Global collective action in mental health financing: allocation of development assistance for mental health in 142 countries, 2000–2015

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Keywords

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Research Highlights

- Disbursements are not aligned with mental health needs of recipient countries.
- Contextual factors might be playing more prominent roles in resource allocation.
- Past recipients are more likely to be selected and to receive larger funding.

- More holistic collective action amongst international donors is required.

Abstract

Collective action between international donors is central to the mobilisation of global solidarity in global health. This is especially important in mental health where resources remain extremely limited. In this paper I investigate global collective action in mental health financing, looking at the responsiveness of international donors to mental health needs in low- and middle-income countries (LMICs). I analyse factors at the level of recipient countries (needs, interests, policy environment) associated with allocation of development assistance for mental health (DAMH) using a two-part regression model applied to a time series cross-sectional dataset of 142 LMICs between 2000 and 2015. Findings reveal that international donors' disbursements are not well aligned with mental health needs of recipient countries, and, moreover, contextual factors might be playing more prominent roles in resource allocation. Countries are more likely to receive DAMH if they experience significant outbreaks of infectious diseases or have lower gross domestic product (GDP) per capita and lower market openness. Selected recipient countries are more likely to receive higher DAMH amounts per capita if they have lower GDP per capita, higher government health expenditure, or higher mortality rates due to conflicts or natural disasters. Past DAMH recipients are more likely to be selected and, when selected, to receive higher DAMH amounts per capita. My results demonstrate that more holistic collective action amongst international donors is required to address mental health needs in LMICs. Investments should better reflect needs, particularly during and after emergencies such as COVID-19, and could be amplified by leveraging synergies across other health conditions and sectors.

1. Introduction

Collective action between international donors is central to global solidarity in global health (Frenk & Moon, 2013), especially in mental health where resources are particularly limited. Mental disorders (including substance use disorders, dementia, and self-harm) in low- and middle-income countries (LMICs) are on the rise and will likely be amplified by COVID-19 and policy response to it (Vigo et al., 2020), while resources remain extremely limited (Patel et al., 2018). A large network of international donors is contributing to address mental disorders in LMICs through development assistance for mental health (DAMH), which includes both financial and in-kind contributions (Iemmi, 2019). However, the limited amount and inequitable distribution of DAMH (Charlson et al., 2017) threaten international donors' collective action. It is therefore important to understand factors driving resource allocation.

Available evidence on factors driving DAMH allocation is extremely limited and suggests that international donors are not adequately responding to mental health needs in LMICs. While DAMH per disability-adjusted life year (DALY, i.e. lost 'healthy' life year) has increased almost fourfold between 1995 and 2015, mental disorders receive the lowest amount per DALY (US$0.85) across all health conditions with HIV/AIDS receiving the highest amount per DALY (US$144), albeit with variation across regions and income groups (Charlson et al., 2017). DAMH per capita varies widely across regions (from US$0.02 in Asia to US$0.07 in Africa) and country groups (US$0.05 in low-income, US$0.02 in lower middle-income, and US$0.03 in upper middle-income countries) in 2011 (B. Gilbert et al., 2015). Similar variation is observed for DAMH for children and adolescents (Lu et al., 2018; Turner et al., 2017). Previous research describes the scarcity of humanitarian assistance for mental health

(Persaud et al., 2018a) and an index has been proposed to facilitate its allocation based on compassion, assertive action, pragmatism, and evidence (Persaud et al., 2018b). A policy report identifies four main reasons for underinvestment in mental disorders in LMICs: lack of understanding of mental disorders, difficulties in measuring return on investment, stigma, and competing priorities (e.g. communicable diseases) (Mackenzie & Kesner, 2016).

Development assistance for health (DAH) provides relevant insights on potential factors likely to be associated with DAMH allocation. The evidence on DAH and health needs reveals a mixed picture: DAH is misaligned with some health indicators (e.g. burden of disease, although with much unexplained variation across countries) (Dieleman et al., 2014), but positively associated with others such as infant and child mortality (Lee & Lim, 2014), and HIV prevalence (Boussalis & Peiffer, 2011). Contextual factors have been found to influence DAH allocation. Competing health needs and limited resources mean that funding is often displaced: for example, HIV/AIDS has diverted resources away from malaria and health sector funding (but not from tuberculosis due to its links with HIV/AIDS) (Lordan et al., 2011). Countries with higher economic needs, measured as gross domestic product (GDP) per capita, receive higher development assistance for HIV (Sterck, 2018). Trade interests influence allocation of development assistance by donor nations (Younas, 2008), while multilateral donors favour disbursements to countries with stronger institutional capacity (Dollar & Levin, 2006).

In this study, I empirically analyse factors in recipient countries associated with DAMH allocation using time series cross-sectional data on 142 LMICs between 2000 and 2015. I test whether international donors' disbursements are aligned with mental health needs of recipient countries, and the role of contextual factors in resource allocation. I focus on international donors as a group to illuminate their collective action and shared responsibilities.

2. Methods

After selecting recipient-country factors likely to be associated with DAMH allocation, I created a new time series cross-sectional dataset by merging data from different sources. I then analysed the two stages of the DAMH allocation process using a two-part regression model, supported by sensitivity analyses and robustness checks. Finally, I reported descriptive statistics to chart trends over time in DAMH disbursements and mental health needs of recipient countries, and findings from the regression analyses.

