An alternative mechanism for international health aid: evaluating a Global Social Protection Fund

Sanjay Basu,1,* David Stuckler2,3 and Martin McKee2

1Department of Medicine, Stanford Prevention Research Center, Stanford University, Medical School Office Building, X322, 1265 Welch Road, Mail Code 5411, Stanford, CA 94158, USA, 2Department of Health Services Research and Policy, London School of Hygiene and Tropical Medicine, WC1H 9SH, London, UK and 3Department of Sociology, Cambridge University, Free School Lane, Cambridge, CB2 3RQ, UK

*Corresponding author. Stanford Prevention Research Center, Stanford University School of Medicine, Medical School Office Building, X322, 1265 Welch Road, Mail Code 5411, Stanford, CA 94305-5411, USA. E-mail: basus@stanford.edu

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Several public health groups have called for the creation of a global fund for ‘social protection’—a fund that produces the international equivalent of domestic tax collection and safety net systems to finance care for the ill and disabled and related health costs. All participating countries would pay into a global fund based on a metric of their ability to pay and withdraw from the common pool based on a metric of their need for funds. We assessed how alternative strategies and metrics by which to operate such a fund would affect its size and impact on health system financing. Using a mathematical model, we found that common targets for health funding in low-income countries require higher levels of aid expenditures than presently distributed. Some mechanisms exist that may incentivize reduction of domestic health inequalities, and direct most funds towards the poorest populations. Payments from high-income countries are also likely to decrease over time as middle-income countries’ economies grow.

Keywords International aid, mathematical models, health systems, social welfare

KEY MESSAGES

- A global fund for ‘social protection’ has been proposed—a fund that produces the international equivalent of domestic tax collection and safety net systems to finance care for the ill and disabled and related health costs.
- We assessed how alternative strategies and metrics by which to operate such a fund would affect its size and impact, using a mathematical model.
- We found that some approaches to fund operation may incentivize domestic reduction of within-country inequalities in health, direct most funds towards the poorest populations and reduce payments from high-income countries over time.

Introduction

Motivations for an alternative aid mechanism

The Millennium Development Goals (MDGs) established in 2000 have generated a substantial influx of resources to reduce poverty, disease and related social problems in poor countries (World Health Organization 2008). Despite having received more international aid than thought necessary to reach the MDGs (Ravishankar et al. 2009), many countries are likely to miss the MDG targets (United Nations Department of Economic and Social Affairs 2011). Among the myriad reasons for missing these targets, one subject that has sparked considerable discussion is how aid is distributed relative to need. That is, it has been thought that the frequently
short-term, volatile, unpredictable, redundant and narrowly focused funding streams characteristic of current aid mechanisms are inadequate to meet the widespread and persistent burden of poverty and poverty-related disease in low-income countries (Ooms et al. 2010). A particular concern is how to render aid systems resilient and effective in addressing ‘poverty traps’ whereby a high and persistent burden of disease, once dominated by endemic tropical infections but now increasingly added to by non-communicable disease, prevents countries from escaping from poverty despite sustained monetary redistribution (Sachs et al. 2004). Worse, countries in such poverty traps are left behind by the ‘winners’ in this global market that are able to escape into a virtuous cycle by which initial gains provide resources that they can invest in ways that give them future comparative advantage, such as education, insurance systems (savings), research and infrastructure; in contrast, ‘losers’ spiral downwards into complete loss of social and economic capital from which it is extremely difficult to escape through existing aid mechanisms, with their decline often initiated by natural disasters or outbreaks of epidemic diseases, with the former sometimes leading to the latter.

Calls for a Global Social Protection Fund

Domestically, most countries have created safety nets, albeit of varying robustness and efficacy, to buffer citizens who experience financial and social losses from poverty traps (e.g. social security systems, disability insurance and healthcare coverage for the poor). These domestic systems use tax revenues rather than donations—i.e. rather than being considered charity, paying taxes to support these ‘social protection’ systems is considered a duty of citizens, who in turn can draw from these resources in times of need. There is a growing call for analogous social support systems to be built internationally, given that the global trade system produces winners and losers across borders (Gostin et al. 2010; Morris 2010; Ooms et al. 2010), and given arguments that current international law provides a basis for such redistribution on an obligatory rather than charity basis to fulfill the Right to Health (Gostin et al. 2010; Ooms et al. 2010).

