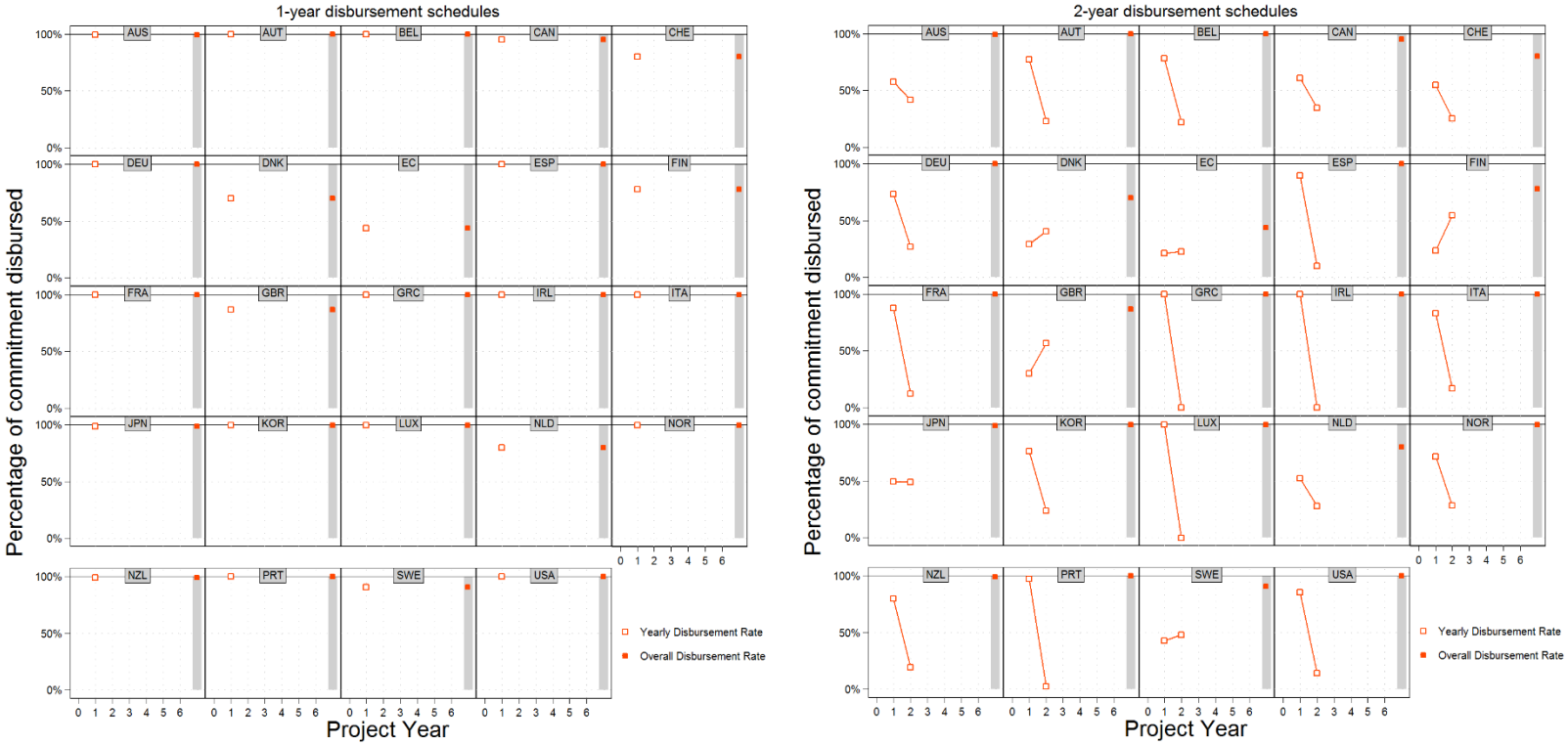
EXAMPLE. Australia's CRS disbursement to commitment ratio and cutoff year

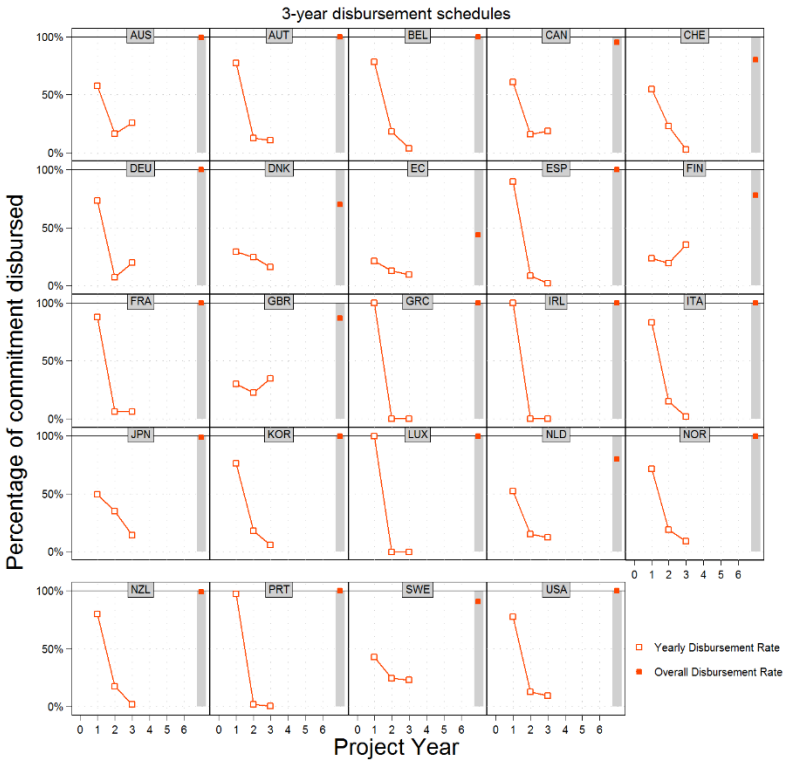
The green line shows the ratio of Australia's disbursements to commitments, as reported in the CRS. Prior to 2001, the ratio was always below 50%. In 2001, the ratio rose above 50% and it did not fall below 30% in subsequent years, thereby defining 2001 as the cutoff year. Thus, for Australia, before 2001 DAH is based on adjusted CRS commitment data. These data are adjusted using disbursements schedules (eFigure 3) and data from the DAC. After 2001, Australia's DAH is based on the disbursements reported in the DAH.

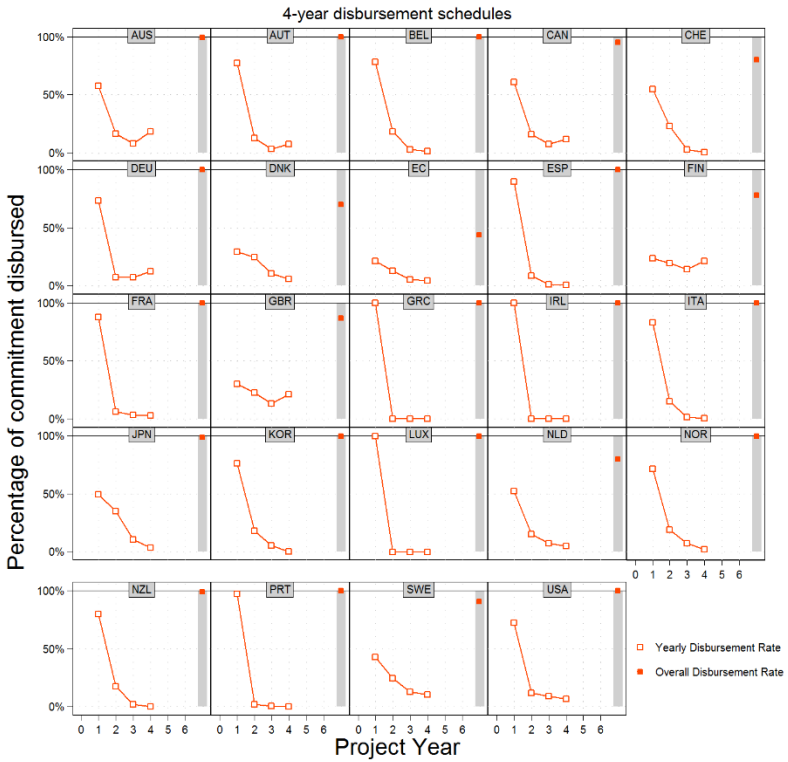
eFigure 3

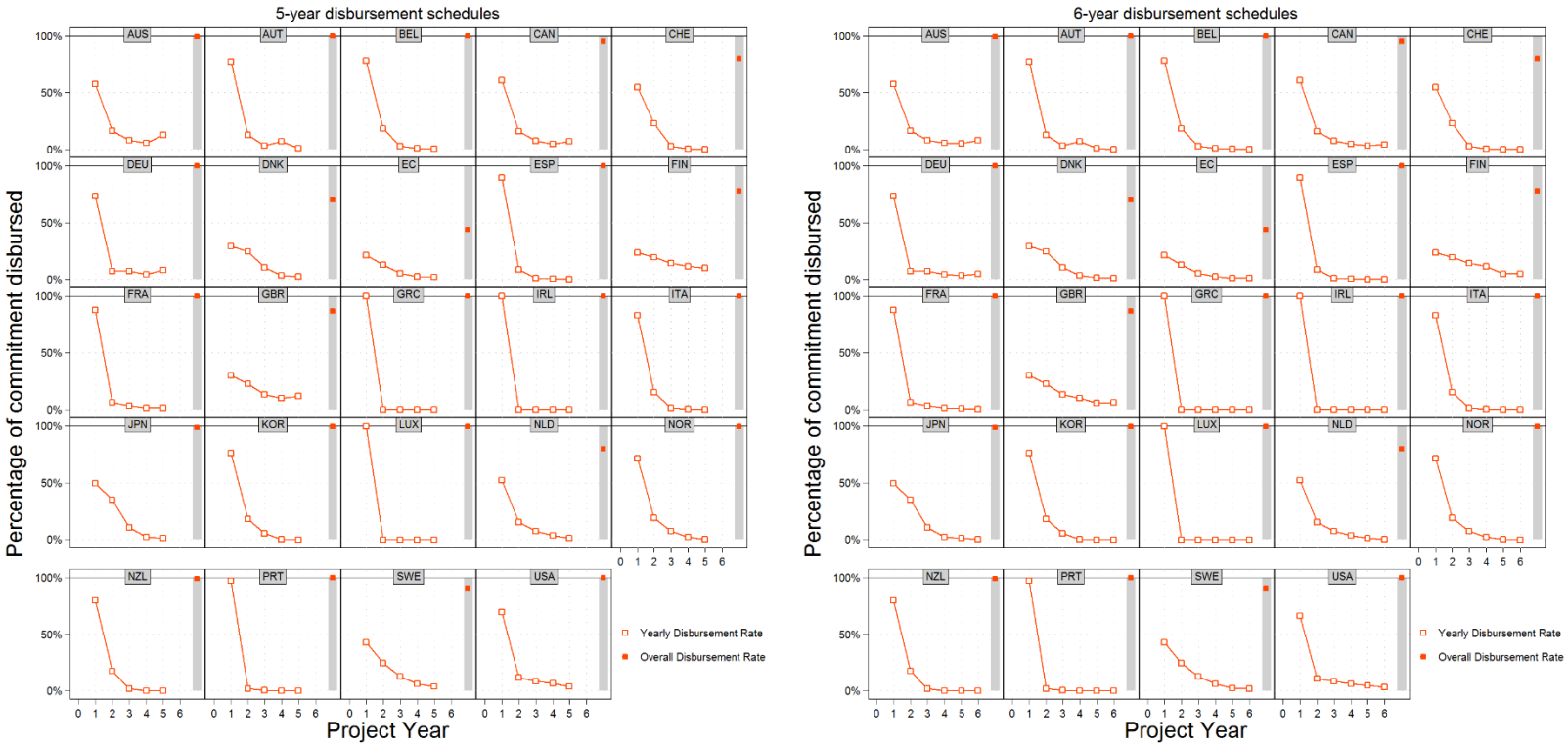
One- to six-year disbursement schedules for bilateral channels