Factors selection

I selected factors representing recipient country characteristics likely to be associated with DAMH allocation and data sources through a review of the literature. Selection was complemented by 35 in-depth interviews with key informants working in international organisations that are prominent players in global health and experts in global mental health (Web-Appendix 1). Identified factors were included in the final model according to data availability, quality, and suitability for analyses. In line with previous conceptualisations of factors influencing development assistance (e.g. Peiffer & Boussalis, 2010), I classified them into three groups: *needs*, *interests*, and *policy environment*. DALYs for mental health per capita was used to measure mental health needs, percentage of DALY for other health conditions to measure competing health needs, and GDP per capita economic needs. For *interests*, trade as a share of GDP was used to measure market openness and donors' commercial interests. For *policy environment*, government effectiveness was used to measure institutional capacity, and government health expenditure as a percentage of GDP government commitment to health as proxy for mental health. In recognition of their links with mental disorders (Charlson et al., 2019), variables capturing humanitarian shocks (conflicts, natural disasters, disease outbreaks) were included. Hypotheses for each variable were based on both literature and interviews: no association was expected for DALYs for mental health per capita (Charlson et al., 2017), negative associations for the percentage of DALY for other health conditions (Mackenzie & Kesner, 2016; interviews) and GDP per capita (Peiffer & Boussalis, 2015), and positive associations for the remaining variables (Charlson et al., 2019; Dollar & Levin, 2006; Karlan & List, 2020; Peiffer & Boussalis, 2015; interviews) (Appendix A). Ethical approval was obtained from the London School of Economics and Political Science Research Ethics Committee (Ref. 000589) and informed consent from interview participants.

Data sources

I developed a new time series cross-sectional (2000–2015) dataset merging sources commonly used in the development aid literature (Appendix A). Data for DAMH came from the DAH 1990–2017 dataset published by the Institute for Health Metrics and Evaluation (IHME) (IHME, 2018a). The IHME DAH dataset reports semi-aggregated data in 172 countries between 1990 and 2017. The dataset includes resources flows from funding sources (governments and philanthropy) through *channel* organisations (e.g. bilateral and multilateral organisations) to recipients (i.e. LMICs) (Global Burden of Disease Health Financing Collaborator Network, 2018b). It includes disbursements to the health sector only and excludes humanitarian assistance. The variable DAMH represents the amount of development assistance for mental disorders disbursed to a country in a particular year. According to the IHME definition of DAMH, mental health includes mental disorders, substance use disorders, dementia, self-harm, some neurological conditions (epilepsy, headache disorders, Parkinson’s disease). DAMH per capita estimates (hereafter labelled as DAMH pc) were derived using population data published by IHME (Global Burden of Disease Collaborative Network 2018c). To identify countries selected to receive DAMH, I created a dummy variable per DAMH selection (value 1 if DAMH was bigger than zero; value 0 otherwise).

DALYs were extracted from IHME Global Burden of Disease Study 2017 dataset (Global Burden of Disease Collaborative Network 2018a). To reflect the IHME definition of DAMH, DALYs for mental health included not only mental disorders but also substance use disorders, dementia, self-harm, and some neurological conditions. Population data published by IHME (Global Burden of Disease Collaborative Network 2018c) were used to derive per capita estimates (DALY for Mental Health pc). Percentage of DALYs for other health conditions (DALY for Other Health, %) represented the share of DALYs for all health conditions except mental disorders, substance use disorders, dementia, self-harm, and some neurological conditions. GDP and trade as a share of GDP were sourced from the World Development Indicators dataset (World Bank, 2019a). GDP represents the “sum of gross value added by all resident producers in the country plus any product taxes and minus any subsidies not included in the value of the products” (World Bank, 2020a). For consistency, GDP per capita figures (GDP pc) were estimated using population data published by IHME (Global Burden of Disease Collaborative Network 2018c). Trade as a share of GDP (Trade, %GDP) is defined as the "sum of exports and imports of goods and services measured as a share of gross domestic product" (World Bank, 2020b).

The government effectiveness index came from the World Governance Indicators dataset (World Bank, 2019b). The index captures "perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies" (Kaufmann et al., 2011, p. 223). Scores range from -2.5 (weak) to +2.5 (strong) governance performance. Government health expenditure was sourced from IHME Global Health Spending dataset (Global Burden of Disease Health Financing Collaborator Network, 2018a) and includes health care good and services, but not capital expenditure (e.g. buildings). Government health expenditure as a percentage of GDP (GHE, %GDP) was derived using GDP estimates sourced from the World Development Indicators dataset (World Bank, 2019a).

Variables identifying humanitarian shocks came from the IHME Global Burden of Disease Study 2017 Cause-Specific Mortality dataset (Global Burden of Disease Collaborative Network 2018b). Number of deaths attributable to conflicts (Conflicts, deaths) and to natural disasters (Natural Disasters, deaths) were extracted from the dataset. In line with previous research (GBD 2017 Causes of Death Collaborators, 2018), I created a variable measuring deaths due to disease outbreaks (Disease Outbreaks, deaths) merging deaths by key infectious disorders: dengue, diarrheal diseases, Ebola, malaria, measles, meningococcal meningitis, Zika virus, and other unspecified infectious diseases. Mortality rates per 100,000 individuals (Conflicts, MR per 100,000; Natural Disasters, MR per 100,000; Disease

Outbreaks, MR per 100,000) were estimated using population data published by IHME (Global Burden of Disease Collaborative Network 2018c).To identify major humanitarian shocks, I created a dummy variable per shock (value 0 if the annual number of deaths per country was less than 1000; value 1 otherwise) (Conflicts; Natural Disasters; Disease Outbreaks). The threshold was chosen in line with the Correlates of War project dataset, where 1000 battle-related deaths differentiates between war and minor conflicts (Gleditsch et al., 2002).

Logarithmic values of three variables were used to normalise their distribution (DAMH pc) or to facilitate interpretation (DALYs for Mental Health pc, GDP pc). Values were rebased to 2017 United States dollars (US$) adjusted by purchasing-power-parity (PPP) using the GDP deflator series published by the World Bank (2019a). Web-Appendix 2 reports descriptive statistics: summary statistics reveal few countries experiencing conflicts and natural disasters during 2000–2015, and Pearson coefficients show statistically significant associations between most independent and dependent variables.

Data were missing for four variables: GDP per capita (1.5% of country-year data points), trade as a share of GDP (4.3%), government effectiveness (7.1%), and government health expenditure as a percentage of GDP (1.5%). Missing data were treated using multiple imputation (White et al., 2011), the preferred method where values are assumed to be not missing at random (Lall, 2016) (Web-Appendix 3).

Model specification

I used a two-part model (Cragg, 1971) to reflect the two stages of the resource allocation process (Stubbs et al., 2016). For the first part, I used a pooled probit estimator to determine factors associated with the probability that a country received DAMH (selection equation). For the second part, I used a pooled Ordinary Least Squared (OLS) estimator on selected recipients to determine factors associated with the amount of DAMH received (allocation equation). The unit of analysis was recipient country-year.