Members of the Joint Action and Learning Initiative on National and Global Responsibilities for Health (JALI), as well as related global health organizations and the International Labor Organization, have called for the creation of a ‘Global Social Protection Fund’ (GSPF) to address international poverty traps (Gostin et al. 2011). Unlike traditional aid systems, the GSPF has been described as extending a centralized aid pooling system similar to the Global Fund for AIDS, Tuberculosis and Malaria, but providing buy-in and solidarity among states by emulating within-country social support systems in which citizens both pay taxes and receive services funded by those taxes (Ooms et al. 2010). That is, as global financial crises and natural disasters can affect any country, participating countries would pay into the GSPF based on some metric of ability to pay and withdraw based on some metric of need for funding; the very wealthy and healthy will pay more than they receive back, and the very poor and ill will pay less than they receive back (Figure 1). Unlike the International Monetary Fund, the GSPF would offer regular contributions to offset global inequalities and poverty traps, would not only operate during fiscal crises, and would seek to offer assistance without conditionalities to pay for social protection. Of note, the GSPF is intended as an annual distribution mechanism based on average annual metrics of ability and need—so it is not intended for punctuated problems, such as natural disasters, which may still require additional assistance, but if such disasters create long-term (or even medium-term) changes in ability or need, the GSPF fund would help to address these changes.

Major operational questions for a GSPF

There have been a number of proposals to create a GSPF (International Trade Union Confederation 2009; UK Department for International Development 2009) while, simultaneously, proposals for a financial transactions tax (Tobin Tax or ‘Robin Hood Tax’) or equivalent capital-collection system offer a means to finance it (Tobin 1978; Patomäki 2001). Contributing states would allocate a portion of domestic tax revenues from the transactions tax or other revenue-generating sources to the GSPF. Germany’s international aid ministry has provisionally accepted the concept of participating in a GSPF, and some financing mechanisms that may fund it have been agreed to in France and remain under discussion in the UK and USA (Stacey 2012). At an initial meeting of global financiers, non-governmental organizations and government ministers in

![Figure 1](image-url)  
Figure 1 Conceptual models of international aid. (a) Depiction of the traditional (current) international aid model and (b) model of the GSPF.
Berlin in 2012 discuss the GSPF (Helen de Beir Foundation 2012), a request was made to create a ‘baseline’ model of how a GSPF might operate according to the principles outlined earlier, to facilitate future planning on the issue.

Here, we present such a baseline model of the GSPF. While the political processes and detailed negotiations about creating and financing a GSPF are ongoing, there are numerous questions about how such a fund would operate if it were to come into existence, which we can address at this stage. How much money would be needed to meet current targets for global social protection? How would alternative metrics for ‘ability to pay’ and ‘need for funding’ affect the size of such a fund and the distribution of its resources among various countries? What do alternative proposed calculation approaches imply for who pays and who receives funding? And how would these calculations change over time in a dynamic global economy?

**Methods**

To answer the earlier questions about a GSPF, we constructed a computer simulation of the fund. As shown in Figure 1b, participating countries were simulated as contributing a portion of their ‘ability to pay’ in each year of the simulation, and receiving a portion of the pooled funds based on their ‘need for funds’ that year. We compared the impact of using alternative metrics for ‘ability’ and ‘need’ by sampling from the United Nations Development Program human development indicators (Table 1). We compared two measures of ability to pay: gross domestic product (GDP) per capita [in purchasing power parity (PPP) terms and constant 2005 international dollars for comparability between countries] and gross national income (GNI) per capita (in the same terms). The GNI incorporates not only the value of goods and services produced in a country (GDP) but also corrects for foreign ownership and debts (e.g. money generated by a factory in Haiti but received by its owner, a US firm, would count as value added to the USA rather than to Haiti). We compared several alternative measures of need given available development indicators, ranging from poverty rates to mortality rates to more complex measures of development such as the multidimensional poverty index (MPI) and inequality-adjusted human development index (HDI) (see Table 1).