This figure shows the estimated disbursement schedules for bilateral channels. Before the channel-specific cut-off year, we rely on commitment data to inform our estimates of DAH. Commitment data is adjusted to reflect disbursements over time using schedules estimated from projects in the Creditor Reporting System (CRS) that have both commitment and disbursement data. The vertical axis represents the percentage of the commitment disbursed. AUS = Australia, AUT = Austria, BEL = Belgium, CAN = Canada, CHE = Switzerland, DEU = Germany, DNK = Denmark, EC = European Commission, 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




3-year disbursement schedules
Percentage of commitment disbursed
Project Year
AUS
AUT
BEL
CAN
CHE
DEU
DNK
EC
ESP
FIN
FRA
GBR
GRC
IRL
ITA
JPN
KOR
LUX
NLD
NOR
NZL
PRT
SWE
USA
100%
50%
0%
0 1 2 3 4 5 6
Yearly Disbursement Rate
Overall Disbursement Rate


4-year disbursement schedules
Percentage of commitment disbursed
Project Year
AUS
AUT
BEL
CAN
CHE
DEU
DNK
EC
ESP
FIN
FRA
GBR
GRC
IRL
ITA
JPN
KOR
LUX
NLD
NOR
NZL
PRT
SWE
USA
100%
50%
0%
0 1 2 3 4 5 6
Yearly Disbursement Rate
Overall Disbursement Rate



Source: OECD Creditor Reporting System

EXAMPLE. Australia's one- to six-year disbursement schedules

To estimate disbursements using commitment data, we rely on disbursement scheduled derived from CRS data that includes both commitments and disbursements. Disbursement schedules are specific for each channel and the length of a project. These schedules also take into consideration the average amount of commitments for each channel that lead to disbursements. Across all Australian projects in the CRS with complete disbursements data, Australia disbursed 98% of the funds that it committed, as shown by the solid red dot on the right-hand side of Australian panel (upper left corner of the first panel of eFigure 3). In projects with a length of one year, Australia disbursed 98% of the funds that it committed in that year. For two-year projects, Australia disbursed 60% of total disbursements in year one and 38% of total disbursements in year two. In projects with lengths of three years, Australia disbursed about 60% of total disbursements in year one and 15% and 23% of total disbursements in years two and three, respectively. This is estimated for projects ranging from one to six years. The disbursement schedules were applied to commitment data from the CRS to estimate disbursements for years prior to the cut-off year, which is 2001 for Australia.

To predict DAH for the recent years not reported in the CRS, budget data were extracted from a variety of sources. These data are listed in eTable 4. Global health budgetary data were utilized whenever possible, but these detailed data were available as a complete time series only for Australia and the United States. For all other bilateral channels, general ODA budgets were used. In order to predict DAH for 2013 and 2014 for 23 bilateral agencies, the budget ratio for each donor were calculated by dividing DAH estimates by the corresponding budget data (ODA or global health). Budget ratios for 2013 and 2014 were projected using a weighted average of the previous three years (placing one-half weight on the one-year lagged ratio, one-third weight on the two-year lagged ratio, and one-sixth weight on the three-year lagged ratio), and this ratio was multiplied by the observed budgeted DAH for those same years. eFigure 4 plots the budget ratio for each bilateral channel.

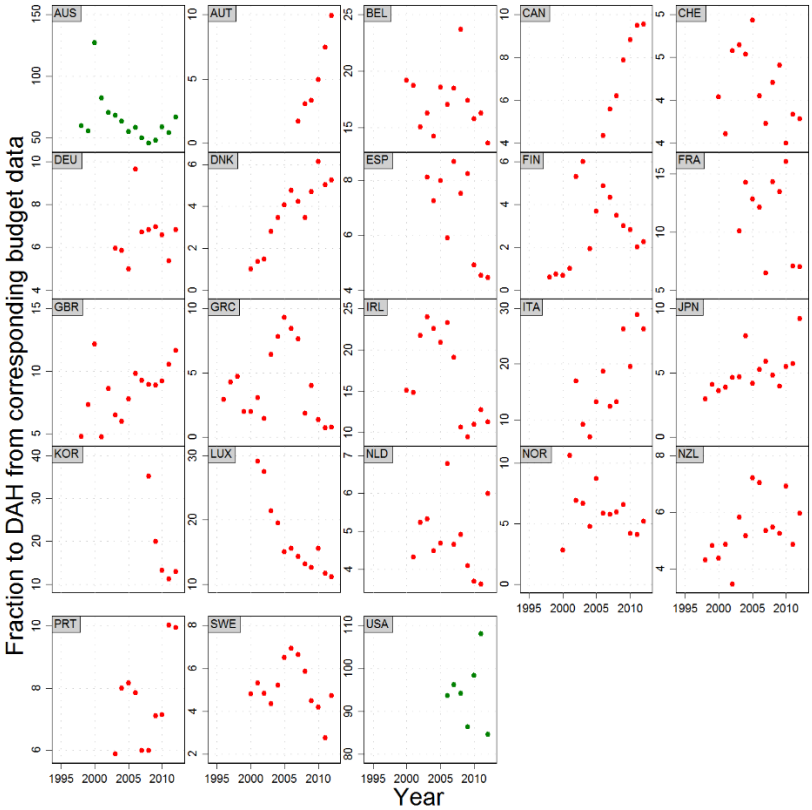
Budget data for the EC were inconsistent and did not match the disbursement series. Instead, DAH for 2013 and 2014 was estimated based on trends in DAH for EC member countries. A weighted average was applied to the percent change in DAH from 2012-2013 and 2013-2014 for all EC member countries. The weighting was based on each country's total national contributions to the EC. These data were collected from the EC's 2012 financial statement.[70] The weighted average was then applied to the EC's 2012 DAH to forecast 2013, and 2013 to forecast 2014.

eFigure 4

DAH as a percentage of corresponding budget data by bilateral agency

This figures shows the trend of the ratio of DAH measured as a share of budget data. Green dots indicate that a donor provided global health-specific budget data, so in these cases the denominator is all global health-specific budgeted data. The numerator is estimated DAH. Red dots indicate that a donor did not have global health-specific budget data, so overall ODA budget data were used in calculating the DAH to budget ratios. The vertical axis represents estimated DAH as a fraction of corresponding budget data. Green dots are out of 100. Red dots are out of 100,000,000.

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: IHME DAH Database (2014) and corresponding bilateral ODA/DAH budget documents outlined in eTable 2.

EXAMPLE. Australia's DAH as a percentage of corresponding budget data

Australia provided global health-specific budget data for 1998-2014 through its International Development Assistance and Overseas Aid Program budgets. For 1998-2012, health ODA and observed DAH were used to create DAH to budget ratios. These budget ratios were then used with 2013 and 2014 health ODA budget data to project DAH in 2013 and 2014, using a weighted average:

$$(\boldsymbol{Total\ DAH_t}) = \left(\frac{\mathbf{1}}{\mathbf{2}}\right)(\boldsymbol{Budget\ ratio_{t-1}})(\boldsymbol{Budgeted\ GHE_t}) + \left(\frac{\mathbf{1}}{\mathbf{3}}\right)(\boldsymbol{Budget\ ratio_{t-2}})(\boldsymbol{Budgeted\ GHE_t}) + \left(\frac{\mathbf{1}}{\mathbf{6}}\right)(\boldsymbol{Budget\ ratio_{t-3}})(\boldsymbol{Budgeted\ GHE_t})$$

where t = year to be modeled (2013 or 2014).

Part 1.2:

TRACKING DEVELOPMENT ASSISTANCE FOR HEALTH FROM THE DEVELOPMENT BANKS

The World Bank

Project-level health disbursement data for 1990-2014 were obtained from the World Bank through correspondence with Miyuki Parris, Operations Analyst.[12] Health disbursements included all health projects as well as other sector projects with a health sector code. In addition to these data, data were collected from the World Bank online loans database in order to fill in descriptive information for loans from the two arms of the World Bank, the International Development Association (IDA) and the International Bank for Reconstruction and Development (IBRD).[12]

Along with keyword searches described in section 1.8, health theme codes were used to allocate disbursements by health focus area. 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, and social subdivisions, while theme codes represent the goals or objectives of World Bank activities. The codes are summarized in eTable 5. Emergency recovery loans were excluded since they do not fit the definition of DAH.

eTable 5

World Bank's health sector and theme codes

Health sector codes Sector codes represent economic, political, or social 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) HIV/AIDS (2) Malaria (3) Tuberculosis (4) Other communicable diseases (5) Population and reproductive health (6) Child health (7) Nutrition and food security (8) Injuries and non-communicable diseases (9) Health system performance

Data on yearly government contributions were obtained from the DAC statistics in order to disaggregate IDA flows by source. Refer to Part 1.7 for details on how we estimate the cost of providing technical assistance and program support for these institutions.

The data received from the World Bank captured disbursements for only the first few months of 2014, so ordinary least squares regression was employed to predict 2014 health disbursements for IDA and IBRD separately. Full-year disbursements were regressed on commitments from May 8 of the previous year to May 8 of the present year for IBRD and from May 20 of the previous year to May 20 of the present year for IDA. May 8 and May 20 were the last dates of a commitment in the data provided by the World Bank.

$$(IDA\ DAH_t) = \alpha + \beta_1(IDA\ commitments\ May\ 20\ to\ May\ 20_t) + \varepsilon$$

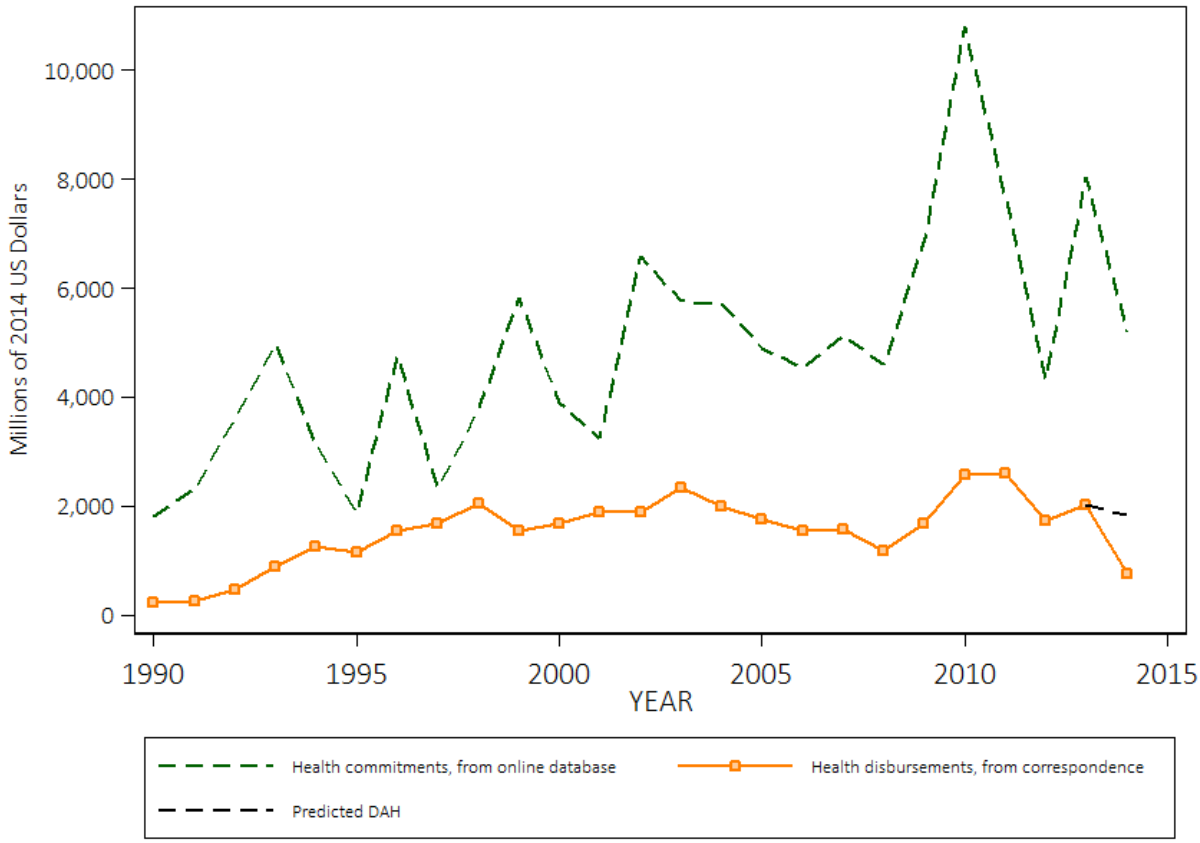
$$(IBRD\ DAH_t) = \alpha + \beta_1(IBRD\ commitments\ May\ 8\ to\ May\ 8_t) + \varepsilon$$

eFigure 5 shows (a) total health commitments from the online loans database (green dashed line), (b) total health disbursements received from correspondence (orange line), and (c) predicted full-year disbursements (black dashed line). The database distinguishes between loans from IDA and IBRD, but the aggregates are shown in the figure.

