Countdown to 2015: tracking donor assistance to maternal, newborn, and child health

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Summary

Background **Timely reliable data on aid flows to maternal, newborn, and child health are essential for assessing the adequacy of current levels of funding, and to promote accountability among donors for attainment of the Millennium Development Goals (MDGs) for child and maternal health. We provide global estimates of official development assistance (ODA) to maternal, newborn, and child health in 2003 and 2004, drawing on data reported by high-income donor countries and aid agencies to the Organisation for Economic Development and Cooperation.**

Methods **ODA was tracked on a project-by-project basis to 150 developing countries. We applied a standard definition of maternal, newborn, and child health across donors, and included not only funds specific to these areas, but also integrated health funds and disease-specific funds allocated on a proportional distribution basis, using appropriate factors.**

Findings **Donor spending on activities related to maternal, newborn, and child health was estimated to be US$1990 million in 2004, representing just 2% of gross aid disbursements to developing countries. The 60 priority low-income countries that account for most child and newborn deaths received $1363 million, or $3·1 per child. Across recipient countries, there is a positive association between mortality and ODA per head, although at any given rate of mortality for children aged younger than 5 years or maternal mortality, there is significant variation in the amount of ODA per person received by developing countries.**

Interpretation **The current level of ODA to maternal, newborn, and child health is inadequate to provide more than a small portion of the total resources needed to reach the MDGs for child and maternal health. If commitments are to be honoured, global aid flows will need to increase sharply during the next 5 years. The challenge will be to ensure a sufficient share of these new funds is channelled effectively towards the scaling up of key maternal, newborn, and child health interventions in high priority countries.**

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Introduction

Adequate financing is necessary for the scaling up of effective maternal, newborn, and child health interventions in order to achieve the Millennium Development Goals for child survival (MDG-4) and maternal health (MDG-5). Estimates place the additional funding requirements to attain universal coverage at a minimum of US$7000 million per year.[1] Other estimates suggest that even greater investments are needed.[2,3] Irrespective of the precise figure, the conclusion is clear. The financing gap represents a substantial sum in relation to domestic budgets.

Despite a long history of attempts to track health expenditure in developing countries,[4,5] many data collection efforts,[6] and various studies on a worldwide level,[7,8] little is known about how much is currently being invested in maternal, newborn, and child health by donors and within recipient countries, or whether levels of funding are changing. Timely, reliable data for health financial flows are essential for informed decision-making at both the worldwide and country level, and to address the gap between what is currently being invested and what is actually needed. For these reasons, tracking the financing flows is viewed as a crucial tool for the Partnership for Maternal, Newborn and Child Survival and others to advocate effectively for additional funds (www.pmnch.org). Monitoring the flow of aid also promotes accountability on the part of both donors and recipient countries in their joint commitment to meeting the MDG targets.

In this paper we estimate the amount of official development assistance (ODA) going to maternal, newborn, and child health in developing countries in 2003 and 2004 and assess broadly the adequacy of current levels in relation to the child and maternal health MDGs. These findings are part of a larger undertaking to monitor on a continuing basis the country-level progress in reducing child deaths, encapsulated in the Child Survival Countdown collaborative effort.[9]

Methods

Methods used were refined from those developed during an exploratory study to recommend an approach for tracking ODA to child health activities and provide preliminary estimates for a restricted number of donors. As part of the scope of work, we also explored the feasibility of tracking expenditure on child health at the country level.[10] The present study included an expanded set of donors and broadened the expenditure boundaries to include maternal and neonatal health activities.

Donors and recipient countries

For the **Creditor Reporting system database** see http://www.oecd.org/dac/stats/idsonline

The estimates of ODA to maternal, newborn, and child health capture the resource flows from bilateral donor agencies, multilateral development organisations, and global health initiatives. We include all 22 high-income donor countries and the European Union, represented in the Development Assistance Committee of the Organisation for Economic Co-operation and Development (OECD), a forum for the major bilateral donors of ODA. Additionally, we include the World Bank, UNICEF, and the UN Population Fund (UNFPA) as multilateral development organisations; and the Global Alliance for Vaccines and Immunisation (GAVI) and the Global Fund to fight AIDS, Tuberculosis and Malaria (GFATM) as global health initiatives. Recipient countries include all those classified by the Development Assistance Committee as developing, which amount to over 150 countries.[11]

For **GFATM disbursements** see http://www.theglobalfund.org/en

***Panel:* Functional classifications for maternal, neonatal, and child health**

Functional classification for child health activities

- Management of childhood illnesses such as oral rehydration therapy, zinc for diarrhoea management, treatment of malaria, case management of pneumonia
- Macronutrient food supplementation to identified malnourished children under 5
- All other curative services to children under 5
- Treatment of severely malnourished children
- Prevention and public-health services such as micronutrient supplementation, immunisation for measles, DPT3, *Haemophilus Influenzae* type b, hepatitis B, and polio, vitamin A supplementation, and zinc supplementation.
- Insecticide treated nets for children under 5
- Breastfeeding counselling, and promotion of supplementary feeding
- Information, education, and communication such as promotion of micronutrient fortification
- All other preventive health services to children under 5
- Health administration and health insurance
- Training of community health workers and in-service training of facility based health workers
- Capital formation of health-care provider institutions

Functional classification for maternal and neonatal health activities

- Insecticide treated nets for pregnant women
- Antimalarial intermittent preventive treatment
- Information, education, and communication such as a prevention of female genital mutilation
- Antenatal care
- Childbirth care including labour, delivery, and immediate postpartum care (basic and comprehensive emergency obstetric care)
- Postnatal care
- All treatment services for the newborn
- All preventive measures for the newborn
- PMTCT: nevirapine and replacement feeding
- Health administration and health insurance
- Training of community health workers and in-service training of facility-based health workers
- Capital formation of health-care provider institutions

PMTCT=prevention of mother-to-child transmission. DPT3=vaccine against diphtheria, pertussis, and tetanus.