We simulated the case in which each country contributes a fraction of their ability to pay (e.g. 0.01% of GNI) to the fund. Distribution of the pooled fund dollars was then determined by each country’s metric of need; specifically, a country’s receipt from the GSPF is the fraction of global need composed of by that country’s need. For example, suppose the poverty gap (fraction of population living on <$1.25 per day) is used as the metric of need; if the poverty gap in Country N has a value of 0.2 and the sum of all countries’ poverty gap is 20, then Country N would receive (0.2/20), or 1%, of the GSPF funds available that year. In this manner, the amount of funds available to the GSPF is never exceeded (every country gets a fraction of the overall ‘need burden’ among the participating countries, and the sum of the fraction is always 1, or 100% of the available funds for that year). This method permits an objective and comparable measure of development to be used to gauge need, rather than a subjective assessment of need or fulfilment of conditionalities—achieving the goals specified in current GSPF proposals (Ooms et al. 2010). Of course, more complex models could employ multiple metrics of ability and multiple metrics of need, but such a system would require ‘weighting’ which metrics are considered more important than others; here, we simulated a simple backbone structure for the

<table>
<thead>
<tr>
<th>Metric</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Ability to pay</td>
<td>The value of all final goods and services produced within a country in a given year divided by the mid-year population for the same year. PPP takes into account the relative cost of living and the inflation rates of the countries, rather than using exchange rates which may distort the real differences in income. Constant 2005 international dollars are used for comparability between countries and years.</td>
</tr>
<tr>
<td>GDP per capita PPP, constant 2005 international dollars</td>
<td></td>
</tr>
<tr>
<td>GNI per capita PPP, constant 2005 international dollars</td>
<td>GDP plus income receipts from the rest of the world minus income payments to the rest of the world.</td>
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<tr>
<td>Need for funding</td>
<td></td>
</tr>
<tr>
<td>Health index</td>
<td>Life expectancy at birth expressed as an index using a minimum value of 20 years and observed maximum value more than 1980–2010.</td>
</tr>
<tr>
<td>HDI</td>
<td>A composite index measuring average achievement in three basic dimensions of human development—a long and healthy life, knowledge and a decent standard of living.</td>
</tr>
<tr>
<td>Inequality-adjusted HDI</td>
<td>HDI value adjusted for inequalities in the three basic dimensions of human development.</td>
</tr>
<tr>
<td>Life expectancy at birth</td>
<td>Number of years a newborn infant could expect to live if prevailing patterns of age-specific mortality rates at the time of birth stay the same throughout the infant’s life. Expressed as a fraction of 100 years.</td>
</tr>
<tr>
<td>Under-five mortality rate</td>
<td>Probability of dying between birth and exactly age 5, expressed as the proportion of 1000 live births.</td>
</tr>
<tr>
<td>MPI</td>
<td>Composite measure of the percentage of deprivations that the average person would experience if the deprivations of poor households were shared equally across the population.</td>
</tr>
<tr>
<td>Poverty gap</td>
<td>Percentage of the population living below the international poverty line at $1.25 (in PPP terms) a day.</td>
</tr>
</tbody>
</table>

*Source: World Development Indicators Database (World Bank 2012b).*
GSPF from which more complex models can be developed, so we used only one metric for ability and one for need to understand the basic functioning of such a fund and avoid arbitrary valuations between different metrics.

Using this collection and distribution mechanism, we calculated what amount of their ability to pay participating countries would need to contribute to meet a minimum target of $50 per person per year of GSPF dollars to every low-income country. This target of $50 per person to low-income countries was previously estimated by a global working group studying the issue (Mills 2009). Our goal is to estimate the minimum quantity of international pooling and transfers that would be needed to achieve this target. Low-income countries were defined by standard World Bank criteria as having a per capita annual income <$1005 in 2011; initial calculations were also performed for the year 2011 as this was the most recent year for which data were publicly available (World Bank 2012b). We recalculate this number with each year of the simulation in our sensitivity analysis, as described further below.