eFigure 5

World Bank's annual health sector commitments and disbursements

This figure shows health sector commitments from the online database in green. The orange line shows annual health disbursements data received from the World Bank through 2014. The substantial drop for 2014 of disbursements is because the 2014 data is incomplete due to reporting lag. The dashed black line shows predicted full-year disbursements based on the regression method described above.



Source: IHME DAH Database (2014) and correspondence with World Bank

Regional development banks

The African Development Bank (AfDB), Asian Development Bank (ADB), and Inter-American Development Bank (IDB) all maintain their own loan databases, which were used to estimate disbursements.[14,15,17] eTable 6 provides a summary of the data sources used across the regional banks. Furthermore, eFigures 6, 7, and 8 display commitments and disbursements from 1990 to 2014 for each organization.

In 2010, the AfDB began providing an online project-level database with cumulative commitment data for all projects and cumulative disbursement data for closed projects. Cumulative disbursements were divided by the project length to estimate annual disbursements for closed projects. For ongoing and approved projects, commitments were adjusted by the average fraction of commitments that were disbursed for closed projects, and then divided the adjusted commitments by the average project length. Disbursement levels prior to 2007 did not match previously gathered data from AfDB's Compendium of Statistics, so data from the Compendium of Statistics were used for pre-2007 estimates of DAH.[16]

The ADB reported commitments and disbursements for all projects. Annual disbursements were estimated by dividing the project length by total disbursements. For projects without a closing date, estimates were based on the average project length by project type. When no disbursement data were available, adjusted commitments were used, based on the average fraction of commitments that were disbursed by project type for projects with both commitments and disbursements data.

The IDB's project database also provided commitments and disbursements for all projects. The same methods were used for estimating annual disbursements from the IDB as were used for the ADB.

All datasets used to estimate disbursements for the regional development banks were updated in October 2014. Due to lags in reporting, preliminary estimates of DAH in 2014 may be incomplete. However, since these channels have so few new projects each year, it was assumed that smoothing disbursements over time for reported projects captured the majority of total disbursements for 2014.

eTable 6

Summary of data sources for the regional development banks

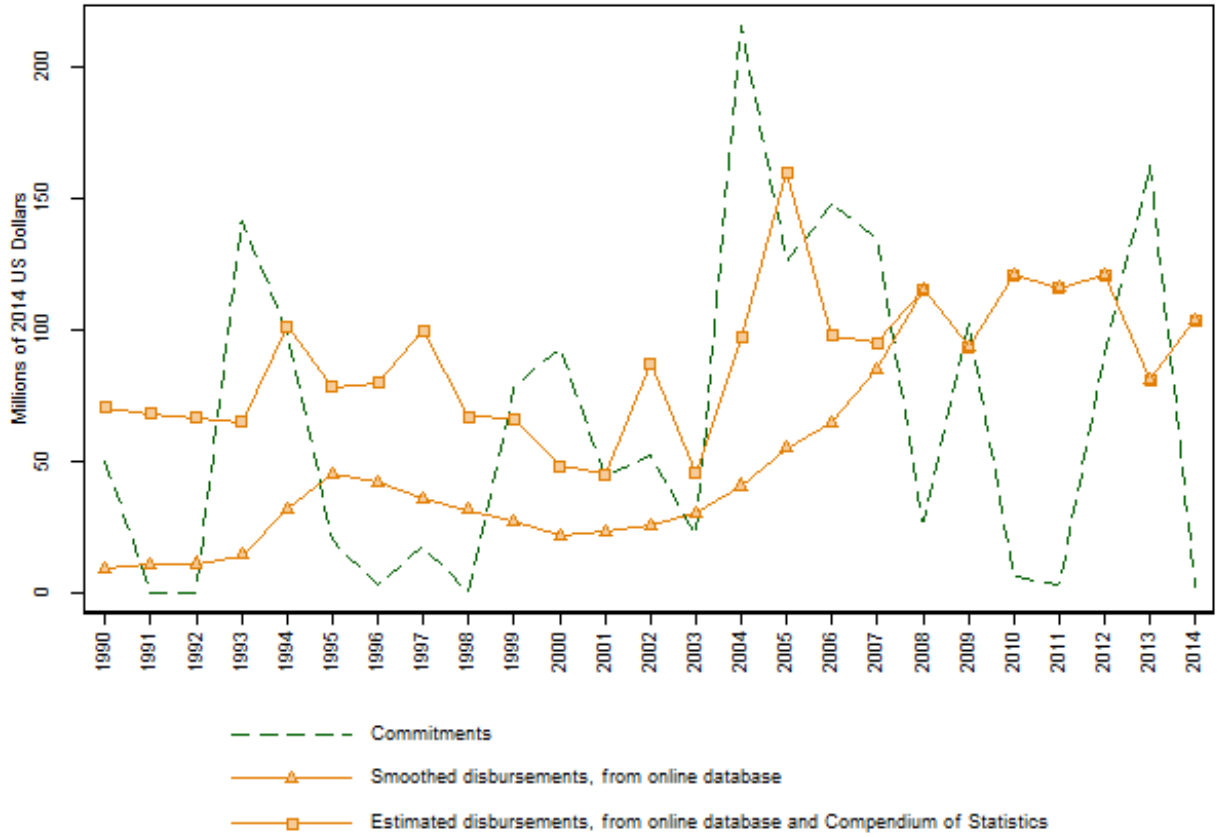
This figure indicate the s data available and used to estimate DAH. (X) indicates that project-level data are present in the dataset. (-) indicates that project-level data are not present in the dataset.

Institution	Data source	Commitments	Cumulative disbursements	Yearly disbursements	Notes
African Development Bank (AfDB)	Compendium of Statistics[16]	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[15]	X	X	-	As yearly disbursement amounts are not provided in the online database, we estimated yearly disbursements by allocating cumulative disbursements over each year of the project.
	OECD-Creditor Reporting System[3]	X	-	X	To maintain continuity with previous estimate, yearly disbursement amounts from the CRS were not used.
Asian Development Bank	Online Projects Database[14]	X	X	-	As yearly disbursement amounts are not provided in the online database, we estimated yearly disbursements by allocating cumulative disbursements over each year of the project.
	OECD-Creditor Reporting System	X	-	-	To maintain continuity with previous estimate, yearly disbursement amounts from the CRS were not used.
Inter-American Development Bank	Online projects database[17]	X	X	-	As yearly disbursement amounts are not provided in the online database, we estimated yearly disbursements by 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.

eFigure 6

Commitments and disbursements by the African Development Bank

The dashed green line shows commitments from the African Development Bank's (AfDB) online project database. The orange line shows smoothed disbursements from the online project database. A combination of the Compendium of Statistics and online project database was used in the DAH estimates, shown by the solid green line.

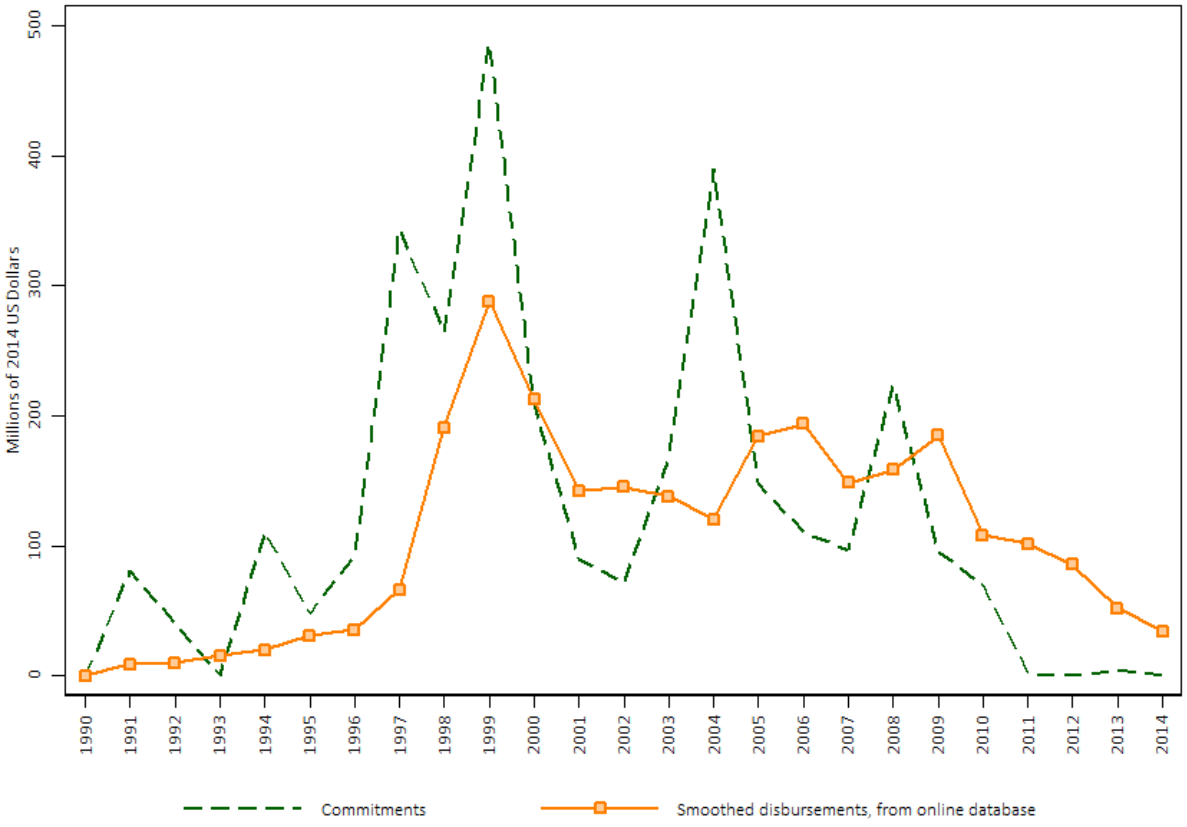


Source: IHME DAH Database (2014) and African Development Bank Compendium of Statistics 2014

eFigure 7

Commitments and disbursements by Asian Development Bank

The dashed green line shows commitments from the Asian Development Bank's (ADB) online projects database. The orange line shows smoothed disbursements from the online projects database.