I used the following base specification of the two-part model, for the selection (1) and allocation (2) equations:

$$Pr(DAMH\ selection_{it} = 1) = F\,(\alpha_0 + \phi_1 DAMH\ selection_{it-2} + \alpha_1 X_{it-2} + \alpha_2 W_{it-s} + \tau_t) \quad (1)$$

$$Ln\ DAMH\ pc_{it} = \beta_0 + \beta_1 X_{it-2} + \beta_2 Z_{it-s} + \beta_3 DAMH\ selection_{it-2} + \tau_t + u_{it} \quad (2)$$

where *i* is recipient country; *t* year; *s* lags; *F* cumulative distribution function; α_0 and β_0 intercepts; α and β regression coefficients for each independent variable; ϕ regression coefficient for the autoregressive term; *X* vector of independent variables representing needs, interests, and policy environment of the recipient country; *W* and *Z* vectors of independent variables representing humanitarian shocks in the recipient country as dummy and continuous variables respectively; τ year fixed effects; *u* error term. Web-Appendix 4 reports the full equations.

The selection equation (1) is an autoregressive distributed lag (ADL) model using a pooled probit estimator. The dependent variable is a dummy variable for DAMH receipt by country per year, taking value one when the country receives DAMH and zero otherwise. A two-year lag is used for the autoregressive term and independent variables representing needs, interests, and policy environment of recipient countries. Independent variables capturing humanitarian shocks use both one-year and two-year lags (conflicts, natural disasters) or one-year lag only (disease outbreaks) due to high multicollinearity with the two-year lag (Marquaridt, 1970). I assumed a two-year lag to reflect information available to decision-makers at the time of selection and allocation of DAMH (i.e. year preceding disbursements) (Neumayer, 2005). I assumed an additional one-year lag for humanitarian shocks to account for the faster availability of information on emergencies and disbursement of emergency funds. In order to reflect the non-linear relationships between the dependent variable and DALY for other health conditions, a square term was added.

The allocation equation (2) is a distributed lag (DL) model using a pooled OLS estimator. The dependent variable is logarithm of DAMH per capita. The only differences with the selection equation (1) are lack of autoregressive term (which absorbed all variation), use of a dummy variable for DAMH selection with a two-year lag to capture new and old recipients, and use of continuous instead of dummy variables for humanitarian shocks to reflect finer considerations during the allocation stage. The clustered standard errors estimator was used in both equations to correct for serial correlation within recipient countries. Gravity models were not used in order to include *all* DAMH independently from the source. Analyses would have required different two-part models to explore different sources while the focus of this study was on *collective* action across donors. Web-Appendix 5 explains the choice of the estimation approach.

Data analyses

I first compared trends for DAMH and DALYs for mental health for 2000–2015, and then carried out regression analyses for the two-part model. I estimated average marginal effects of coefficients in the first stage to facilitate interpretation (Williams, 2012). Next, I conducted analyses to test sensitivity of results to changes in model specification generally aiming for parsimony, and robustness checks: using different lags; excluding outliers using trimming (i.e. excluding the first and 99th percentiles) or winsorising (i.e. replacing extreme values with extreme percentiles); and using the original dataset with full data or complete cases.

I limited analyses to the period 2000 to 2015 due to lack of accurate reporting for DAH before 2000 and availability of preliminary estimates only for DAH post-2015, leaving 166 countries. I discarded 26 countries and territories due to lack of data on variables of interest, leaving 142 LMICs in the analyses (full list in Web-Appendix 6). Values are reported in 2017 PPP-adjusted US$. Analyses were conducted in Stata 15 (StataCorp, 2017).