A full mathematical description of the model is provided in Box 1, using the definitions of the parameter symbols in Table 2. The model equations describe the sequence of steps for calculating the amount of funds contributed by each country and withdrawn by each country to achieve the $50 target. The equations first define a variable for the total GSPF fund size, by adding the contribution given by each country based on per capita ability to pay and population size. The model then distributes the GSPF funds to each country based on the total fund size multiplied by the fraction of global need that is made up by each country’s need. Finally, the contribution (fraction) of ability to pay for each country that is necessary to reach the $50 per person target is calculated through a solving algorithm.

As a sensitivity analysis, we additionally perform a calculation that may potentially adjust the GSPF mechanism for within-country inequality and extreme poverty. Specifically, we simulate a scenario in which countries receive greater GSPF funds if they have lower internal inequality of need than would be expected for their income, and receive fewer GSPF funds if they have higher internal inequality of need than would be expected for their income (see Figure 2). The equations

### Table 2 Model parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>$\alpha$</td>
<td>Per capita metric of ability (from Table 1, e.g. GNI per capita)</td>
</tr>
<tr>
<td>$\omega$</td>
<td>Country population size</td>
</tr>
<tr>
<td>$\rho$</td>
<td>Proportion of ability given to fund (e.g. % of GNI)</td>
</tr>
<tr>
<td>$\eta$</td>
<td>Metric of need (from Table 1, e.g. health index)</td>
</tr>
<tr>
<td>$\delta$</td>
<td>Funds distributed to country</td>
</tr>
<tr>
<td>$\tau$</td>
<td>Threshold for being defined as low income (e.g. $1005/person/years in 2011)</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>Total GSPF fund size</td>
</tr>
<tr>
<td>$\beta$</td>
<td>Domestic poverty size (e.g. $5 needed to give everyone $1.25 per day for 1 year)</td>
</tr>
<tr>
<td>$\lambda$</td>
<td>Target funds distributed per capita to low-income countries (e.g. $50/person/years)</td>
</tr>
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### Box 2 Model equations

Here, we use the definitions of the parameter symbols in Table 2.

The base model equations for countries $i$ are:

1. \( \sigma = \sum \rho i \alpha i \omega i \) (here, $\sigma$ is the total GSPF fund size, and is calculated by adding the contribution $\rho$ given by each $i$ country, based on per capita ability to pay $\alpha$ and population size $\omega$).
2. \( \delta i = \frac{\alpha i \omega i}{\sum \alpha j \omega j} \) (here, funds delta are distributed to a country based on the total fund size multiplied by the fraction of need $\eta$ that is made up by that country as a fraction of total worldwide need).
3. We solve for $\min \rho$ such that $\forall i \in \{ \alpha i \leq \tau \}, \frac{\alpha i}{\omega i} \geq \lambda$ (here, we find the minimum necessary contribution from each country such that for all countries in which the ability to pay alpha meets the criteria for being low income, tau, the funds distributed to the country per capita—the ratio of delta to omega—will be at least the target amount lambda, which we set as $50 per person).

As a sensitivity analysis, we additionally perform a calculation to adjust the GSPF mechanism for within-country inequality and extreme poverty. Specifically, we simulate a scenario in which countries receive greater GSPF funds if they have lower internal inequality of need than would be expected for their income, and receive fewer GSPF funds if they have higher internal inequality of need than would be expected for their income (see Figure 2). The following equations describe the adjustment, where ‘loess’ refers to a non-parametric locally weighted regression where the bandwidth (weighting among neighbours) is specified by Akaike’s information criterion (Akaike 1974).