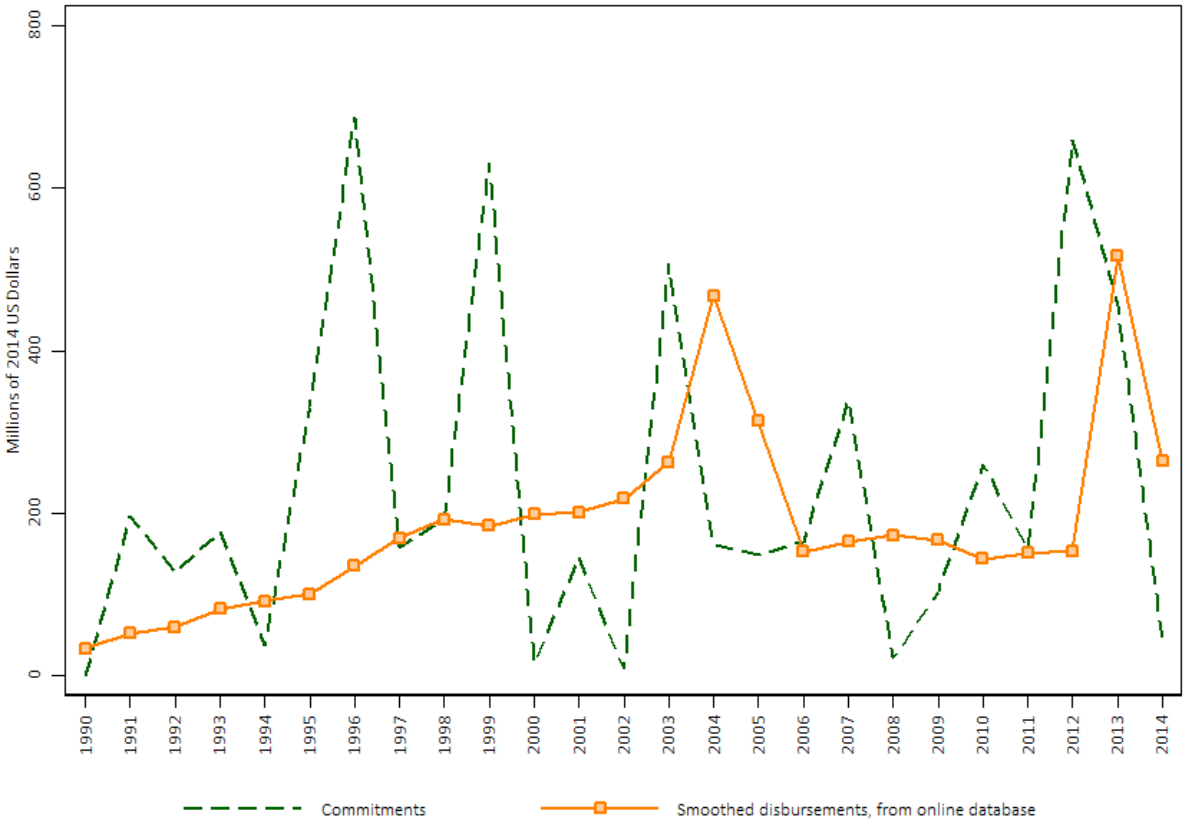


Source: IHME DAH Database (2014)

eFigure 8

Commitments and disbursements by Inter-American Development Bank

The dashed green line shows commitments from the Inter-American Development Bank's (IDB) online projects database. The orange line shows smoothed disbursements from the online projects database.



Source: IHME DAH Database (2014)

Part 1.3:

TRACKING CONTRIBUTIONS FROM GFATM AND GAVI

The Global Fund to Fight AIDS, Tuberculosis and Malaria

The grants database made available online by the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) provides grant-level commitments and annual disbursements.[21] In addition, sources of funding were compiled from the GFATM contributions dataset and annual reports, all downloaded from the GFATM website.[22,23] eFigure 9 shows GFATM's annual contributions received from public and private sources.

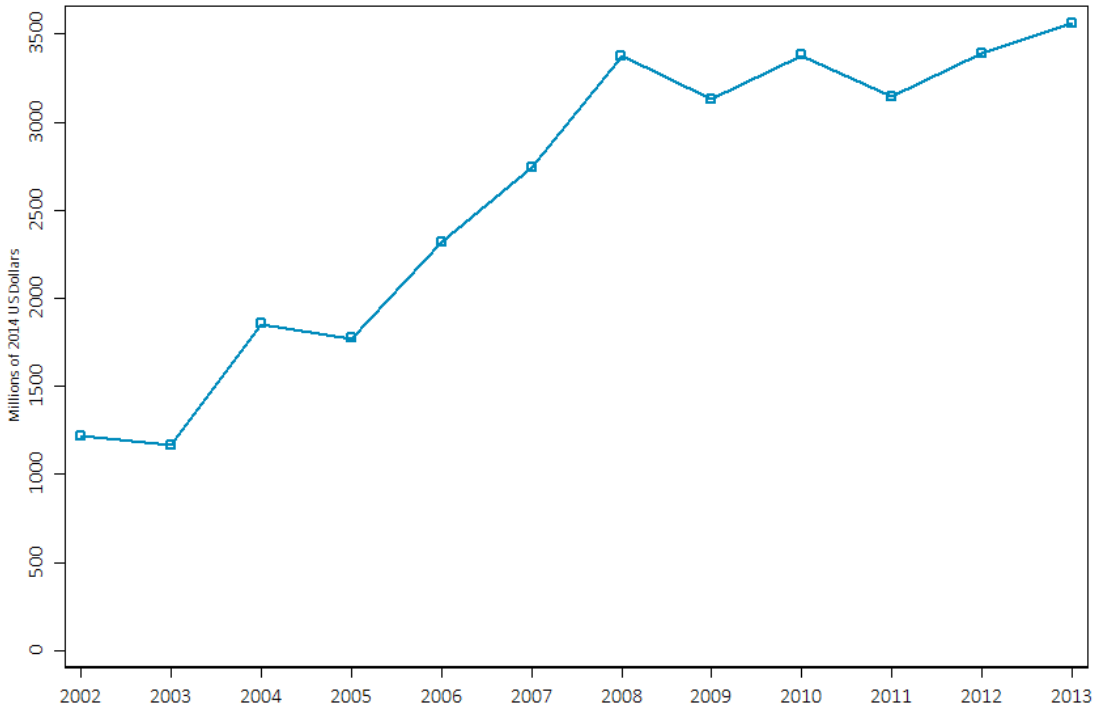
Disbursement data for 2014 was incomplete. In order to account for missing disbursements for the second half of 2014, we used planned funding allocations by disease from GFATM's Progress Update on the New Funding Model report from July 2014. We adjusted these numbers to account for in-kind DAH and double-counting. We did this by regressing the estimated DAH sequence from 2002 to 2013 that includes corrections for these issues on the expected disbursements reported by GFATM, using ordinary least squares. We used the estimated regression coefficients to adjust for 2014 expected disbursement, as reported in the GFATM's Progress Update on the New Funding Model report from July 2014.[71]

$$(GFATM\ DAH_t) = \alpha + \beta_1(expected\ disbursements\ reported\ by\ GFATM_t) + \varepsilon$$

eFigure 10 shows GFATM's annual commitments and disbursements from its project database as well as predicted DAH for 2014.

eFigure 9

Contributions received by the Global Fund to Fight AIDS, Tuberculosis and Malaria



Source: GFATM pledges and contributions 2014

eFigure 10

The Global Fund to Fight AIDS, Tuberculosis and Malaria's commitments and disbursements

The dashed green line shows commitments from the Global Fund to Fight AIDS, Tuberculosis and Malaria's (GFATM) online grants database. The orange line shows disbursements from the online grants database. Disbursements for 2014 were predicted based on disbursements reported for the first half of the same year and disbursement trends in previous years, illustrated by the dashed black line.

Source: IHME DAH Database (2014)

Gavi, the Vaccine Alliance

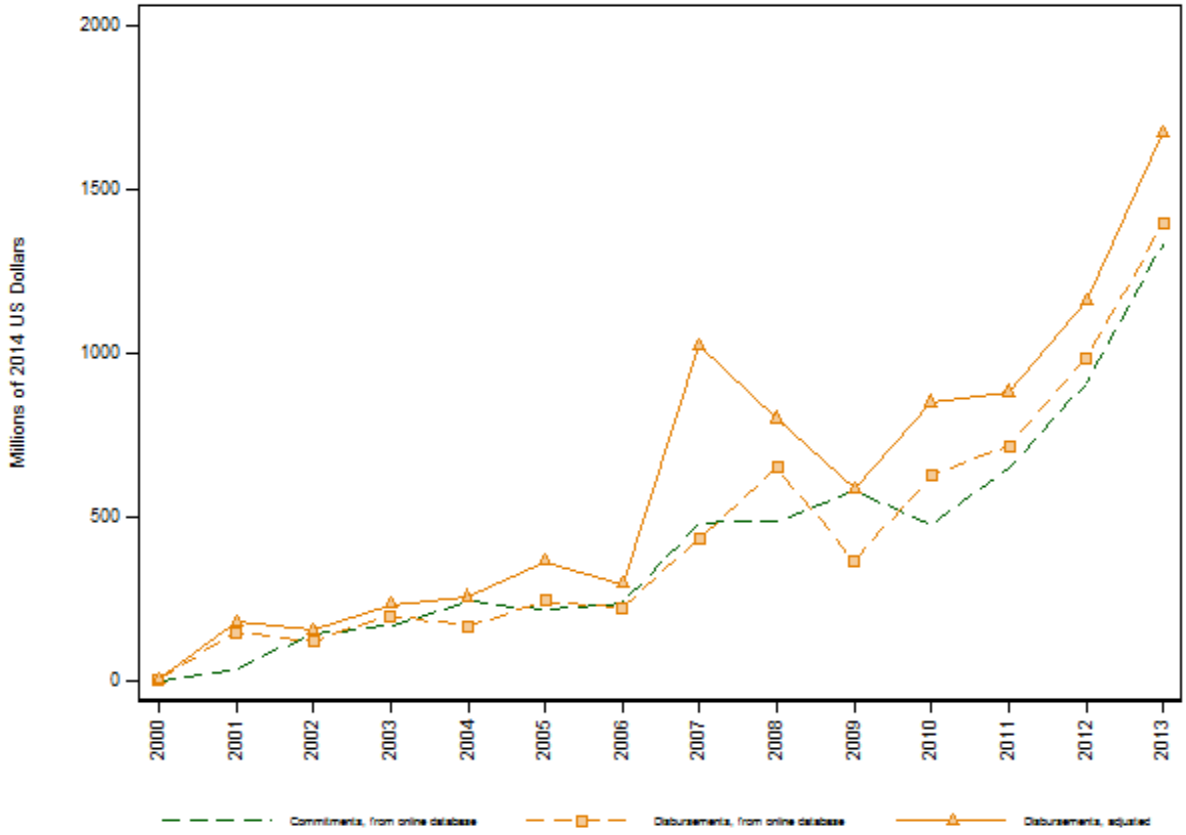
Gavi provided publically available project-level data on commitments, disbursements, and investment cases from 2000 through the present.[17,8] Gavi's annual DAH was defined as the sum of (1) project-level disbursements by year paid; (2) investment cases (one-time investments in disease prevention and control); and (3) administrative and work plan costs. Data from Gavi's online databases include expenditure for (1) and (2), but not (3). However, project-level data from the CRS for 2007-2012 did include administrative and work plan costs, so disbursements data from the online database were adjusted to match the CRS in those years. The average fraction of administrative and work plan costs was added to total disbursements in 2000-2006 and 2013, the years in which the CRS did not include these data. Total DAH before (dashed orange line) and after (blue line) are shown in eFigure 11. Contributions data from Gavi's website as well as annual reports from the IFFIm were used to determine Gavi's annual income. [20,21]

All of the data sources used for Gavi estimates were complete through 2013. Donor contributions received and outstanding pledges data were available on Gavi's website through 2014. The unadjusted total pledges were used as total disbursements for 2014.

eFigure 11

Gavi's income and disbursements

The dashed green line shows commitments from Gavi's online database. The dashed orange line shows the disbursements from Gavi's online database, which is the sum of project-level disbursements and investment cases. These data are adjusted using Gavi expenditure data reported to the Creditor Reporting System (CRS) to add administrative and work plan costs to the total. Adjusted disbursements are shown by the blue line.