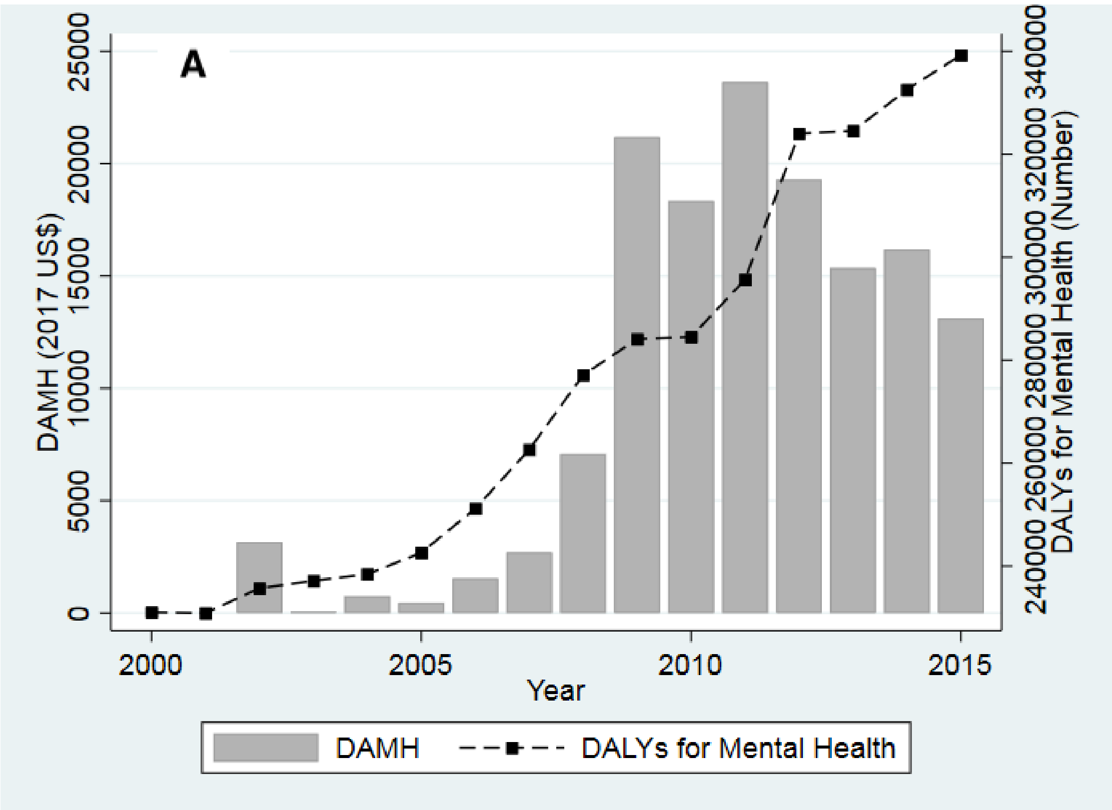
3. Results

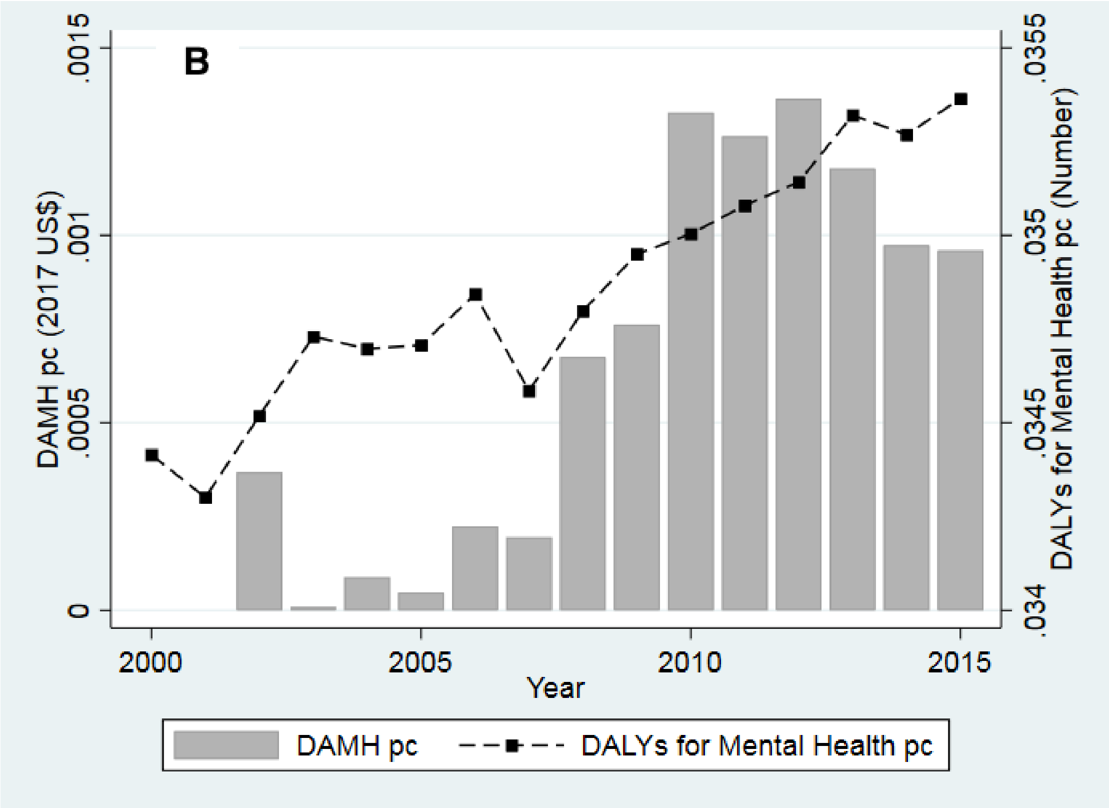
Trends

Findings reveal that DAMH began to decrease in 2014 after a first phase of increase in (low) disbursements, although DALYs for mental health continued to rise between 2000 and 2015 (Web-Appendix 7, Table 7.1). The total level of annual DAMH increased five-fold between

2000 and 2015 for the 142 LMICs in the sample, with broad variations across years and countries (Web-Appendix 7, Table 7.2). The median level of annual DAMH increased from zero to US$23,639 between 2000 and 2011, decreasing to US$13,117 in 2015, while median level of DALYs for mental health increased steadily over the same period (Figure 1, Panel A) (Web-Appendix 7, Table 7.3). Similarly, the median level of annual DAMH per capita increased slightly from zero to US$0.001 between 2000 and 2012, and started decreasing soon after, while DALYs for mental health per capita increased steadily (Figure 1, Panel B) (Web-Appendix 7, Table 7.4). All estimates are characterised by broad uncertainty (Web-Appendix 7, Tables 7.3–7.4), a feature of analyses of this kind of data. Of course, there are potentially many other factors influencing disbursements as I will explore.

Figure 1. DAMH and DALYs for mental health between 2000 and 2015, median (Panel A) and median per capita (Panel B).





DALYs, disability-adjusted life years; DAMH, development assistance for mental health; pc, per capita.

Two-part model

Results show that disbursements are not well aligned with total mental health needs of recipient countries, and contextual factors might be playing more important roles in resource allocation. Table 1 reports results from the main selection model (i.e. the first part), including 1818 observations for 140 countries between 2000 and 2015. DALYs for mental health per capita were not associated with the probability of the country being a DAMH recipient *ceteris paribus*. The probability that a LMIC received DAMH was positively associated with two variables (disease outbreaks, past DAMH receipt) and negatively associated with two others (GDP per capita, trade as a share of GDP). In particular, past DAMH receipt and experience of significant outbreaks of infectious diseases were associated with higher probability of receiving DAMH. A 1% increase in GDP per capita was associated with a 6% decrease in probability of DAMH receipt. An increase in trade equivalent to 1% of GDP was associated with 0.1% decrease in probability of DAMH receipt. A 1% increase in share of DALYs for other health conditions was associated with a 1% decrease in probability of DAMH receipt, close to 10% statistical significance (p=0.106). The remaining variables were not associated with the probability of DAMH receipt.