4. \( \sigma = \sum \rho (\alpha i - \beta \omega i) \) (here, ability to pay is reduced by the domestic need to pay for poverty beta).
5. \( \eta j = \text{loess}(\eta i) \forall j \in \{ \eta j \approx \alpha j \} \) (here, eta is being calculated based on the typical need for all countries $j$ with an alpha ability level that is close to that of the country $i$).
6. \( \delta i = \frac{\sigma i}{\sum \eta j} \) (here, we perform the same calculation as Equation 2).
7. We solve for $\min \rho$ such that $\forall i \in \{ \alpha i \leq \tau \}, \frac{\alpha i}{\omega i} \geq \lambda$ (here, we perform the same calculation as Equation 3).
describing the adjustment are also provided in Box 1. All equations and calculations were performed in Microsoft Excel 2011 (Microsoft Inc., Redmond).

Results and discussion
Table 2 and Figure 3 display results of the model. We found that to meet the $50 per person target for low-income countries would require between $169 and $821 billion, which amounts to between 0.25 and 1.27% of per capita income from participating countries. For reference, the USA currently contributes ~0.19% of per capita income to international aid—the lowest percentage among high-income nations—whereas Sweden gives the highest percentage at ~1%. The UN MDG target request is 0.7%. The top contributors to the GSPF would be the USA (which on average would contribute 20% of total GSPF dollars), followed by China (14%), Japan (6%), India (6%) and Germany (4%). Of note, China and India enter the top contributors column because total capital available is used as a metric of ability to pay; they also are among key recipients of funds (India receives 0.84% of the fund and China 0.49% on average), highlighting the difference between this GSPF structure in which some countries can be both donors and recipients (as in a domestic tax system, where individuals both pay taxes and receive services back). Top recipients would include Burundi (which on average would receive 2.4% of fund dollars), followed by Niger (1.7%), the Democratic Republic of Congo (1.4%), Guinea-Bissau (1.3%) and Sierra Leone (1.3%). The distribution of funds from the GSPF is much more diffuse than the global distribution of capital, most countries would receive <1% of GSPF funds per year. The differences in the estimated size of the fund according to the different metrics of need are a consequence of the degree of dispersion of these metrics; for some, large values are highly concentrated in a small number of very poor countries, while for others there is a smoother gradient that stretches from very poor to middle-income countries.

The high-inequality middle-income country problem
There is little difference between using GDP or GNI as a measure of ability in most scenarios (Figure 2). An exception is when using under-five mortality rate and the multidimensional poverty index. Both metrics of need assume relatively high values in middle-income nations, which also differ markedly depending on whether GDP or GNI is used because of the greater importance of foreign ownership and debts. The range of total funds required to reach the $50 target for low-income nations varied substantially when using different metrics to describe need for funding, as seen in Figure 2. We found that this wide variation in needed funds resulted from the poor performance of middle-income countries on several human development indicators. That is, because some high-inequality middle-income countries have high burdens of poverty and poor health, using common development metrics as an empirical measure of need would distribute most funds towards middle-income nations rather than low-income nations. Some metrics of need are very high in low-income countries but not very high in middle-income countries; therefore, distributing funds based on these metrics creates a low overall amount of funding needed in the total GSPF pool. Conversely, some metrics of need are high in both low- and middle-income countries. As a result, more overall funding is needed to distribute according to the need levels of each country (as each country gets money according to their need, spreading out the pool more diffusely) to achieve the $50 target. On average, middle-income countries would receive 60% of fund dollars, as
opposed to 23% distributed to low-income countries (see Table 2). However, because this fund operates differently from traditional aid mechanisms, in that participating countries contribute a percentage of their income and withdrawing funds based on need, middle-income countries also contribute significantly to the fund—contributing 34% of GSPF dollars.

This poses a dilemma for the GSPF: while we think of such a fund as correcting between-country inequalities produced in the global trading system, the distribution of funding from a GSPF will be profoundly affected by within-country inequalities among middle-income nations, because of the poor performance of middle-income countries on common human development indicators. Yet theoretically we do not wish to ‘reward’ countries for having high levels of inequality, but rather wish to correct global inequalities that result in poverty traps at an international level—assisting countries that truly lack capital to help their citizens, not countries that have failed to use their available capital for internal assistance. Could this be accomplished while still using empirical and objective measures of need to guide a ‘fair’ disbursement process without arbitrary conditionalities, as GSPF proposals have called for?