Data sources

For all but two of the donors, the analysis uses data from the Creditor Reporting System database (CRS), maintained and administered by the OECD. Members of the Development Assistance Committee and some multilateral aid organisations report to the CRS on a regular basis, providing both financial and descriptive detail on their aid activities. The CRS database is the definitive source on aid flows, and since the data are reported by donors themselves according to clearly specified guidelines, we presume it to be the most accurate available. The database includes project-by-project information on donor commitments and disbursements summarised by year, recipient country, and purpose of aid. The annual datasets show an improvement in the completeness and quality of donor reporting over time. GAVI provided data on request, and the GFATM disbursements were obtained online.

The use of data obtained predominantly from the CRS meant an analysis could be done independently of donors, and without the need to burden organisations with data requests, a strategy that has shown limited success in the past for disease-specific studies.[12] During the initial exploratory stages of the research, donors were typically unable to provide information of additional value to that already contained within the CRS.

Defining maternal, newborn, and child health

The definition of expenditure adopted for this study is based on a functional classification of maternal, newborn, and child health activities, and therefore determined by the activities on which the money is spent. For simplicity, we separated child health expenditures from maternal and neonatal health expenditures to show differences in how and to whom the two sets of interventions are delivered. Expenditures on child health were defined as expenditures on those activities whose primary purpose is to restore, improve, and maintain the health of children during a specified period of time and that are delivered directly to the child.[13] Children are defined as those aged between 1 week and 5 years (under 5). Maternal and neonatal health expenditures were defined as expenditures on those activities whose primary purpose is to restore, improve, and maintain the health of women and their newborn during pregnancy, childbirth, and the 7-day postnatal period. The panel provides an overview of the activities included under maternal, newborn, and child health. Resources for individual activities or interventions cannot be tracked easily, as accounting systems of donor organisations are rarely designed to identify expenditures on different activities within a project.

Resource flows

We tracked ODA, as defined by the OECD.[11,14] The flows of public funds of developing country governments and private funds were not recorded. To avoid double counting, a clear definitional distinction was made

between bilateral and multilateral aid. The regular contributions of donor country governments to multilateral aid agencies, often referred to as core funding, were classified as multilateral aid. However, funds that support projects implemented by multilateral institutions, with the donor government retaining significant control over how those funds are used, were classified as bilateral—ie, when the donor stipulates the recipient country, the specific purpose of aid, or both.[14]

Our estimates represent actual disbursements, that is the placement of financial resources at the disposal of a recipient country during a calendar year,[14] as opposed to amounts budgeted or committed. Different types of financial data have their respective uses, but for a retrospective analysis, knowing how much was spent is more informative. Delays in disbursement and outright cancellations mean that commitment data are an indication of intention only, not of delivery on promises.

We analysed ODA flowing through four aid modalities used by donors to deliver development assistance: general budget support, sector budget support, basket-funding (ie, pooling money from different donors into one fund to be spent on specific health areas), and projects. Funds for general budget support are deposited in the central bank of the recipient country and disbursement is linked to overall budget priorities as set out in the government's medium-term expenditure framework, with no earmarking of specific expenditures. Sector budget support and basket-funding are specific to the health sector; however, basket-funding is earmarked to specific expenditures within the sector, such as primary health care.[15] Despite the challenge of tracking

	Allocation factors		Basis and rationale for allocation
	Percentage child health	Percentage for maternal and neonatal health	
Disease specific projects			
Malaria	Region specific (range from 42% Europe to 54% Africa)	15%	Allocation indicates the proportion of total malaria funds spent on: Preventive (insecticide-treated nets [ITNs]) and treatment interventions given to children under 5 based on a combination of ITN use in households with a net and regional malaria incidence rates; Preventive interventions (ITNs and intermittent presumptive treatment) given to pregnant women.
HIV/AIDS	Country specific (range from 0% to 15% Uganda)	0	Allocation indicates the proportion of total malaria funds spent on anti-retroviral treatment to children under 5 and is based on country-specific estimates of the percentage of children under 5 with HIV.
Tuberculosis, non-specified infectious diseases, mental health, and physically handicapped	Country specific (range from 5% Croatia to 30% Bhutan)	0	Allocation indicates the proportion of funds within such projects spent on services for tuberculosis, non-specified infectious disease, mental illness, and physical disabilities in children under 5. Based on country-specific estimates of the percentage of population under 5. Use of services supported by such projects assumed to be the same for children as it is for the rest of the population and that the average cost of each contact is identical
General health-care projects			
Primary-level health care	40%	8%	Allocation indicates the proportion of funds at the primary health-care level spent on maternal, newborn, and child health services and is based on the proportion of primary health provider costs attributable to these services.
Hospital-level health care	11%	13%	Allocation indicates the proportion of funds at the hospital health care level spent on maternal, newborn, and child health services and is based on the proportion of hospital provider costs attributable to these services.
General health care—not level specific	20%	12%	Allocation indicates the proportion of funds at all levels of health care in the system spent on maternal, newborn, and child health services and is based on a weighted average of the above estimates at primary-level and hospital-level care to take into account the relative cost of services at different levels attributable to maternal, newborn, and child health services.
Budget support and basket-funds			
General budget support	Country specific (range from 0·6% Pakistan to 4% Mozambique)	Country specific (range from 0·4% Pakistan to 2·3% Mozambique)	Allocation indicates the proportion of total government funds spent on maternal, newborn, and child health services. We have assumed general budget support funds are allocated across sectors and sub-sectors identically to government funds. Allocation is based on a combination of WHO country-specific estimates of government health spending as a proportion of total government spending and the estimates for sector budget support.
Health-sector budget support	20%	12%	Allocation indicates the proportion of government health-sector funds spent on maternal, newborn, and child health services. It is assumed that sector budget support funds are allocated within the health sector identically to government funds. Allocation is based on the above project estimates at primary and hospital level care, and the distribution of government health sector funds between primary and hospital level services.
Basket-funding	40%	8%	Allocation indicates the proportion of basket-funds spent on maternal, newborn, and child health services and is based on the proportion of primary health provider costs attributable to these services. It is assumed that all basket-funding is earmarked by donors to primary health care services.