Table 1. Factors associated with selection of DAMH recipients between 2000 and 2015

	Pooled Probit					
	Main specification	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
DAMH selection						
L2 Ln DALYs for Mental Health pc	-0.0068	0.0001	-0.00350	-0.0043	-0.0076	-0.0152
	(0.0708)	(0.0659)	(0.0692)	(0.0687)	(0.0699)	(0.0719)
L2 DALYs for Other Health (%)[a]	-0.009	-0.003	-0.009	-0.009	-0.009	**-0.010***
	0.006	0.005	0.006	0.006	0.006	0.006
L2 Ln GDP pc	**-0.060*** **	**-0.056*** **	**-0.061*** **	**-0.060*** **	**-0.060*** **	**-0.063*** **
	(0.019)	(0.019)	(0.019)	(0.018)	(0.018)	(0.020)
L2 Trade (%GDP)	**-0.0005** **	**-0.0007** **	**-0.0005** **	**-0.0005* **	**-0.0005** **	
	(-0.0002)	(-0.0003)	(-0.0003)	(-0.0003)	(-0.0002)	
L2 Government Effectiveness	0.002	-0.002	0.002			-0.001
	(0.018)	(0.019)	(0.018)			(0.018)
L2 GHE (%GDP)	0.0015	-0.0066			0.0016	0.0002
	(0.0071)	(0.0063)			(0.0070)	(0.0074)
L1 Conflicts	-0.034		-0.034	-0.034	-0.034	-0.033
	(0.058)		(0.058)	(0.058)	(0.058)	(0.057)
L2 Conflicts	0.058		0.058	0.058	0.057	0.067
	(0.055)		(0.055)	(0.055)	(0.055)	(0.053)
L1 Natural Disasters	0.049		0.048	0.048	0.049	0.055
	(0.101)		(0.102)	(0.101)	(0.101)	(0.099)
L2 Natural Disasters	.		.	.	.	.
	.		.	.	.	.
L1 Disease Outbreaks	**0.097*** **		**0.095*** **	**0.095*** **	**0.097*** **	**0.100*** **
	(0.033)		(0.031)	(0.031)	(0.033)	(0.032)
L2 DAMH selection	**0.533*** **	**0.570*** **	**0.534*** **	**0.534*** **	**0.533*** **	**0.544*** **
	(0.047)	(0.049)	(0.048)	(0.048)	(0.047)	(0.049)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	166.71***	203.10***	165.76***	166.02***	166.95***	176.85***
	(54.25)	(56.83)	(54.23)	(53.96)	(54.07)	(53.48)

	Pooled Probit					
	Main specification	(2)	(3)	(4)	(5)	(6)
F statistic	51.07	73.61	52.94	55.16	53.12	49.67
p-value	8.23e-254	0	2.24e-253	7.05e-254	2.55e-254	1.18e-236
N observations	1818	1857	1818	1818	1818	1818
N countries	140	140	140	140	140	140

Main specification and sensitivity analyses (models 2–6). Average marginal effects with clustered standard errors in parentheses, imputed dataset (M=20). Significance: *P<0.10, **P<0.05, ***P<0.01. (.) Omitted due to collinearity. [a]Combined marginal effect for L2 DALYs for Other Health (%) and L2 DALYs for Other Health (%) Squared. DALYs, disability-adjusted life years; DAMH, development assistance for mental health; GDP, gross domestic product; GHE, government health expenditure; Ln, logarithm; pc, per capita.

Table 2 reports results from the main allocation model (i.e. the second part). Mental health-related DALYs per capita were not associated with DAMH per capita *ceteris paribus*. DAMH per capita was positively associated with four variables (past DAMH receipt, government health expenditure as a percentage of GDP, conflicts and natural disasters) and negatively with one other (GDP per capita). Past DAMH recipients received 1.5-fold greater DAMH per capita. An increase in government health expenditure of 1% of GDP was associated with 49% increase in DAMH per capita. Deaths from conflicts (one and two years prior) were more important in driving DAMH per capita than deaths from natural disasters (one and two years prior): an increase of one death attributed to conflicts and natural disasters per 100,000 individuals was associated with 1% and 0.1–0.2% increase in DAMH per capita respectively. A 1% increase in GDP per capita was associated with 124% decrease in DAMH per capita. The remaining variables were not associated with DAMH per capita.

Table 2. Factors associated with DAMH allocation between 2000 and 2015

	Pooled OLS					
	Main specification	(2)	(3)	(4)	(5)	(6)
Ln DAMH pc (2017 US$)						
L2 Ln DALYs for Mental Health pc	-1.917	-1.739	-0.628	-1.395	**-2.288****	-1.835
	(1.250)	(1.280)	(1.257)	(1.204)	(1.120)	(1.242)
L2 DALYs for Other Health (%)[a]	-0.152	**-0.249*****	**-0.179***	**-0.232****	**-0.180***	-0.151
	0.112	0.095	0.105	0.112	0.110	0.109

	Pooled OLS					
	Main specification	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
L2 Ln GDP pc	**-1.238*** **	**-1.200*** **	**-1.288*** **	**-1.071*** **	**-1.100*** **	**-1.234*** **
	(0.338)	(0.337)	(0.360)	(0.369)	(0.331)	(0.335)
L2 Trade (%GDP)	0.003	0.004		0.006		
	(0.004)	(0.005)		(0.004)		
L2 Government Effectiveness	0.550	0.448	**0.899** **			0.550
	(0.433)	(0.434)	(0.401)			(0.432)
L2 GHE (%GDP)	**0.485*** **	**0.478*** **			**0.550*** **	**0.498*** **
	(0.151)	(0.152)			(0.134)	(0.150)
L1 Conflicts (MR per 100,000)	**0.009*** **		**0.008*** **	**0.006*** **	**0.008*** **	**0.009*** **
	(0.003)		(0.002)	(0.002)	(0.002)	(0.003)
L2 Conflicts (MR per 100,000)	**0.005*** **		**0.005*** **	**0.004** **	**0.004** **	**0.005*** **
	(0.002)		(0.002)	(0.002)	(0.002)	(0.002)
L1 Natural Disasters (MR per 100,000)	**0.001*** **		**0.0006** **	**0.0004* **	**0.0008*** **	**0.0009*** **
	(0.000)		(0.0003)	(0.0019)	(0.0002)	(0.0003)
L2 Natural Disasters (MR per 100,000)	**0.002*** **		**0.002*** **	**0.0013** **	**0.002*** **	**0.0017*** **
	(0.001)		(0.001)	(0.0005)	(0.001)	(0.0006)
L1 Disease Outbreaks (MR per 100,000)	-0.004		-0.005	-0.004	-0.004	-0.005
	(0.003)		(0.003)	(0.003)	(0.003)	(0.003)
L2 DAMH selection	**1.492*** **	**1.463*** **	**1.503*** **	**1.548*** **	**1.480*** **	**1.474*** **
	(0.311)	(0.314)	(0.367)	(0.365)	(0.306)	(0.310)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-141.25	-254.12*	-179.39	-183.55	-159.11	-149.86
	(168.19)	(136.11)	(185.60)	(175.97)	(165.71)	(170.15)
F statistic	15.45	15.02	14.87	15.28	16.37	15.71
p-value	4.80e-26	1.69e-23	1.31e-24	4.51e-25	2.70e-26	5.85e-26
N observations	1426	1426	1426	1426	1426	1426
N countries	113	113	113	113	113	113