In addition, it may not be sufficiently progressive to introduce a global tax that requires low-income countries to contribute the same percentage of their capital as all other countries to the GSPF, as evidence indicates that the marginal benefit of each dollar for low-income countries is greater than the benefits in countries having more capital at their disposal. Can we allow low-income countries to contribute less to the GSPF without choosing arbitrary rates of contribution for these countries as opposed to higher-income nations? We wish to have all countries contribute, to preserve the solidarity mechanism by which they need to contribute so as to readjust how funds are contributed as economies develop (e.g. so that a country that grows economically will contribute more to the fund and withdraw less over time, whereas a country that is doing well now but suffers from a recession in the future will be able to call on these other countries for contributions in the future). Is there a systematic and fair method of adjusting for extreme poverty when assessing the need for such countries to contribute to the GSPF, without being arbitrary? Can we make contributions account for poverty better than just a linear contribution with income, as is the case if all countries contribute a fixed percentage of their capital to a GSPF?

Figure 3  GSPF needs. Capital needed to meet a $50 target per person in low-income countries when using alternative human development indicators as measures of ability and need. Figures illustrate the baseline model scenario without adjustments. Metrics of ability are: GDP per capita (dark blue in online version; black in print version) vs GNI per capita (light blue in online version; grey in print version).

Sensitivity analyses: adjusting the GSPF mechanism for within-country inequality and extreme poverty

Some high-income country aid ministries have suggested that high-income nations will be discouraged from participating in the GSPF if its funds are disproportionately going to countries where domestic poverty could be addressed much better through domestic resource redistribution—i.e. why use international funds to reward countries where need is very high because internal resources are very unequally distributed (Helen de Beir Foundation 2012)? While our baseline model does not account for this issue, we additionally performed a sensitivity analysis of strategies to address the problem of ‘rewarding’
unequal middle-income countries with high levels of need but high levels of domestic capital. Second, we performed another sensitivity analysis to examine how mechanisms could reduce the contribution required from countries with very high poverty levels. That is, we also explore a strategy to address the problem of wanting low-income countries to contribute less of their capital without arbitrarily deciding different contribution rates for different countries.

First, we simulated how, as countries increased their domestic incomes, they will have less need, as illustrated in Figure 2, which displays per capita GNI against poverty rates. The GSPF could only give funding according to the ‘typical need’ for a country with a particular income level, defined by the curve in Figure 2. This ‘typical need’ curve is a non-parametric locally weighted regression—i.e. it is essentially defined by typical country needs at a given level of income. If the GSPF gives only the typical need for a given income level, then countries doing more poorly (in Figure 2, countries above the income vs poverty curve, such as India) will not be ‘rewarded’ by the fund for failing to better use their resources to address domestic poverty. Conversely, funding at the typical need level means that a country using its domestic resources better than average (falling below the income vs poverty curve, such as Cameroon) would be rewarded by the fund. This approach generates an incentive for countries to address within-country inequality, and prevents the fund dollars from being heavily distributed to middle-income nations that have not addressed internal poverty.

Second, we can prevent the fund from drawing upon excessively low-income countries for funding by adjusting the approach by which contributions are acquired from countries. While it is egalitarian to require every country to contribute the same percentage of its income, one approach to generating a progressive ‘taxation’ rate for the fund is to subtract from each country’s gross income whatever quantity of capital would be required to supply each of its citizens with $1.25 per day (i.e. to meet the international poverty line) before applying the contribution percentage to the net result to fund the GSPF. This would imply that a country would first be left with the capital needed to domestically fund its citizens out of extreme poverty, then share the remainder with the GSPF for international solidarity (see ‘Methods’ section for equations).

When we applied these two adjustments to the computer simulation of the GSPF, using GNI per capita as a measure of ability and poverty gap as a measure of need to illustrate the adjustments, we found that the overall funding required to meet the $50 per person target in low-income countries was reduced to $190 billion, or 0.29% of net income minus poverty adjustment for each country. The adjustments did not change which countries were top contributors to the fund, and the top recipients continued to be sub-Saharan African nations. Low income nations received 30% of funding, while middle-income countries continued to receive a large portion of the fund and GSPF distributions shifted towards lower-income countries after the adjustments were made (Table 2B). When we conducted further sensitivity analyses by varying the size of the neighbourhood for the loess function, we found that variations of 10% in the number of countries included in the local regression to decide ‘typical need’ would change the amount of funding by at most 2%.