Source: IHME DAH Database (2014)

Part 1.4:

TRACKING EXPENDITURE BY UNITED NATIONS AGENCIES ACTIVE IN THE HEALTH DOMAIN

Data on income and expenditures were collected for five UN agencies: WHO, UNICEF, UNFPA, UNAIDS, and PAHO. The data sources and calculations for each are described in detail below. Similar to the bilateral channels, we extracted budget data for the UN agencies to predict DAH for years for which we did not have health expenditure data. Model choices and budget measures for UN agencies are presented in eTable 4.

World Health Organization

Data on WHO's budgetary and extrabudgetary income and expenditure were compiled from annual reports and audited financial statements released by WHO.[10] Income data were extracted from WHO's assessed and voluntary contributions, while expenditure data were extracted from both budgetary and extrabudgetary spending reports. As the financial statements represent activities over a two-year period, both income and expenditure data were divided by two, in order to approximate yearly amounts, and dollars were deflated using the US GDP deflator specific to the reporting year. 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 were excluded. Expenditures from supply services funds were also excluded, as these expenditures pertain to services provided by WHO but paid for by recipient countries.

Disbursement data were not available for WHO in 2014. Much like the bilateral agencies, the ratio of DAH to the total program budget was estimated for 1990-2013 and then predicted for 2014 using the three-year weighted average of previous years (placing one-half weight on the one-year lagged ratio, one-third weight on the two-year lagged ratio, and one-sixth weight on the three-year lagged ratio).[61] The predicted ratio was then multiplied by the observed program budget for 2014 to get the estimates of DAH (see "EXAMPLE. Australia's data sources" box on page 11 and "EXAMPLE. Australia's DAH as a percentage of corresponding budget data on page 22 for an example of this methodology).

United Nations Population Fund

Data on income and expenditure were extracted for UNFPA from its audited financial statements.[9] As these statements represent activities over a two-year period, income and expenditure data were divided by two in order 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.

Income and expenditures associated with procurement and cost-sharing activities were excluded from estimates of health assistance because 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, it is not included in calculations of total DAH. UNFPA's additional expenditures for these projects come from trust funds or regular resources and are therefore captured in our estimates.

The disbursement data for UNFPA were available through 2013. For year 2014, we received estimated total spending via correspondence with Neil Spencer, Financial Analyst.[66]

United Nations Children's Fund

Data on income and expenditure for UNICEF were extracted from its audited financial statements.[6] As these statements represent activities over a two-year period for all years except 2012, income and expenditure data were

divided by two in order to approximate yearly amounts for 1990-2011. Dollars were deflated using the US GDP deflator specific to the reporting year.

Since UNICEF's activities are not limited to the health sector, the fraction of UNICEF's expenditure that was for health was estimated using a combination of annual reports and personal correspondence. UNICEF's annual reports in the 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, health expenditure data were obtained from UNICEF directly.[7]

In order to estimate DAH in years where health expenditure data were missing, the average fraction of expenditure for health for regular and supplementary funds over the five most recent years were applied to the expenditure reported in the financial reports in those years. In those years, 13% of regular funds and 32% of supplementary funds, on average, were utilized for health.

Disbursement data for UNICEF for year 2013 were received via correspondence with Lina Sabbah, Budget Officer and Andrea Suley, Chief of Funds management, Monitoring, and Reporting, Division of Financial and Administrative Managment.64 The product of observed program budget and the weighted average of the DAH to budget ratio (placing one-half weight on the one-year lagged ratio, one-third weight on the two-year lagged ratio, and one-sixth weight on the three-year lagged ratio) was used to predict DAH in 2014, using the same methodology that was utilized in predicting DAH for WHO.[64]

Joint United Nations Programme on HIV/AIDS

UNAIDS income and expenditure data for both its core and noncore budgets were extracted from its audited financial statements.[5] As financial data are provided on a biennium basis in all years except for 2012, the quantities were divided by two to obtain yearly amounts for all biennium data. Dollars were deflated using the US GDP deflator specific to the reporting year.

For UNAIDS, budget measures were available only for a subset of reported total disbursements. UNAIDS reported total expenditure, which combined Unified Budget and Workplan (UBW) and non-UWB components, but only UBW budget data were available.[63][62] To predict DAH for UNAIDS in 2013 and 2014, disbursements in those years were by multiplying the observed UBW budget with the three-year weighted average of the ratio of DAH to the UWB budget (placing one-half weight on the one-year lagged ratio, one-third weight on the two-year lagged ratio, and one-sixth weight on the three-year lagged ratio).

Pan American Health Organization

The Pan American Regional Office for WHO, or PAHO, reports its income and expenditure in its biennial financial report.[10] Correspondence with WHO revealed that WHO reported only a small subset of the overall funds received by PAHO, which meant that PAHO DAH needed to be estimated separately. According to the financial reports, WHO funds made up 6.6% and 6.5% of PAHO's total expenditures in 2012 and 2013, respectively.

The funds transferred through the "Rotating Fund" were excluded because developing countries fund this procurement of health commodities, and it therefore does not fit the definition of DAH.

As the financial data are provided on a biennial basis (with the exception of 2010 through 2013, where single-year financial reports were available), the quantities were divided by two to obtain yearly amounts. Dollars were deflated using the US GDP deflator specific to the reporting year

For PAHO, disbursement data were not available for 2014. PAHO reported disaggregated expenditures of voluntary and regular programs in its financial statements, but only regular program budget data were available in 2014.[66] Thus, to predict DAH for PAHO in 2014 the product of the three-year weighted average of DAH to the regular budget (placing one-half weight on the one-year lagged ratio, one-third weight on the two-year lagged ratio, and one-sixth weight on the three-year lagged ratio), as was the case with several other UN agencies.

Part 1.5:

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.[71] Hence, this research focused efforts on tracking only US foundations. 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.[72] 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, its contributions do not meet the definition of DAH.

US foundations

The Foundation Center maintains a database of all grants of $10,000 or more awarded by over a thousand US foundations. The Foundation Center has coded each grant by sector and international focus and, therefore, is able to identify global health grants. IHME purchased a customized dataset with cross-border health grants and health grants to US-based international programs from 1992 to 2012 from the Foundation Center.[31] Grants from BMGF, which were tracked separately, were excluded. Additionally, grants to channels that this research already tracks were excluded.

To estimate total health grants 1990-1991 and 2013-2014, aggregate US foundation DAH was regressed on US GDP per capita and year using ordinary least squares estimation.

$$(Foundation\ DAH_t) = \beta_1\ (US\ GDP\ per\ capita_t) + \beta_2\ (year) + \varepsilon$$

The missing years of data were predicted based on estimated regression coefficients from the equation.

Refer to Part 1.7 for details on how the cost of providing technical assistance and program support for US foundations were estimated.

Bill & Melinda Gates Foundation

BMGF has been the single largest grant-making institution in the health domain since 2000; hence, additional research was undertaken to accurately capture its annual disbursements. BMGF's IRS 990PF filings for years 1990-2007, which report all global health grants disbursed per year, were downloaded from the BMGF website.[30] Additionally, disbursement data were obtained, for years 2008-2013 were collected from the BMGF online grants database and the OECD CRS.[29,31] All BMGF grants disbursed by recipient type (distinguishing between awards to other foundations, NGOs, universities and research institutions, UN agencies, private-public partnerships, and governments) were manually coded for years for which this information was not provided.

An ordinary least squares linear regression model was used to predict the disbursement for BMGF 2014. Since there is a strong correlation between market trends and BMGF annual disbursements, market data including lagged US GDP, lagged yearly average of the S&P 500, lagged yearly average of Berkshire stock returns, lagged yearly average of the Russell Index, and lagged total assets of the BMGF Trust were utilized to predict the total disbursement for year 2014.[68]

$$\begin{aligned}(BMGF\ total\ disbursement_t\ ) \\ &= \beta_1\ (US\ GDP\ per\ capita_{t-1}) + \beta_2\ (S\&P\ 500\ market\ index_{t-1}) \\ &+ \beta_3\ (Berkshire\ stock\ returns_{t-1}) + \beta_4\ (Russel\ Index_{t-1}) + \beta_5\ (BMGF\ total\ asset_{t-1}) + \varepsilon\end{aligned}$$

BMGF's predicted DAH was adjusted to account for in-kind DAH and double-counting. The difference between BMGF's final DAH and DAH without in-kind added and double-counting removed from 2003-2013 was regressed using ordinary least squares on DAH without in-kind added and double-counting removed and year. The predicted difference was then subtracted from the predicted DAH from the previous regression for 2014.

Part 1.6:

TRACKING NON-GOVERNMENTAL ORGANIZATIONS

Currently, there are no centralized, easily accessible databases for tracking program expenses of the thousands of NGOs based in high-income countries that are active in providing development assistance and humanitarian relief worldwide. This study relied on the only comprehensive data source identified for a large subset of these NGOs, namely the United States Agency for International Development's Report of Voluntary Agencies (USAID's VolAg report).[25] The report, which includes both US-based and international NGOs 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, private contributions, and in-kind Total revenue and expenditure data obtained from the NGO's IRS tax forms, accessed through the GuideStar online database, were also used in tracking NGOs incorporated in the US.[25]

Several challenges arose in using these data. We outline these challenges here, and discuss below the estimation methods employed to estimate a consistent series of DAH channeled through NGOs despite these challenges. First, with the exception of BMGF, it was impossible to track the amount of funding from US foundations routed through US NGOs, which may have led to double-counting in estimates of total health assistance. The second challenge relates to the incompleteness of the universe of NGOs captured through the USAID report. The report provides data on NGOs that received funding from the US government. While this covers many of the largest NGOs, it is not a comprehensive list. A related problem is that the VolAg 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 are reported across all years. Third, health sector-specific expenditure is not reported in the VolAg or systematically reported in IRS tax forms. The VolAg does report overseas expenditure but does not disaggregate this expenditure by sector. Fourth, complete data are lacking in several time periods. At the time of analysis, the 2013 VolAg, which provided data for 2011, was the most recent report available. For NGOs incorporated in the US, IRS tax forms for 2012 were obtainedt. Furthermore, prior to 1998 the VolAg report did not include international NGOs. Attempts were made to compile other data on the health expenditures of the top international NGOs, in terms of overseas expenditure, by searching other websites for financial documents and contacting these organizations directly. Getting reliable time series data before 2000 proved to be extremely difficult for even this small sample of international NGOs.