Main specification and sensitivity analyses (models 2–6). Regression coefficients with clustered standard errors in parentheses, imputed dataset (M=20). Significance: *P<0.10, **P<0.05, ***P<0.01. [a]Combined marginal effect for L2 DALYs for Other Health (%) and L2 DALYs for Other Health (%) Squared. DALYs, disability-adjusted life years; DAMH, development assistance for mental health; GDP, gross domestic product; GHE, government health expenditure; Ln, logarithm; MR, mortality rate; pc, per capita; US$, United States dollars.

Sensitivity analyses and robustness checks

Statistically significant results remained essentially unchanged across models examined during sensitivity analyses for the selection model (Table 1, models 2–6). Results for three independent variables (DALYs for mental health per capita, government effectiveness, and government health expenditure) appeared to be inconsistent in direction across models but none were statistically significant. DALYs for other health conditions were statistically significant when trade (model 6) was excluded from the model specification.

Results continued to be valid across models examined in sensitivity analyses for the allocation model (Table 2, models 2–6). The only variable with less stable results across models was DALYs for other health conditions, which was statistically significant in four models: a 1% increase in share of DALYs for other health conditions was associated with an 18–25% decrease in DAMH per capita (models 2–5). Two independent variables became statistically significant in some models. DALYs for mental health per capita were statistically significant when trade and government effectiveness were excluded from the model specification (model 5), with a 1% increase associated with a halving of DAMH per capita. Similarly, government effectiveness became statistically significant when trade and government health expenditure were excluded from the model specification (model 3), with a one-point increase in this indicator associated with a 90% increase in DAMH per capita.

Across robustness checks, results were similar to the main specifications for both selection and allocation models, with some exceptions (Web-Appendix 8). When analyses were performed on the original dataset, conflicts two years prior became statistically significant in the selection model: the probability of receiving DAMH increased by 10% in countries experiencing conflict two years prior. In the allocation model, mortality rate from conflict three years prior lost when using different lags while DALYs for mental health gained significance when trimming outliers: a 1% increase in DALYs for mental health per capita was associated with a halving of DAMH per capita.

4. Discussion

Findings reveals that international donors' disbursements are not very well aligned with mental health needs of recipient countries, and, moreover, contextual factors might be playing more prominent roles in resource allocation. Countries were more likely to receive DAMH if they had experienced significant outbreaks of infectious diseases, and they had lower GDP per capita and market openness. Once selected as recipients, countries were more likely to receive higher DAMH amounts per capita if they had lower GDP per capita, higher government health expenditure, and bigger conflicts or natural disasters. Past DAMH recipients were more likely to be selected and, when selected, to receive higher DAMH amounts per capita.

Between 2000 and 2015, DAMH did not follow mental health needs of recipient countries. The misalignment between DAMH and mental health needs (both including some neurological conditions) concurs with evidence of DAH allocation pertaining to other health conditions (Charlson et al., 2017; Dieleman et al., 2014; Shiffman, 2006). This misalignment could be attributed to the lack of understanding of mental disorders within the donor community, their definition and available solutions (Mackenzie & Kesner, 2016). It could also be ascribed to donor prioritisation of worst-off population groups (e.g. young people who are at high risk of experiencing mental disorders) not fully captured by total mental health needs, or different donor priorities (Voigt & King, 2017). This could also reflect reticence to using DALYs for resource allocation due to lack of transparency in their estimation (Shiffman & Shawar, 2020) and equity concerns (Anand & Hanson, 1997). However, the higher likelihood of receiving DAMH for countries experiencing significant outbreaks of infectious diseases suggests donors might understand and respond to increased mental health needs following humanitarian emergencies (Charlson et al., 2019). This reflects humanitarian donors' growing attention to mental health *during* and *after* emergencies (WHO, 2013) since the 2005 Tsunami in Banda Aceh and the subsequent publication of the Inter-Agency Standing Committee guidelines on mental health and psychosocial support in emergency settings (IASC, 2007) (Iemmi, 2021). The lack of positive association at the allocation stage suggests that response may *not* be adequate yet, and that resources might be disproportionally directed towards physical health. This concurs with the evidence on the disruption of non-outbreak-related health services during pandemics (Wilhelm & Helleringer, 2019) and a possible donor preference to fund mental health and psychosocial support integrated into sectors outside health as part of the humanitarian response (Tol et al., 2011). While positive associations were found for conflict and natural disasters at the allocation stage only, these findings should be interpreted with caution due to the smaller sample size for the analyses that included those variables.

Competing health needs may have a negative impact on whether a country received any DAMH (close to 10% statistical significance). The negative impact could corroborate results from a rapid review (Mackenzie & Kesner, 2016) identifying competing priorities as one of the reasons for underinvestment in mental disorders in LMICs. The same review highlights the difficulties in measuring return on investment in mental health as a barrier to investment: resources may have been diverted to other health conditions with more cost-effective interventions (Bendavid et al., 2015). This could align with the literature on aid displacement demonstrating diversion of funding by donors' high priorities such as HIV/AIDS (Lordan et al., 2011). This result could also be linked to the integration of mental health components into investments in other health conditions (e.g. HIV/AIDS, Chuah et al., 2017) and sectors beyond health (e.g. education, Fazel et al., 2014), not entirely captured by the IHME DAH dataset (IHME, 2018b). Integration has been growing over the last decade along with the expanding evidence base on social determinants and impacts of mental health (Lund et al., 2018).