Table 1: **Allocation factors used to apportion integrated and disease-specific funds to maternal, newborn, and child health**

ODA through budgetary support mechanisms to specific areas of health, evidence suggests that overall these flows are important and should therefore not be ignored.[16] In addition to specific funds for maternal, newborn, and child health, integrated funds flowing through budgetary mechanisms, basket-funding, and health projects were also included, and allocated on a proportionally distributed basis. Tracking resources to a specific demographic group, such as children, cuts across diseases. Therefore, at the project level we include those funds that support general health activities and contribute through health-system improvement, and disease-specific funds with benefit to maternal, newborn, and child health.

Data analysis

We analysed over 80 000 project records within the 2003 and 2004 datasets, the two most recent years for which data were available, and identified almost 17 000 disbursements that fell within our boundaries for maternal, newborn, and child health expenditure. We reviewed not only the data categories for "health" and "population policies/programmes and reproductive health" of the CRS system,[17] but also projects in other categories so as to correct for potential erroneous classification of health projects within the database (webtable 1). Although time consuming, this process allowed for a more thorough analysis of the data.

Using the inclusion criteria of our expenditure boundaries, projects were reviewed based on the project title and descriptions given in the CRS, and categorised accordingly. For those projects exclusively dedicated to child health activities, maternal and neonatal health activities (as defined in the panel), or both, the entire disbursement was included in our estimates. Where funds were not specific to maternal, newborn, and child health, allocation factors were chosen based on the available published work and assumptions, and used to apportion disbursements (table 1). We identified three broad categories of funds for which allocation factors were needed: disease-specific projects; general health-care projects; and budget support funds. Further sub-categories characterise more precisely the purpose of the funds related to maternal, newborn, and child health (see webtable 2 and 3 for details of calculation methods and sources of data).

See Online for webtables 1, 2, and 3

The proportion of malaria project funds, included to indicate spending on preventive and treatment interventions in children under 5 and pregnant women, was based on evidence of the use of insecticide-treated nets by children under 5 and on regional malaria incidence rates.[18,19] For HIV/AIDS projects, we used country-level estimates of the proportion of children under 5 in the total population with HIV as the basis for our allocation to child health, to indicate expenditure on treatment of HIV-positive children.[20] Expenditure within general health projects supporting health-system improvement was included on a proportionally distributed basis, dependent on whether the project supported primary health care, hospital-level care, or the health system and policy development more broadly. Allocation factors were chosen using evidence of the proportion of total cost attributable to child health and maternal and neonatal services within primary-level and hospital-level health care providers in various developing countries (Taghreed Adam, personal communication).[21–23]

Allocation factors for health-sector budget support funds were based on a combination of the cost data for the primary-level and hospital-level health care providers (Taghreed Adam, personal communication),[21–23] with an appropriate weighting of these estimates to indicate the pattern of government health-spending between primary-level and hospital-level care in developing countries.[24] We assumed basket-funding was earmarked entirely by donors to primary health care. Expenditure on maternal, newborn, and child health from general budget support funds was derived with a two-step process. In the first instance, WHO country-specific estimates of government health-spending as a proportion of total government spending were applied to give an approximation of the amount of general budgetary support spent on health.[25] We then applied the same proportions used for health-sector budget support to these imputed health funds.

Using best-case and worst-case scenarios, sensitivity analyses were undertaken to provide an indication of the robustness of results to variations in the allocation factors used between realistic ranges (webtable 2). In this way we were able to provide both an upper and lower estimate of ODA to give an approximation of the uncertainty in our results.

	2003		2004	
	Total ODA	%	Total ODA	%
Maternal, newborn, and child health				
	1 996 813 (1 875 939–2 129 258)	-	1 989 887 (1 843 806–2 148 616)	-
Broad purpose of aid flow				
Child health	1 333 122 (1 257 151–1 419 662)	67%	1 459 542 (1 368 478–1 563 253)	73%
Maternal and newborn health	663 691 (617 788–709 596)	33%	530 345 (475 328–585 363)	27%
Type of aid flow				
Grants	1 950 575	98%	1 949 484	98%
Loans	46 237	2%	40 403	2%
Source of aid flow				
Bilateral	1 221 402	61%	1 207 617	61%
Multilateral	612 894	31%	468 359	24%
Global Health Initiative	162 516	8%	313 911	16%

Disbursements are in US dollars (thousands). Values in parentheses represent best-case and worst-case scenarios of the sensitivity analysis

Table 2: **Worldwide ODA to maternal, newborn, and child health by broad purpose, type, and source of aid flow**

Recognising the possibility of reviewer subjectivity in the categorisation of funds, a second reviewer, masked to the analysis of the first reviewer, re-analysed the entire data set. Reliability of our approach was assessed with two indicators to measure the amount of agreement between the results of the two reviewers. The relative difference was calculated as the average percentage deviation in the amount of ODA from the mean across project categories. We also used the intraclass correlation coefficient to show the relative importance of measurement error within the total variance of the calculated values.

The framework of analysis allowed disbursements to be presented according to recipient country, donor, type of aid modality, purpose of project, and type of flow (ie, grant or loan). Cross-country comparisons of ODA to maternal, newborn, and child health are made on a per child basis, which—by including the newborn in the denominator—also counts the mother.[26] As all financial data are recorded in US dollars, there was no need to make currency conversions.