Estimates of the share of overseas expenditure spent on health-related projects drew upon a sample of NGOs for which such data were available. 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 for each year; the sample included the top 30 NGOs in terms of overseas expenditure and 20 randomly selected US-based NGOs from the remaining pool, with the probability of being selected set proportional to overseas expenditure. Next, health expenditure data were collected for each NGO in this sample by seeking out annual reports, audited financial statements, 990 tax forms, and data from NGO websites. Health expenditure was carefully reviewed to ensure that expenditures on food aid, food security, disaster relief, and water and sanitation projects were not included. eTable 7 summarizes the number of NGOs included each year in the USAID report, the number of NGOs in the sample by year, and the number of NGOs for which health expenditure data were successfully compiled.

eTable 7

Summary of US non-governmental organizations in the study

Year	Number of US NGOs in VolAG report	Number of international NGOs in VolAG report	Number of US NGOs in IHME sample	Number of US NGOs from sample for which data on health expenditure were found
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	44	24	22
1999	438	-	41	37
2000	433	50	47	43
2001	442	51	46	43
2002	486	58	46	43
2003	507	54	55	49
2004	508	55	57	48
2005	494	59	60	54
2006	536	67	63	56
2007	555	68	62	56
2008	564	78	57	55
2009	580	90	45	38
2010	579	95	54	50
2011	595	112	56	53

A random effects regression model was fit to predict health expenditure as a fraction of total expenditure using the data for the sampled NGOs. This model was used to predict the fraction of expenditure spent on health for the remaining NGOs. To ensure that the predicted health fractions were bounded between zero and one, the regression utilized the logit-transformed health fraction as the dependent variable. Since several NGOs in the sample were observed for multiple years, the regression included a random effect that varied by NGO. Five of the nine variables used to predict the health fraction were drawn from the VolAg reports. They were (1) fraction of revenue from in-kind donations, (2) fraction of revenue from the US government, (3) fraction of revenue from private financial contributions, (4) overseas expenditure as a fraction of total expenditure, and (5) calendar year. The remaining four variables used to predict the health fraction were binary indicators that were constructed based on keyword searches on the NGO name and NGO description found in the VolAg.[25] For both the NGO name and description, a keyword search was conducted to indicate whether the name or description was sufficiently health-related. Another keyword search was conducted independently on the NGO names and descriptions for keywords that indicated if the NGOs might focus on something other than health. eTable 8 lists the keywords we used to identify health-related and non-health-related NGO names and descriptions. These four indicators proved excellent predictors of health fractions.

$$
\begin{aligned}
logit(NGO - specific\ DAH_{it}) \\
&= \alpha + \beta_1(In - kind\ contributions\ fraction_{it}) \\
&+ \beta_2(US\ government\ contributions\ fraction_{it}) \\
&+ \beta_3(Private\ financial\ contributions\ fraction_{it}) \\
&+ \beta_4(Oversease\ expenditure\ as\ a\ fraction\ of\ total\ expenditure_{it}) \\
&+ \beta_5(Health - related\ name_{it}) + \beta_6(Non - health - related\ name_{it}) \\
&+ \beta_7(Health - related\ description_{it}) + \beta_8(Non - health - related\ description_{it}) \\
&+ U_i + \varepsilon
\end{aligned}
$$

eTable 8

Keywords used to tag NGOs as health-related or non-health-related

Category	Keywords
Health-related	health, hiv, aids, nutrition, medical, cancer, gavi, gfatm, vaccine, malaria, bednet, ncd, doctor, medicine, medisend, pathologist, lung, physician, tuberculosis, injuries, noncommunicable, paho, syndrome, retroviral, tb, dots, polio, tobacco, smoking, leprosy, eye, blind, pediatric, fistula, population, santé, medecin, pharmaciens, pharmacy, handicap, prosthetics, marie stopes
Non-health-related	water, sanitation, agriculture, climate, environmental, torture, forest, orphan, fauna, flora, nature, tree, wildlife, emergency, energy, soybean, book, earth, green, transportation, road, economic, zoological, humanitarian, humane society, food

Overseas health expenditure was calculated for individual NGOs in each year by multiplying the estimated health fraction and total overseas expenditure. For the NGOs that were sampled, the observed health fraction acquired through data collection was used. For the unsampled NGOs, the fitted fraction from the previously described random effects regression was used. Total overseas expenditure, reported in the VolAg, was not available for 2012-2014. For 2012 US-based NGOs, the 2012 NGO overseas fraction was calculated by regressing the logit-transformed observed overseas fraction on a linear time trend using ordinary least squares, for each NGO independently. For these cases, the overseas health fraction was calculated as the product of estimated overseas fraction, estimated health fraction, and total expenditure found in the IRS 990 forms.

$$logit(Observed\ oversease\ health\ expenditure\ fraction_i) = \alpha + \beta_1(year_i) + U_i + \varepsilon$$

At this point three reasons remained why the overseas health expenditure for some NGOs remained unknown. First, if an observation was non-US-based for 2012 then IRS tax forms were not available and total overseas expenditure could not be calculated. Second, for 2013 or 2014, no data were available. Finally, if an NGO was reported in the VolAg in multiple years but not for an intermittent year, no NGO-specific data were available for the gap year. This would be the case if a NGO received support from the US government one year and then again in a nonconsecutive year. For all three of these scenarios, a panel-based hierarchical linear regression model was used to fill in the overseas health expenditure gaps. Total overseas health expenditure (measured at the NGO-year level) was regressed on US GDP per capita and US bilateral DAH disbursed. Because the US government funds many of these NGOs, US bilateral DAH was an excellent predictor of NGO DAH. A flexible model was employed to allow both the GDP and US government DAH coefficients to vary randomly across NGOs, such that each NGO employed a unique (but not independent) relationship between overseas health expenditure, GDP, and US government DAH. A

random intercept was also included to capture the significant unobserved heterogeneity present in our set of NGOs. Once fit, this model was used to predict overseas health expenditure for all remaining gaps.

$$(NGO\ DAH_{it}) = \alpha + \beta_{1i}(US\ GDP\ per\ capita_t) + \beta_{2i}(US\ bilateral\ DAH\ per\ capita_t) + U_i + \varepsilon$$

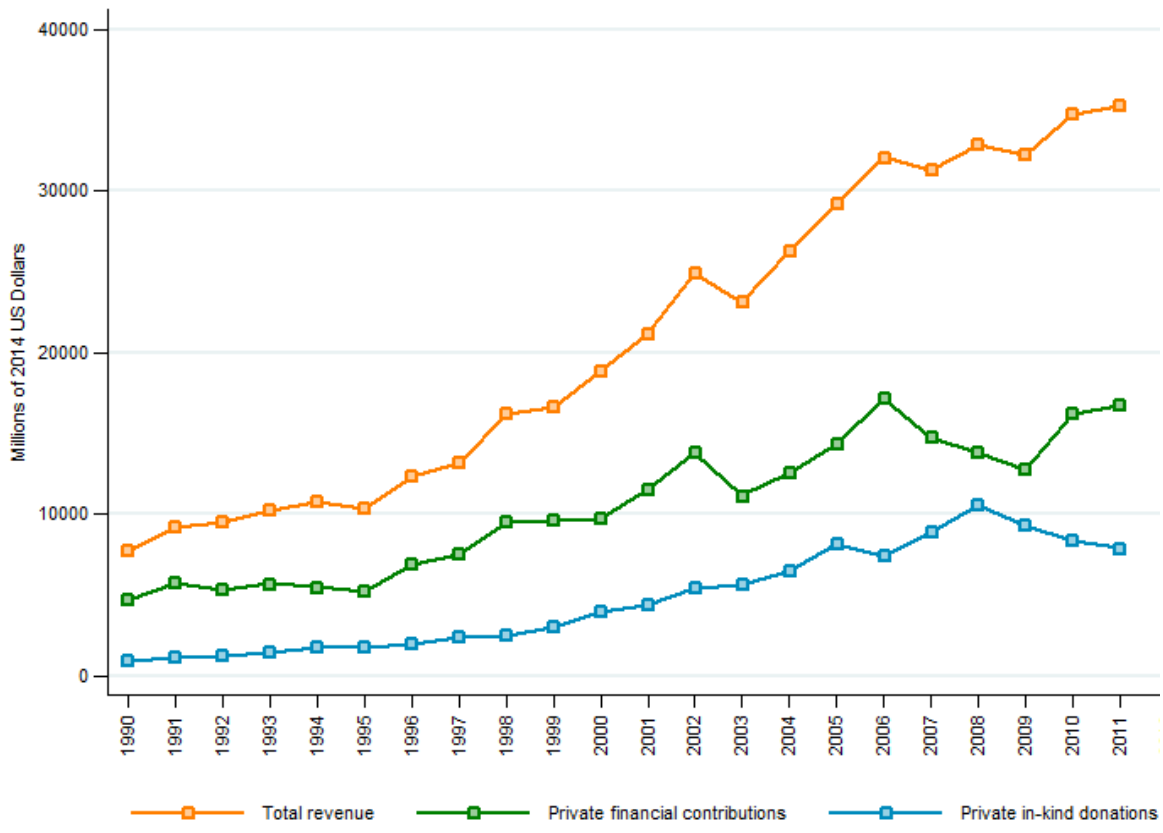
Expenditures financed from each revenue sources were then calculated by multiplying overseas health expenditure by NGO-specific revenue fractions. Expenditures from in-kind sources were deflated by a constant fraction. This was determined by comparing the federal upper limit and average wholesale price valuations of drugs on the WHO's Model List of Essential Medicines from the RED BOOK Expanded Database. [27,28]

eFigure 12 and eFigure 13 show the income and estimated overseas health expenditure, respectively, of the NGOs in the universe of US- and non-US-based NGOs that were tracked in this study from 1990 to 2011 in constant 2014 US dollars.

eFigure 12

Total revenue received by non-governmental organizations

The orange line shows total revenue for all sources, both public and private, received by NGOs. The green line shows estimates of private financial contributions to NGOs, while the blue line shows private in-kind donations to NGOs.

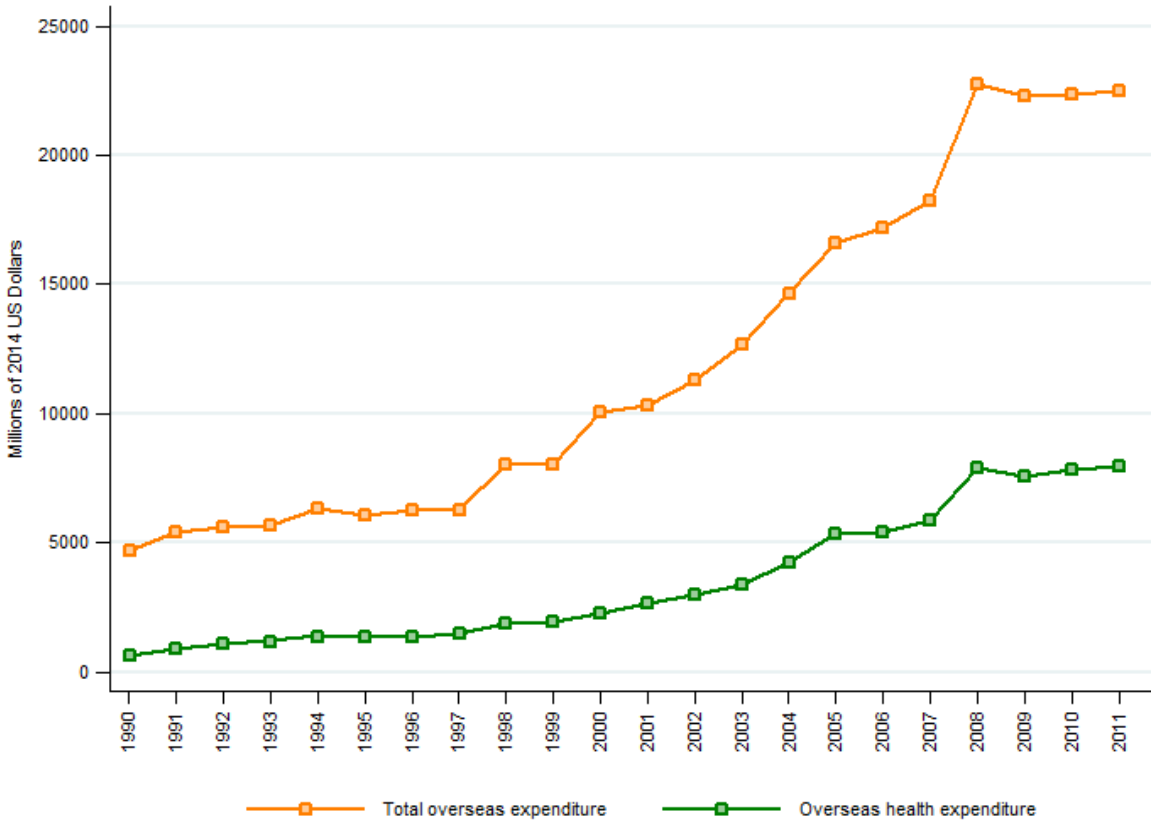


Source: IHME DAH Database (2014)

eFigure 13

Expenditure by non-governmental organizations

The orange line illustrates total overseas expenditure by NGOs, regardless of sector. The green line shows overseas expenditure by NGOs to health-specific recipients, or DAH.