GDP per capita negatively impacted DAMH, meaning that countries with lower standards of living were more likely not only to be selected for assistance but also to receive higher amounts. This is in line with the broader literature on development assistance that suggests 'poverty selectivity' in resource allocation (Peiffer & Boussalis, 2015). In addition, the alignment between DAMH and economic needs suggests that donors understand the vicious circle between poverty and mental disorders (i.e. people living with mental disorders are at higher risk of falling into poverty, and poor people are at higher risk of mental illness) (Lund et al., 2011). Economic interests had a negative impact on the decision to provide assistance, but not on the amount of funding received. The lower impact of trade openness compared to GDP may be explained by the fact that, while trade openness is commonly used in the development aid literature, cross-country variation is determined more by GDP than by trade (Fujii, 2019).

Government health expenditure had a positive impact on the amount of DAMH (but not on whether any assistance was received), implying that selected countries that spend more government resources on health are being rewarded for their commitment. This is in line with the Monterrey Consensus (UN, 2003), contending that development assistance is more effective when disbursed to countries with good policies and institutions, and with the literature on development assistance that suggests 'policy selectivity' in resource allocation

(Peiffer & Boussalis, 2015). Government effectiveness was not associated with DAMH, which contrasts with the evidence of 'institutional selectivity' in the allocation of development assistance (Dollar & Levin, 2006). However, sensitivity analyses suggest that the impact of government effectiveness may have been partly absorbed in the regression analyses by another variable (i.e. government health expenditure as a percentage of GDP).

Past receipts of DAMH had a positive impact on both the selection of DAMH recipients and the amount of assistance received. This means that donors are more likely to disburse to countries with existing mental health programmes. While the biggest and most generous donor countries in the health field have not been found to influence other donors' behaviours (Beech et al., 2015), quality signal mechanisms have been identified in philanthropic giving (Karlan & List, 2020): the presence of mental health programmes could have encouraged disbursements by signalling not only mental health needs but also the feasibility of investment. Nevertheless, this result also questions donors' path-dependency in prioritising specific recipient countries, and the risk of recipients' dependency on more volatile external funding and displacement of more sustainable domestic resources (Lu et al., 2010).

Data limitations meant that DAMH estimates did not include development assistance from other LMICs which are gaining importance in global health (Micah et al., 2019) and the representation of philanthropic donors was limited (Iemmi, 2020). Some DAMH figures may be underestimates because of the IHME methodological approach: for example disbursements from global health initiatives and some multilateral governmental organisations (United Nations Children's Fund, Joint United Nations Programme on HIV and

AIDS) are classified under health conditions constituting the organisation's focus, though their programmes may include mental health components (IHME, 2018b). The majority of DAMH was excluded, as not allocated to single countries. This limits the generalisability of results to funding to specific countries, which may have been qualitatively different from funding to unspecified recipients. However, the IHME DAH dataset is currently the best source of data for this type of analyses (Iemmi, 2019). Second, the analyses did not include all the variables for all possible drivers of DAMH. For instance, a lack of panel data on government mental health expenditure meant that government health expenditure was used as a proxy, and indicators for countries' mental health capacity (e.g. number of mental health workers) were not included. In addition, quantitative indicators do not capture less quantifiable factors that have been shown to play a crucial role in shaping organisational decisions to invest in mental health in LMICs, such as support of leaders and champions within donor organisations, political support in both source and recipient countries, and advocacy efforts at the global level (Iemmi, 2021).

Third, both DAMH and DALYs for mental health included some neurological disorders: these are identified as mental disorders by WHO (2008) because their service provision is often combined in LMICs. Fourth, I only examined the period between 2000 and 2015: this made it possible to use more robust DAMH data, and facilitated meaningful interpretation. Fifth, a few countries and territories had to be discarded because of a lack of data, including Palestine (an important recipient) (B. Gilbert et al., 2015) and some countries with conflicts and natural disasters. Finally, the disbursement processes are inherently complex (McCoy et al., 2009) and my models are necessarily simplifications.

Conclusions

This paper suggests that better collective action amongst international donors is required to address mental health needs in LMICs. Needs are on the rise due to epidemiological and demographic changes and an increase in adverse social determinants of mental health (Patel et al., 2018). Despite being the leading cause of years lived with disability in LMICs (18%), mental disorders attract as little as 1.6% of LMIC government health budgets (WHO, 2018) and 0.4% of DAH (Charlson et al., 2017). The impact of COVID-19 and the following policy responses are likely to amplify those needs (Brooks et al., 2020) and put additional pressure on LMIC government finances. In line with the Addis Ababa Action Agenda (UN, 2015a), the Sustainable Development Goals (UN, 2015b) recommend harnessing resources from a wide range of sources including development assistance, while gradually increasing domestic financing to ensure sustainability. They also emphasize the importance of collective efforts across countries to achieve sustainable development.

Global collective action to finance non-communicable disorders is limited. WHO Independent High-Level Commission on non-communicable diseases has proposed a multi-donor fund for non-communicable disorders and mental health (Nishtar et al., 2018), yet the establishment of a new organisation in an already large ecosystem of actors could contribute to additional fragmentation of efforts (Iemmi, 2019). Similarly, experts have posited the creation of a partnership for global mental health to mobilise funding and provide stewardship for their effective use (Vigo et al., 2019). While further research on global collective action in mental health financing is required, particularly on its challenges such as free-riding and social norms (Siegal et al., 2009) and on social networks (Han et al., 2018), this paper points to opportunities to improve the collective response of international donors to address mental health in LMICs.