We provide an exploratory assessment of the association between ODA and the health needs of countries by comparing across recipient countries the pattern of mortality for children under 5 with that of ODA to child health per child, and similarly maternal mortality with ODA to maternal and neonatal health per livebirth. We use Kendall's tau-b, a non-parametric test that relies on ranks, to measure the association between mortality rates and ODA per head. Values range between –1 and 1, with a value of 1 indicating the ranks of the two variables differ in the same direction and are therefore concordant. A value of –1 indicates the two variables are perfectly discordant.[27]

Role of the funding source

The study was funded by the United States Agency for International Development through the Basic Support

	2003			2004		
	Child health	Maternal and neonatal health	Total maternal, newborn, and child health	Child health	Maternal and neonatal health	Total maternal, newborn, and child health
Australia	19231	12440	31670	17852	16592	34444
Austria	1989	982	2971	2739	1053	3792
Belgium	8118	2821	10939	N/A	N/A	N/A
Canada	37358	10255	47613	46515	19112	65626
Denmark	N/A	N/A	N/A	18212	6688	24900
EC	27265	24999	52264	41952	18433	60385
Finland	3886	3382	7269	N/A	N/A	N/A
France	25710	15420	41130	36782	22237	59019
GAVI	114248	0	114248	183188	0	183188
Germany	31814	29985	61799	27998	8748	36745
GFATM	40844	7425	48268	110194	20529	130723
Greece	11506	1612	13118	1199	1094	2292
Ireland	13051	4290	17342	21625	7472	29097
Italy	14762	4855	19617	15437	6101	21538
Japan	68321	44808	113130	63016	27219	90236
Luxembourg	N/A	N/A	N/A	8496	2889	11385
Netherlands	33892	34917	68809	30195	31278	61473
New Zealand	2255	602	2858	3288	2876	6164
Norway	16921	12786	29707	19846	9104	28951
Portugal	849	972	1822	1177	1273	2451
Spain	19701	13608	33309	22463	14252	36715
Sweden	16026	15833	31860	21761	21702	43463
Switzerland	11762	2994	14756	12847	4414	17261
UNFPA	531	176485	177016	63	60068	60131
UNICEF	58698	15267	73965	59857	15364	75221
United Kingdom	141956	55801	197757	114821	61829	176650
United States	374296	99632	473928	391244	64171	455414
World Bank	238129	71520	309649	186776	85846	272622
Total	1333122	663691	1996813	1459542	530345	1989887

Disbursements are in US dollars (thousands). N/A=data not available. EC=European Commission.

Table 3: **Worldwide ODA to maternal, newborn, and child health by donor**

	2003		2004	
	ODA	%	ODA	%
Total maternal, newborn, and child health	1996813	-	1989887	-
General budget support	48092	2%	83408	4%
Sector budget support	2031	0%	1591	0%
Basket-funding	27210	1%	41053	2%
Projects	1919479	96%	1863835	93%
General health care	669450	35%	783102	42%
Disease-specific	126327	7%	265715	14%
Maternal, newborn, and child health-specific	1123702	59%	815019	44%
Integrated management of childhood illness	15508	1%	17706	2%
Prevention of mother-to-child transmission	3619	0·3%	3091	0·4%
Nutrition	106808	10%	78224	10%
Immunisation	520156	46%	445577	55%
Maternal and neonatal health	393077	35%	200841	25%
Childhood diseases (not specified)	8605	0·8%	2313	0·3%
Non-specified maternal, newborn, and child health	75929	7%	67267	8%

Disbursements are in US dollars (thousands). Percentage values represent the proportion of the total for those particular line items

Table 4: **Worldwide ODA to maternal, newborn, and child health by aid modality and purpose of project**

	2003		2004	
	Total ODA (%)	ODA per child	Total ODA (%)	ODA per child
Africa (AFR)	892245 (45%)	7·6	988894 (50%)	8·3
Americas (AMR)	139255 (7%)	2·4	142263 (7%)	2·4
Eastern Mediterranean (EMR)	270686 (14%)	4·1	255763 (13%)	3·8
Europe (EUR)	101023 (5%)	6·4	110851 (6%)	6·9
Southeast Asia (SEAR)	447853 (22%)	2·6	345957 (17%)	2·0
Western Pacific (WPR)	145750 (7%)	1·3	146159 (7%)	1·3
Total	1996813	3·7	1989887	3·6

Total disbursements are in US dollars (thousands). ODA per child in US dollars.

Table 5: **Aggregate and per child ODA to maternal, newborn, and child health by WHO region**

Country	U5MR (2004)	MMR (2000)	2003		2004	
			ODA	ODA per child	ODA	ODA per child
Afghanistan	257	1900	50217	9·3	35143	6·4
Angola	260	1700	14850	5·1	27488	9·4
Azerbaijan	90	94	786	1·3	1295	2·2
Bangladesh	77	380	36380	2·2	45972	2·7
Benin	152	850	9704	6·9	18164	12·8
Botswana	116	100	2080	9·8	414	1·9
Brazil	34	260	7871	0·4	7613	0·4
Burkina Faso	192	1000	11139	4·7	18736	7·7
Burundi	190	1000	17753	13·8	9561	7·3
Cambodia	141	450	12736	7·1	7267	4·0
Cameroon	149	730	6723	2·8	11731	4·9
Central African Republic	193	1100	2541	4·1	6625	10·5
Chad	200	1100	3624	2·0	9103	4·9

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for Institutionalising Child Survival project, and by the Partnership for Maternal, Newborn and Child Health. The sponsors had no role in the study design, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

In 2003 and 2004, $1997 million and $1990 million of ODA, respectively, went to activities related to maternal, newborn, and child health (table 2). In both years, child health accounted for more than two-thirds of total ODA to these areas, increasing its share from 67% in 2003 to 73% in the next year. Almost all funds to developing countries were provided as grants.

Bilateral donors were the main contributors of ODA to maternal, newborn, and child health, providing $1208 million, or 61% of total funds in 2004, compared with 24% from multilateral development organisations (table 2). Collectively, GFATM and GAVI increased their share of worldwide ODA from 8% in 2003 to 16% the next year, although more than half of the increase in funds went through disease-focused projects that were not specific to these areas. In absolute terms, the three largest donors were the USA, World Bank, and UK, between them accounting for almost 50% of all ODA to maternal, newborn, and child health (table 3). Their collective contribution, however, dropped by almost 8% from $981 million in 2003 to $905 million in 2004.