Source: IHME DAH Database (2014)

Part 1.7:

CALCULATING THE TECHNICAL ASSISTANCE AND PROGRAM SUPPORT COMPONENT OF DEVELOPMENT ASSISTANCE FOR HEALTH FROM LOAN- AND GRANT-MAKING CHANNELS OF ASSISTANCE

The following methods were used 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.

Data on the total administrative costs were compiled 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 this sample are summarized in eTable 9. The ratio of total administrative costs to total grants and loans was calculated for each source by year. It was 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, the model assumed that 20% of administrative costs of the foundation were spent on facilitating these health grants. Given this assumption, the ratios of the observed administrative costs to grants/loans were used 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, the ratio from the institution most similar to it was used to arrive at an estimate of in-kind contributions. The average ratio observed for IDA and IBRD was used 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 previous 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 eFigure 14. Total in-kind contributions ranged from 8.4% to 17.3% of the financial transfers between 1990 and 2012. There was also considerable variation across channels in the ratio of in-kind contributions to financial contributions. At the high end, the ratio for USAID was on average 19.6% over the study period, while the average for IBRD was 6.7%.

eTable 9

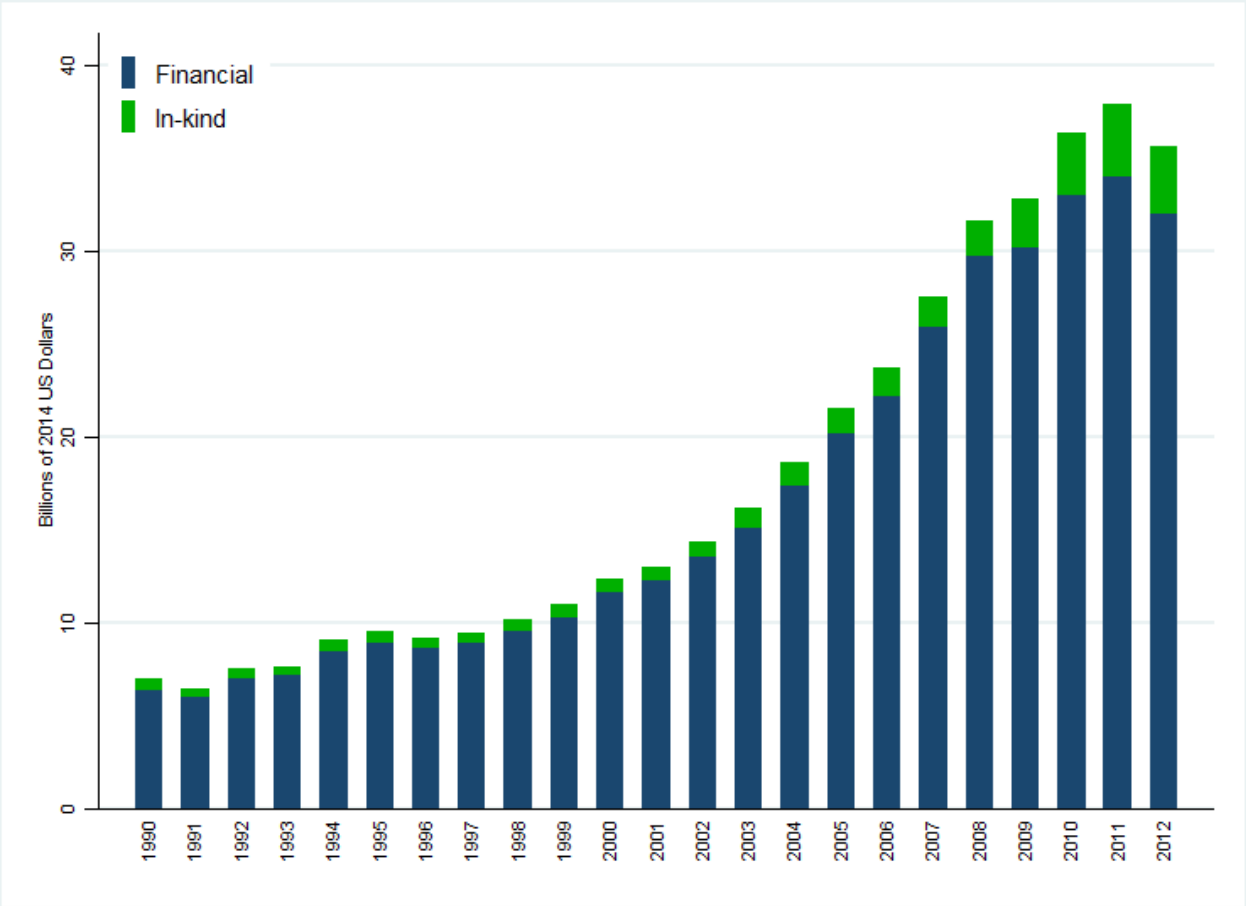
Summary of data sources for calculating in-kind contributions

Organization	Source	Notes
BMGF	990 tax returns[30]	Used "cash basis" column to calculate ratio of total operating and administrative expenses to grants paid.
GFATM	Annual report financial statements[24]	Calculated ratio of operating expenses to grants disbursed.
Gavi	Annual report financial statements[21]	Calculated ratio of management, general, and fundraising expenses to program expenses.
USAID	US government budget database[61]	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[73]	Calculated ratio of DFID's administration expenses to DFID's bilateral program expenses from 2002 onward.
IDA	World Bank audited financial statements[74]	Calculated ratio of management fee charged by IBRD to development credit disbursements.
IBRD	World Bank audited financial statements[75]	Calculated ratio of administrative expenses to loan disbursements.

eFigure 14

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

This figure illustrates the proportions of financial and in-kind DAH disbursed by loan- and grant-making institutions. The proportion of in-kind DAH varies, based on the channel. The overall proportion of in-kind DAH received across all channels has grown over time.



Source: IHME DAH Database (2014)

Part 1.8:

DISAGGREGATING BY HEALTH FOCUS AREA

Disaggregating estimates by health focus area

DAH was disaggregated into eight health focus areas: HIV/AIDS; tuberculosis; malaria; maternal, newborn and child health; health sector support; non-communicable diseases; SWAps/health sector support; and other infectious diseases. Three of these health focus areas were disaggregated into more granular groups: (1) malaria into bednets and unspecified; (2) maternal, newborn, and child health into maternal health – family planning, maternal health – non-family planning, child and newborn health – nutrition, child and newborn health – vaccines, child and newborn health – unspecified, and maternal, newborn, and child health – unspecified; and (3) noncommunicable diseases into tobacco, mental health, and unspecified. For most data sources, project-level data were available only through 2012. Methods to estimate health focus area allocations for 2013 and 2014 are described in more detail below. Keyword searches were performed for a subset of global health channels that provide project-level data with project titles or descriptions. These sources include the bilateral development assistance agencies from the 23 DAC member countries, the EC, GFATM, the World Bank, ADB, AfDB, IDB, BMGF, NGOs, and US foundations. These keywords are outlined in eTable 10 below. Descriptive fields were adjusted so that they were in all capitalized letters and search terms with multiple words were put between quotation marks. All keywords were translated into 9 major languages (English, Spanish, French, Portuguese, Italian, Dutch, German, Norwegian, and Swedish) used in the OECD CRS, checked for double meanings across all languages, and adjusted accordingly.

Total DAH was split across the health focus areas using weighted averages based on the number of keywords present in each project's descriptive variables. If, for example, three keywords suggested the project focused on HIV/AIDS and two keywords related to tuberculosis were also tagged, three fifths of the project's total DAH was allocated to HIV/AIDS and two fifths was allocated to tuberculosis. To account for the sensitivity of this method, several checks were implemented after the keyword searches to ensure the project was accurately categorized. First, projects that were tagged as child and newborn vaccines and other infectious diseases were categorized as child and newborn vaccines only. Second, projects that were tagged as one of the three major infectious diseases (HIV/AIDS, tuberculosis, or malaria) and other infectious diseases were categorized under only HIV/AIDS, tuberculosis, or malaria.

EXAMPLE. Post-keyword search weighting

A project in the CRS database had a value of $1000 of DAH. A keyword search conducted on this project's title and description tagged five keywords: 3 keywords related to HIV/AIDs and 2 keywords related to tuberculosis.

Therefore, $600, or 3/5 of total DAH, was allocated to HIV/AIDS, while $400, or 2/5 of total DAH, was allocated to tuberculosis.

In addition to keyword searches, funds were allocated to health focus areas based on characteristics of the channel or additional channel variables. For the bilateral agencies and the EC, purpose codes from the CRS were used to supplement keyword searches. For the World Bank-IDA and -IBRD, health focus areas were also determined by the project sector codes and theme codes. All funds from Gavi were allocated to child and newborn vaccines and all funds from UNICEF to maternal, newborn, and child health, unspecified. All funds from UNAIDS were allocated to HIV/AIDS. UNFPA and WHO funds were allocated to specific health focus areas based on project expenditure data from their annual reports and annual financial reports. See eTable 11 below for more details on these categorizations.

eTable 10

Terms for keyword searches

Health focus area level I	Health focus area level II	Keywords
HIV/AIDS		retroviral, H.I.V. treatment, AIDS treatment, ART, ARV, cd4 count, HAART, viral load, viral burden, viral titer, viral titre, condom, H.I.V. prevention, H.I.V. education, AIDS prevention, AIDS education, prevention of AIDS, reducing the transmission of H.I.V., reduce the transmission of H.I.V., male circumcision, safe blood supply, safe injection, abstinence, PMTCT, mother to child AIDS transmission, mother to child H.I.V./AIDS transmission, mother to child transmission, parent to child transmission, mother to child transmission, PLHAS, H.I.V., AIDS, human immunodeficiency virus, reverse transcriptase inhibitor, acquired immune deficiency syndrome, acquired immunnodeficiency syndrome
Tuberculosis		tuberculos, TB, tubercular, DOTS, directly observed treatment, XDR TB, MDR TB, rifampicin, isoniazid
Malaria	Nets	bednets, bed nets, SMITN, ITN, LLIN , insecticide treated nets
	Unspecified	malaria, plasmodium falciparum, anopheles, artemisinin, indoor residual spray, IRS
Maternal, newborn, and child health	Maternal health, family planning	fertility, family planning, FP, birth spacing, contraceptive, family size
	Maternal health, unspecified	postpartum, maternal health, maternal mortality, maternal death, safe motherhood, birth attendant, SBA, maternal and infant health, antenatal, prenatal, neonatal, perinatal, postnatal, fetus, feta, IPTP, reproductive health, maternity, obstetric, abortion, pregnancy, RH, STD, STI, sexual health, sexually transmitted, syphilis, fistula, women's health, womens health, sepsis, septicemia, anemi, anaemi, foetus, foetal
	Child/newborn nutrition	nutrition, birth weight, birthweight, vitamin A, breast fe, breastfe, feeding, micronutrient, zinc, fortification, stunted, stunting, wasting, underweight, under weight, baby friendly hospital initiative, breastmilk, breast milk, iodine, iodized, iodization, VAD, lactat, folic acid, folate, iron
	Child/newborn vaccines	polio, vaccine, vaccination, immunization, immunize, diphtheria, tetanus, pertussis, DTP, Hib, rotavirus, measles, immunization, immunization, HepB mono, Hib mono, injection safety, rubella, meningitis, penta, pneumo, tetra
	Child/newborn other	child health, infant health, newborn health, child mortality, infant mortality, under five mortality, child survival, infant survival, childhood illness, LRI, respiratory infection, diarrhea, diarrhoea, oral rehydration, ORT, ORS
	Maternal, newborn, and child health, unspecified	MNCH; maternal, newborn & child health; maternal newborn & child health; maternal, newborn and child health; maternal newborn and child health; MNH; MCH
Non-communicable diseases	Tobacco	tobacco, smoking, smoker