The mental health needs of recipient countries need to be better reflected in DAMH allocation. While ranking recipient countries to inform DAH allocation requires a careful choice of multiple indicators (Ottersen et al., 2018), health needs have come to the foreground in more recent discussions (Haakenstad et al., 2018) especially vis-à-vis low-income countries (Ottersen et al., 2017). Recipient countries have been shown to value burden of disease more than income per capita (Grepin et al., 2018), the predominance of which in allocation decisions has been already challenged (Sterck et al., 2018). To ensure local ownership and sustainability of programmes beyond funded activities (Kiendrebeogo & Meessen, 2019), donors should position recipient countries at the centre of funding decisions: *systematically* including countries' preferences and priorities (Grepin et al., 2018) at the allocation stage and adopting a long-term approach (K. Gilbert et al., 2019). In particular, DAMH allocation should better target humanitarian emergencies, where mental health needs increase (Charlson et al., 2019). Resources should target response during both the emergency (IASC, 2007) and the recovery period, providing opportunities to build better mental health systems (WHO, 2013). This approach is pertinent to the current COVID-19 response and the future recovery phase.

International donors could strengthen their responses to mental health needs in LMICs by integrating mental health components into investments in other priorities, in particular different health conditions and sectors beyond health. Mental disorders often co-occur with communicable (Remien et al., 2019) and other non-communicable disorders (Mendenhall et al., 2017), playing a key role in both treatment and recovery. With a substantial population of people living with communicable disorders (GBD 2017 HIV Collaborators, 2019) and an increasing burden of non-communicable disorders worldwide (GBD 2017 DALYs and HALE Collaborators, 2018), LMICs face an unprecedented challenge: a synergetic approach to DAMH could improve health systems response. Similarly, mental disorders affect and are affected by multiple dimensions of people's lives (Patel et al., 2018) and the social determinants of mental disorders go beyond the health sector (Lund et al., 2018), thus calling for wide-ranging investments. In particular, the well-established link between poverty and mental disorders offers opportunities for catalysing the impact of development programmes through inclusion of both aspects (Lund et al., 2011).

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Declaration of competing interest

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Author statement

VI conceived and designed the study; collected and analysed the data; interpreted the results; and wrote the manuscript.

Ethical approval

London School of Economics and Political Science.

Appendix A. Variables

Variable	Definition	Unit	Source	Hypothesis
DAMH pc (2017 US$)	Amount of development assistance for mental health per capita	2017 PPP-adjusted US$	Development Assistance for Health dataset, 1990–2017 (IHME, 2018a)[a,b]	Not applicable
DAMH selection	Receipt of development assistance for mental health	1: DAMH>0 0: DAMH=0	Development Assistance for Health dataset, 1990–2017 (IHME, 2018a)[a]	Positive association (Karlan & List, 2020)
DALYs for Mental Health pc	Disability-adjusted life years attributable to mental disorders per capita	Numerical	Global Burden of Disease Study 2017 dataset, 1990–2017 (Global Burden of Disease Collaborative Network 2018a)[b]	No association (Charlson et al., 2017)
DALYs for Other Health (%)	Percentage of disability-adjusted life years attributable to all other health conditions (outside mental disorders)	Percentage	Global Burden of Disease Study 2017 dataset, 1990–2017 (Global Burden of Disease Collaborative Network 2018a)	Negative association (Mackenzie & Kesner, 2016; Interviews)
GDP pc	Gross domestic product per capita	2017 PPP-adjusted US$	World Development Indicators dataset, 1960–2018 (World Bank, 2019a)[b]	Negative association (Peiffer & Boussalis, 2015)
Trade (%GDP)	Trade as a share of gross domestic product	Percentage	World Development Indicators dataset, 1960–2018 (World Bank, 2019a)	Positive association (Peiffer & Boussalis, 2015)
Government Effectiveness	Government effectiveness	-2.5 (weak) to +2.5 (strong)	World Governance Indicators dataset, 1996–2017 (World Bank, 2019b)	Positive association (Peiffer & Boussalis, 2015)
GHE (%GDP)	Government health expenditure as a percentage of gross domestic product	Percentage	Global Health Spending dataset, 1995–2015 (Global Burden of Disease Health Financing Collaborator Network, 2018a)[c]	Positive association (Dollar & Levin, 2006; Interviews)
Conflicts (MR per 100,000)	Numbers of deaths attributable to conflicts	Numerical, per 100,000 population	Global Burden of Disease Study 2017 Cause-Specific Mortality dataset, 1980–2017 (Global Burden of Disease Collaborative Network 2018b)[b]	Positive association (Charlson et al., 2019; Interviews)
Natural Disasters (MR per 100,000)	Numbers of deaths attributable to natural disasters	Numerical, per 100,000 population	Idem	Idem
Disease Outbreaks (MR per 100,000)	Numbers of deaths attributable to outbreaks of infectious diseases	Numerical, per 100,000 population	Idem	Idem

Variable	Definition	Unit	Source	Hypothesis
Conflicts	Conflicts	1: Conflicts (Deaths)≥1000 0: Conflicts (Deaths)<1000	Idem	Idem
Natural Disasters	Natural disasters	1: Natural Disasters (Deaths)≥1000 0: Natural Disasters (Deaths)<1000	Idem	Idem
Disease Outbreaks	Outbreaks of infectious diseases	1: Disease Outbreaks (Deaths)≥1000 0: Disease Outbreaks (Deaths)<1000	Idem	Idem

[a]A detailed version was obtained from the Institute for Health Metrics and Evaluation in September 2018, including values omitted in the publicly available dataset: values greater than US$0 but less than US$500, or less than US$0 and greater than -US$500. [b]Per capita estimates and mortality rates were derived using population estimates sourced from the Global Burden of Disease Study 2017 Population Estimates 1950–2017 dataset (Global Burden of Disease Collaborative Network, 2018c). [c]Shares of GDP estimates were derived using GDP figures sourced from the World Development Indicators dataset (World Bank, 2019a). DALYs, disability-adjusted life years; DAMH, development assistance for mental health; GDP, gross domestic product; GHE, government health expenditure; MR, mortality rate; pc, per capita; PPP, purchasing-power-parity; US$, United States dollars.

Appendix B. Supplementary data

Supplementary data related to this article can be found at [web link].

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