Analysis of the financing mechanisms used to disburse funds suggests that most of the ODA is provided through projects (table 4). The other aid modalities, namely general budget support, sector budget support, and basket-funding, together accounted for around 5% in each of the 2 years analysed.

Projects exclusively targeting maternal, newborn, and child health activities disbursed $1124 million in 2003, falling to $815 million in 2004, explained in part by the substantial drop in spending on immunisation and projects for maternal and neonatal health (table 4). Immunisation projects accounted for between 46% and 55% of funds specific to maternal, newborn, and child health over the period of analysis, whereas projects exclusively supporting integrated management of childhood illnesses and prevention of mother-to-child transmission of HIV activities received little funding (table 4). Our results show the substantial contribution of project funds to general health-care and to specific diseases. In 2004, an estimated $783 million of disbursements from projects supporting general health services went to maternal, newborn, and child health.

Table 5 shows the amount of ODA received by countries in each WHO region. The Africa region accounted for over 45% of ODA, substantially more than other regions such as southeast Asia (20%) and eastern Mediterranean (13%). The region was also the largest recipient on a per

child basis, receiving roughly $8 per child. Of the 60 priority countries identified as having the greatest burden in newborn and child deaths and representing 94% of child deaths worldwide,[28] the three largest recipients in absolute terms in 2004 were India, Pakistan, and Uganda, between them accounting for 15% of the total. Zambia, Mozambique, and Rwanda benefited most in terms of ODA per child (table 6).

The Kendall's tau-b value of the association between under 5 mortality and ODA to child health per child was 0·343 (p=0·00012), implying that there is a positive relation between the ranks of these two variables across recipient countries. There is also concordance, albeit weaker, between the rankings of the maternal mortality rates and ODA to maternal and neonatal health per livebirth, as indicated by a Kendall's tau value of 0·284 (p=0·0015). Both test results are significant. The scatter plots illustrate the positive associations between the variables for mortality and ODA per head (figure 1 and 2). Nevertheless, at any rate of under-5 mortality or maternal mortality, there is substantial variation in the amount ODA per head received by developing countries, suggesting other factors are important in aid allocation decisions.

The agreement between the results of the two reviewers was good. The intraclass correlation coefficient was 0·975 in 2003 and 0·973 in 2004, indicating that less than 3% of the total recorded variance was because of variance in the results of the two reviewers (measurement error). The relative difference between the reviewers' estimates was 7·3% in 2003 and 6·3% in 2004.

In the best-case scenario of the sensitivity analysis, using the high-end values of the allocation factors, total ODA to maternal, newborn, and child health increased to $2129 million (by 6·6%) in 2003 and $2149 million (by 8·0%) in 2004 (table 2). Using low-end values in the worst-case scenario, our estimates fell to $1875 million (by 6·1%) and $1844 million (by 7·3%) in the same years. These results of the sensitivity analysis together with the relative difference between the reviewers imply an uncertainty range in our estimates of around 14%.

Discussion

The world's major donors gave an estimated $1990 million of aid to developing countries for maternal, newborn, and child health activities in 2004, of which $815 million was disbursed through projects exclusively targeting such activities. Funds for general health-care projects and for specific diseases accounted for a substantial 56% of total project funds. However, diarrhoea and pneumonia, the two diseases that kill the greatest number of children worldwide every year, are not addressed by the disease-specific funds.[29] The results suggest an emerging role of global health initiatives in the financing of interventions for maternal, newborn, and child health.

Disbursements for maternal, newborn, and child health are greater than those to malaria and tuberculosis but far less than the funds committed to HIV/AIDS. In 2004,

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China	31	56	34 810	0·4	42 167	0·5
Congo, Republic of the	108	510	1780	2·4	5412	7·3
Cote d'Ivoire	194	690	6862	2·5	11 523	4·2
Democratic Republic of the Congo (Zaire)	205	990	1780	2·4	5412	7·3
Djibouti	126	730	2811	24·1	1343	11·4
Egypt	36	84	6212	0·7	6827	0·8
Equatorial Guinea	204	880	750	8·8	1147	13·2
Ethiopia	166	850	61 813	4·9	48 116	3·7
Gabon	91	420	560	3·0	2681	14·1
Gambia	122	540	1125	5·0	1969	8·6
Ghana	112	540	66 590	22·1	47 534	15·5
Guinea	155	740	6473	4·2	6574	4·2
Guinea-Bissau	203	1100	1422	4·7	3085	10·1
Haiti	117	680	4605	4·1	11 266	10·0
India	85	540	218 924	1·9	149 340	1·3
Indonesia	38	230	72 060	3·4	42 575	2·0
Iraq	125	250	35 586	8·5	20 450	4·8
Kenya	120	1000	38 863	7·0	49 718	8·8
Liberia	235	760	6537	10·7	10 002	16·1
Madagascar	123	550	20 765	6·9	20 045	6·5
Malawi	175	1800	32 696	14·4	36 280	15·7
Mali	219	1200	9496	3·8	20 593	8·0
Mauritania	125	1000	2282	4·5	2890	5·6
Mexico	28	83	4542	0·4	3520	0·3
Mozambique	152	1000	44 723	14·0	64 450	19·9
Myanmar (Burma)	106	360	10 282	2·3	9513	2·1
Nepal	76	740	17 019	4·8	27 016	7·5
Niger	259	1600	8590	3·1	13 312	4·7
Nigeria	197	800	64 059	3·0	46 414	2·1
Pakistan	101	500	61 234	3·0	81 461	3·9
Papua New Guinea	93	300	10 334	13·1	12 558	15·6
Philippines	34	200	17 265	1·8	12 275	1·3
Rwanda	203	1400	12 637	8·7	24 832	16·8
Senegal	137	690	16 690	9·3	21 580	11·9
Sierra Leone	283	2000	11 942	12·8	6588	7·0
Somalia	225	1100	5683	3·9	8711	6·0
South Africa	67	230	12 794	2·5	13 433	2·6
Sudan	91	590	9978	2·0	33 605	6·5
Swaziland	156	370	1314	9·9	471	3·5
Tajikistan	118	100	6134	7·6	6182	7·5
Tanzania	126	1500	68 447	11·7	66 393	11·1
Togo	140	570	3146	3·2	6496	6·5
Turkmenistan	103	31	970	2·0	1336	2·8
Uganda	138	880	44 115	7·6	71 636	12·2
Yemen	111	570	6642	1·9	25 140	7·0
Zambia	182	750	39 282	20·1	50 655	25·6
Zimbabwe	129	1100	12 219	7·2	9331	5·4
Total			1 301 247	3·0	1 362 970	3·1