Health focus area level I	Health focus area level II	Keywords
	Mental health	schizophrenia, mental health, neurotic, neurosis, psychology, psychiatric, emotional, PTSD, post traumatic, posttraumatic, alcohol, addiction, Down syndrome, Down's syndrome, Downs syndrome, behavioral, dependence, drug use, drug abuse, substance abuse, opioid, cocaine, amphetamine, cannabis, depressive disorder, depression, dysthymia, bipolar, anxiety, eating disorder, autism, Asperger, developmental disorder, conduct disorder, intellectual disability, phobia, mental disability, mental retardation
	Non-communicable diseases, unspecified	cancer, chemotherapy, radiation, neoplas, tumor, diabet, insulin, endocrine, rheumati, ischaemic, ischemic, circulatory, cerebrovascular, cirrhosis, digestive disease, other digestive, genitourinary, urogenital, musculoskeletal, congenit, obesity, overweight, glaucoma, hypertensi, hernia, arthritis, cleft lip, cleft palate, phenylketonuria, PKU, sickle cell, drepanocytosis, hemophilia, haemophilia, thalassemia, genetic, heart disease, cardiovascular, chronic respiratory, noncommunicable, non communicable, copd, stroke, cataract, chronic obstructive pulmonary disease, asthma, skin disease, physical disability, dental, oral health, CVD, IHD, CKD, kidney disease, MSK
SWAps/ Health sector support		SWAP, sector wide approach, sector program, budget support, sector support, budgetary support, HSS, health system strengthening, health systems strengthening, tracking progress, skilled health workers, skilled staff, adequate facilities, training program, staff training, essential medicines, health information system, policy development, early warning alert and response system, health system support, health systems support, capacity building, medical equipment, surgical equipment, construction, human resources, human capital
Other infectious diseases		infectious, tropical disease, parasite disease, communicable, trichuriasis, yellow fever, whipworm, trachoma, schistosomiasis, snail fever, kayayama fever, rabies, onchocerciasis, river blindness, robles disease, lymphatic filariasis, elephantiasis, leishmaniasis, leishmaniosis, hookworm, foodborne trematod, food borne trematod, echinococcosis, hydatid disease, hydatidosis, dengue, cysticercosis, chagas, trypanosomiasis, ascariasis, avian, cholera, dysentery, influenza, pandemic, epidemic, ebola

eTable 11

Additional health focus area categorizations

Channel	Allocation criteria	Health focus area
Bilaterals and the EC	CRS purpose code 13030, family planning	Family planning
	CRS purpose code 13020, reproductive health care	Maternal health, non-family planning
	CRS purpose code 12240, basic nutrition	Child and newborn nutrition
	CRS purpose code 12250, infectious disease control and the keywords “child” or “vaccine” present in descriptive variables	Child and newborn vaccines
	CRS purpose code 13040, STD control including HIV/AIDS	HIV/AIDS
	CRS purpose code 12262, malaria control	Malaria, unspecified
	CRS purpose code 12250, infectious disease control and no other keywords present in the descriptive variables	Other infectious diseases
	CRS purpose code 12263, tuberculosis control	Tuberculosis
World Bank IDA and IBRD	Theme code population and reproductive health	Maternal, newborn, and child health, unspecified
	Theme code tuberculosis	Tuberculosis
	Theme code child health	Child and newborn health, unspecified
	Theme code HIV/AIDS	HIV/AIDS
	Theme code malaria	Malaria, unspecified
	Theme code injuries and non-communicable diseases	Non-communicable diseases, unspecified
UNFPA	Family planning, gender equality, population and development	Family planning
	Reproductive health, sexual health, maternal and newborn health, STI prevention	Maternal health, unspecified
	Data analysis, mobilization, program coordination, monitoring and evaluation, advocacy	Maternal, newborn, and child health, unspecified
UNICEF	All DAH	Child and newborn health, unspecified
UNAIDS	All DAH	HIV/AIDS
GAVI	All DAH	Child and newborn vaccines
WHO	Reproductive, maternal, newborn, child, and adolescent health (divided by 2); Research in human reproduction	Maternal health, unspecified
	Nutrition	Child and newborn nutrition
	Vaccine-preventable diseases	Child and newborn vaccines
	Reproductive, maternal, newborn, child and adolescent health (divided by 2)	Child and newborn health, unspecified
	Aging and health; gender, equity and human rights mainstreaming	Maternal, newborn, and child health, unspecified
	HIV/AIDS	HIV/AIDS
	Malaria	Malaria
	Tuberculosis	Tuberculosis
	Mental health and substance abuse	Non-communicable diseases, mental health
	Disabilities and rehabilitation; Non-communicable diseases; Violence and injuries	Non-communicable diseases, unspecified

Channel	Allocation criteria	Health focus area
	Neglected tropical diseases; Tropical disease research; Epidemic- and pandemic-prone diseases	Other infectious diseases
	Health system information and evidence; Integrated people-centered health services; National health policies, strategies and plans; Access to medicines and health technologies and strengthening regulatory capacity; Alert and response capacities	SWAps/health system strengthening

Disaggregating preliminary estimates by health focus area

Estimates by health focus area for years in which descriptive data were not available (usually 2014 and in many cases 2013 as well) were obtained health focus areas estimates for each channel by modeling channel-specific DAH per health focus area as a function of time. Out-of-sample validation was used to test the predictive accuracy of a large suite of models, estimating the models using 1990-2010 data and predicting 2011 and 2012. The potential models included fractional multinomial logit regression, OLS regression, autoregressive integrated moving average (ARIMA) models, epanechnikov kernel-weighted local polynomial smoothing, and multivariable fractional polynomial models. For each model, time was modeled linearly, with splines, and by including lag-dependent variables. Other methodologies considered included modeling health-focus-area-specific DAH as a dollar amount and as a fraction of the channel-specific total DAH. Lastly, models that involved transforming the dependent variable in natural log and logit transformed space were considered. In order to accommodate zero values in the logit transformation, the transformation described in Smithson and Verkuilen were applied.[75] Over 40 models and specifications were evaluated in total.

Each of the potential model and specification described above were estimated using data from 1990 through 2010, and then the estimated model was used to predict DAH by health focus area for 2011 and 2012. Since we have DAH estimates for 2011 and 2012 we compared the modeled estimates and the observed estimates and calculated average percent deviation and average total absolute deviation for each model and specification across all the channels and health focus areas. A variant of the Epanechnikov kernel-weighted local polynomial smoothing had the smallest average percent deviations and average total absolute error. In this model and specification, health focus area-specific DAH fractions were independently estimated at the channel level after they were logit transformed. Time was the only independent variable included in the model. The health focus area-specific DAH estimates were adjusted so the sum of the channel's health focus area disbursements totaled channel-specific DAH envelope. eTable 12 demonstrates the performance of four models, each with their optimal specification (as determined by the out-of-sample average percent deviation and total absolute error). Our preferred model, the Epanechnikov kernel-weighted local polynomial smoothing, minimized both the average percent deviation and the total absolute error out of sample, predicting two years ahead.

eTable 12

Average percent deviation and average total absolute error for five models

Model	Average percent deviation	Average total absolute error (millions USD)
Best performer: Epanechnikov kernel-weighted local polynomial smoothing	55.0%	58.7
Fractional multinomial logit	60.9%	173.6
Multivariate fractional polynomial	64.9%	167.9
Autoregressive integrated moving average (ARIMA)	73.3%	118.0

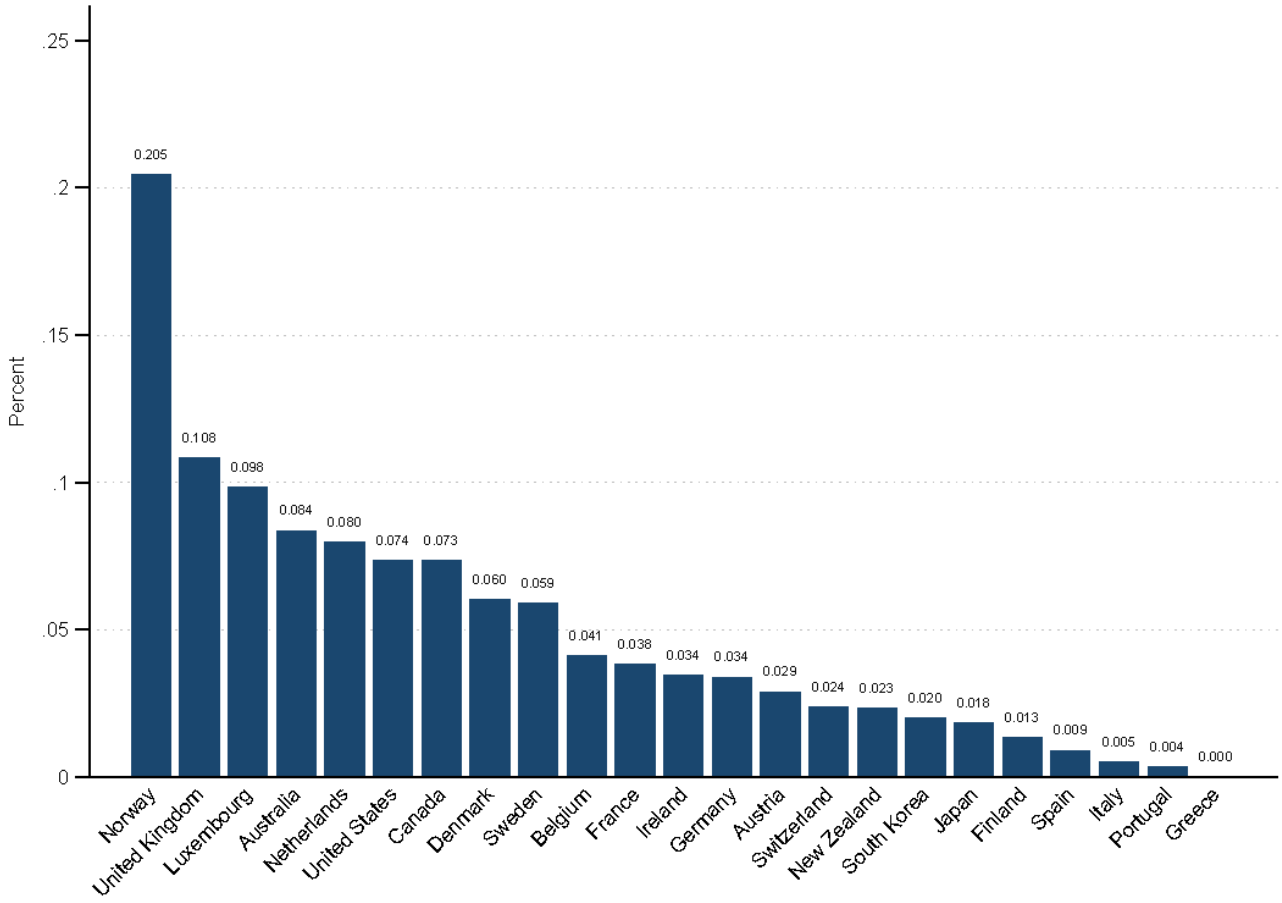
Part 1.9:

Comparing DAH by source and GDP

eFigure 15

DAH by source as a percentage of GDP, 2014

This figure illustrates DAH as percentage of GDP for each country as a source, across all channels. GDP data is constructed using methods developed by Spencer James and colleagues.[76]



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