Total disbursements in US dollars (thousands). ODA per child in US dollars. U5MR=under 5 mortality rate. MMR=maternal mortality rate.

Table 6: **Aggregate and per child ODA to maternal, newborn and child health, under-5 mortality rates (per 1000 livebirths), and maternal mortality rates (per 100 000 livebirths) in the 60 priority countries**

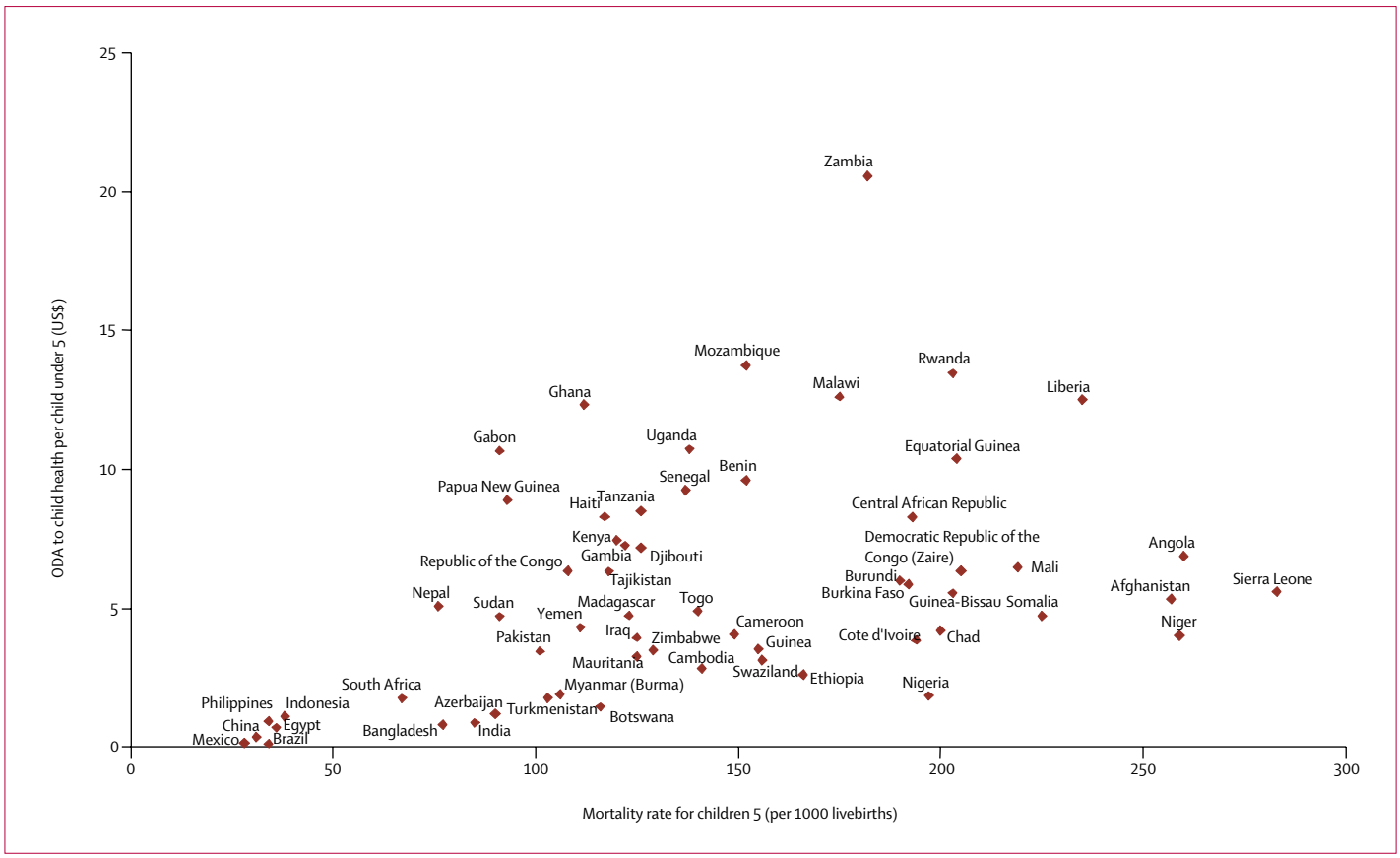

Figure 1: **Under-5 mortality rates and ODA to child health per child in the 60 priority countries in 2004**

donor commitments to fight HIV/AIDS were estimated at $3·2 billion ($3·6 billion if international research is included);[30] ODA for malaria control was almost $600 million;[31] and ODA for tuberculosis control was almost $200 million.[32] Note that these estimates include child and mother-related disease-specific expenditures included in our study within maternal, newborn, and child health, but exclude an allowance for disease-control support from general health-care projects, general and sector budget support, and basket-funding. In terms of gross aid flows, Development Assistance Committee donors in 2004 disbursed $92 200 million of ODA, of which $7100 million was for health and population activities.[33] Aid to maternal, newborn, and child health represented only 2·2% of gross disbursements to developing countries.

A closer look at the 60 priority low-income countries that account for most child and newborn deaths indicates that $1363 million, or $3·1 per child, was disbursed to these countries for maternal, newborn, and child health in 2004, representing 68% of the total amount to all developing countries. The provision of aid according to need is a well-established basic principle, and our results provide anecdotal evidence highlighting a number of priority countries, typically fragile states, that receive lower ODA per head than apparently less needy countries. Sierra Leone, for example, received considerably less ODA to child health per child than a score of countries with lower under-5 mortality rates. We recognise that aid allocation decisions are based on a complex set of circumstances, affected often by historical and strategic ties with the recipient country, and issues such as absorption capacity and fiduciary risk. The reasons as to why such countries receive lower ODA per head need further examination through a more in-depth regression analysis of the causal relation between aid and its determining factors.

Although there has previously been no concerted effort to track ODA to maternal, newborn, and child health, estimates that have used basic methods have been compiled from published data of donor organisations and the OECD.[34,35] One such estimate placed the figure at $1750 million in 2003.[34] We believe our analysis uses more reliable methods, confirmed by observations during the exploratory stage of our study that donor in-house estimates of aid were based on widely different definitions of what constitute maternal, newborn, and child health activities, suggesting these figures could neither be compared with one another nor aggregated to produce a reliable worldwide estimate. Our application of a common

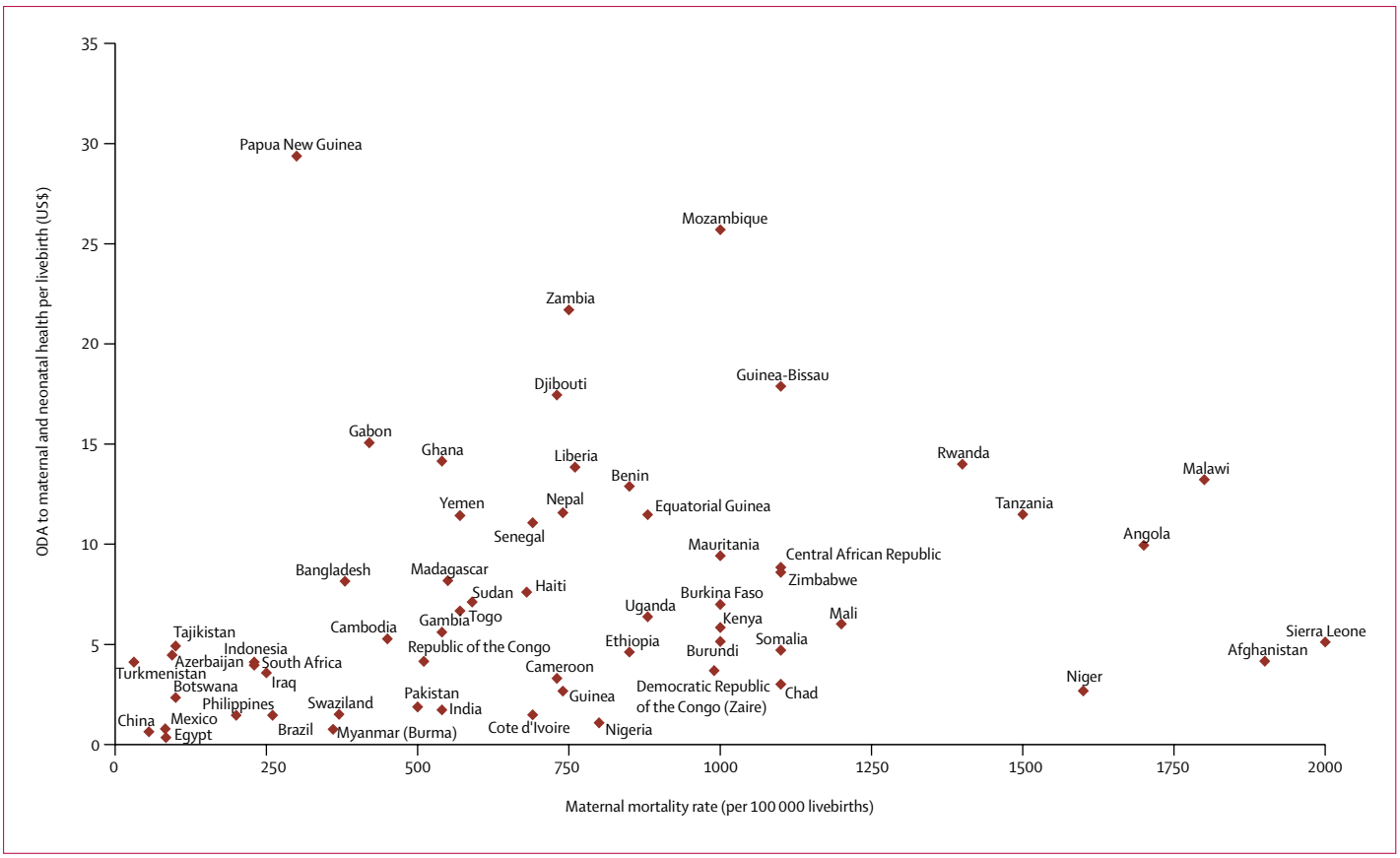

Figure 2: **Maternal mortality rates and ODA to maternal and neonatal health per live birth in the 60 priority countries in 2004**
Sources: Under-5 mortality rates: United Nations Children's Fund. Tracking Progress in Child Survival: The 2005 Report, Provisional Version. New York: United Nations Children's Fund (UNICEF), 2005. Maternal mortality rates: WHO. Maternal mortality in 2000: estimates developed by WHO, UNICEF and UNFPA. Geneva: WHO, 2004.

methodology across all donors using project level data and a consistent definition of maternal, newborn, and child health ensures results for different donors are comparable.

Unlike other worldwide estimates of ODA to specific diseases,[30–32] we sought to include not only funds specific to maternal, newborn, and child health activities but also funds disbursed through general health-care projects and budget support mechanisms. By using such an approach, we show the potentially important contribution of such funds, avoid the risk of seeming to advocate for disease-specific or intervention-specific worldwide programmes, and imply no judgment on how donors can most effectively target aid towards the reduction of child and maternal mortality. The worldwide estimates of aid to specific diseases, by ignoring general health-care project funds, can hold donors accountable only for changes in disease-specific funds and implicitly serve as an advocacy tool for channelling aid in this way rather than through general health-service support.

There is uncertainty around the allocation factors and assumptions we use to apportion funds which are not specific to maternal, newborn, and child health. In particular, we acknowledge that the exact share of general budget support is unmeasurable, in view of the fungible (interchangeable) nature of such funds, and our methods serve to provide indicative estimates only. These uncertainties highlight the importance of reinforcing systems of public financial management and health management information, which are crucial to providing the data on which resource tracking and the apportionment of integrated funds to specific disease areas or demographic groups depend. Even if we take the conservative estimates from our sensitivity analysis, the conclusion that general health-care and disease-specific funds represent a substantial proportion of aid to maternal, newborn, and child health remains unchanged, indicating the importance of including all types of funds in the analysis.

Our study has several other possible limitations. First, we analysed ODA only, and did not capture domestic resource flows to maternal, newborn, and child health. Although worldwide ODA resource flow estimates are valuable to donors wishing to monitor levels of aid to specific disease areas or demographic groups, a measure of how much is being invested in maternal, newborn, and child health within countries is needed for a comprehensive picture of the financing situation. This

information would be useful, for example, in determining whether the amount of domestic government expenditure is an important factor in explaining the amount of ODA donors channel into a country. The limitation of our focus on ODA is highlighted by the fact that only 20% of total health expenditures in developing countries came from external sources of finance in 2003.[36]

The identification of domestic maternal, newborn, and child health expenditures can only be done with country-specific sources of data and allocation factors. The system of National Health Accounts provides the most comprehensive and accepted method to track health financial resources at the country level.[37] Methods are currently being developed and tested to assess expenditures on maternal, newborn, and child health, and such studies, within the context of the National Health Accounts, are planned over the coming years. The system of National Health Accounts is, however, a framework and relies heavily on the strength of public financial management systems, the quality of health service use and cost data, and the availability of private expenditure data. Future actions to improve health financial resource tracking must focus first and foremost on these systems, such that they can meet the information needs of in-country decision makers.[38]

Second, the results of the second review suggest that there is indeed an element of subjectivity in the method, albeit fairly small. The difference between the two reviewers indicates the difficulty in categorising a project when there is a lack of descriptive information provided by the donor. Within the CRS, data are most incomplete in the description data field, sometimes making verification of the specific purpose of a project and how it relates to maternal, newborn, and child health impossible. This situation potentially gives rise to the misclassification of projects into the wrong purpose categories. The extent of subjectivity in the categorisation of projects was specific to the donor, as the quality of data varied according to the organisation providing the data. Despite the differences between reviewers, the degree to which the final estimates were affected is deemed acceptable for the purposes at hand and will diminish as project descriptions become more complete in the future. Indeed, use of the database in the way done in this paper should provide a stimulus to improved project descriptions.

A third consideration relates to missing donors and the external resource flows not covered by the study. Some donors, most notably WHO, were not included in the analysis because of a lack of sufficiently detailed published data. Expenditures by WHO on maternal, newborn, and child health from its regular budget was around $30 million during 2002–03, suggesting that this omission is probably not likely to be of great importance.[39] More important, and difficult to capture, are the external flows not included as ODA such as the core-funds of non-governmental organisations, private donations from individuals, companies, and foundations,[40,41] and remittances.[42]

We conclude by assessing how current aid flows compare against the projected cost of reaching the MDGs for child and maternal health. Although estimates of the cost of achieving health goals are characterised by a wide margin of uncertainty,[43] they provide some sense of the order of magnitude of the challenge ahead. Walker and colleagues[1] suggest the total financial requirement to achieve MDG-4 and MDG-5 in the 60 priority child survival countries is $11 351 million per year, on the assumption that funds are spent effectively. The price tag, however, does not include the much larger cost of health-system strengthening needed to scale up services to universal coverage,[43] and therefore underestimates substantially the true cost of reaching MDG-4 and MDG-5. Nonetheless, the current ODA level of $1363 million is clearly inadequate to provide more than a small portion of the total resources needed to reach these health goals. In light of the estimated additional resource requirement of $7000 million per year, an important question is how much capacity do governments and their external partners have to increase funding for maternal, newborn, and child health?

Governments have the opportunity to generate additional domestic resources through, for example, economic growth, debt relief, and the re-allocation of existing government funds, but it is not known whether these will be sufficient. Future projections of ODA suggest the outlook is positive. If commitments are honoured, ODA is forecast to rise by $50 000 million to $130 000 million in 2010, with half these additional funds going to Africa.[44] Moreover, new financing mechanisms such as the International Finance Facility[45] and the airline tax proposal[46] have the potential to provide additional funds quickly. However, few of these funds can be guaranteed to go to maternal, newborn, and child health and much will depend on whether governments and donors prioritise this within their spending plans and how effectively funds are spent. The advent of general budgetary support and basket-funding is affecting the dynamics of decision making, transferring more responsibility to actors involved in the annual government budget process. Those advocating for maternal, newborn, and child health will need a greater appreciation of the changing environment if their voices are to be heard.

Contributors

T Powell-Jackson, J Borghi, and A Mills conceptualised the analysis and developed the assumptions related to the allocation of integrated funds. Analysis was done by T Powell-Jackson and E Patouillard. D Mueller provided findings from the country work. T Powell-Jackson prepared the first draft of the manuscript. Subsequent revisions were made by T Powell-Jackson, J Borghi, and A Mills on the basis of input from all authors. All authors reviewed the final draft and approved it for submission.

Conflict of interest statement
We declare that we have no conflict of interest

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