The impact of changing economies
While these scenarios indicate that GSPF funding would have to be large and account for complex economic inequalities between and within countries, there is a question of how this funding stream would be sustained and change over time. What is anticipated to happen to a GSPF in a dynamic world economy in which some countries’ economies grow and others experience recessions?

We used the World Bank’s economic growth rate estimates to calculate country income 10 years from now (for the year 2022), to illustrate what would happen to the fund’s receipts, disbursements and net redistribution among countries under future projected income scenarios. Several countries would move to a higher income classifications under this projection (where the income classifications themselves are adjusted for inflation [World Bank 2012a]). If we still attempted to achieve the $50 target, adjusted for inflation to $80, the current top contributors to the fund would actually have to contribute 25% less in 10 years than they would in the initial years of the GSPF even though the overall fund pool would grow by 44%. This is because currently high-income countries would have to contribute proportionately less percentage of their incomes to the fund as the calculation approach we adopt would gradually require increasing contributions of middle-income countries as their economies grow and they enter the high-income category.

Remaining questions for constructing a GSPF
There are numerous political and technical questions that remain unaddressed about a potential GSPF, which will require broader discussion before any such fund comes into existence, if it does become reality. Before discussing these myriad issues, we wish to point out the limitations to our current analysis. As with all mathematical models, the model we provide here is subject to uncertainties and assumptions. We chose a highly simplified structure to illustrate basic dynamics of a GSPF, but in reality more complex combinations of metrics may be employed, and the number of participating countries is highly uncertain. If few countries participate, particularly among funders, contribution percentages among the higher-income block will of course need to be higher than what is estimated here. Furthermore, we assumed—consistent with current GSPF proposals—that no conditionalities would be placed on funds redistributed via a GSPF. This would be a radical departure from current aid systems, and would likely raise concerns among countries giving larger funds, particularly, as some countries with high need, as measured by the various development indexes we used in this model, are involved in politicized conflicts and have been accused of corrupt practices or generate concerns about their capacity to absorb and effectively distribute funds. Nevertheless, our goal was to simulate an ideal scenario so that more complex and subtle models may be developed from a common baseline model. Our goal is to generate further conversations about what may be needed to optimize a GSPF framework.

Several other questions must be addressed before such a framework can be developed. First, we used a $50 target per person among low-income country citizens based on a prior working-group study. Yet the question of what monetary value is truly necessary to afford basic social protections against
catastrophic poverty and illness remains to be decided, although work on this issue is being done by the International Labor Organization and other bodies. Even in traditional PPP terms that attempt to equalize the value of money across countries to allow equivalent expenditures, it is likely that such a target will be challenging to agree, and alternative groups will argue for different definitions and degrees of ‘social protection’. Should social protection exclusively include health care and disability coverage, or also education, retirement pensions and wider social goods? This is a topic that will require further political and technical debate, e.g. on how to define boundaries to what GSPF funds can be spent on. The threat is that a social protection ‘floor’ calculation will be taken as a ‘ceiling’, or an absolute target that is ‘good enough’ to fulfil human needs, just as a $1 per day target had become a basic development mantra for years that did not sufficiently account for the difficulties people face in extreme poverty. Here, we have not fully addressed these challenges, and our exercise is intrinsically risky in that it requires the use of numbers that attempt to capture complex concepts, such as poverty traps and economic development.

One major issue for the GSPF will be the question of what metrics of ability to pay and need for funding should be employed. Here, we found that using GDP vs GNI as a measure could produce differing results when accounting for foreign ownership and debts in the GNI, as several middle-income nations have differing metrics of ability between the two measures. Another key finding is that when using nearly any available metric of need, middle-income countries gain a substantial and sometimes a majority of GSPF funds unless they are weighted in some way to be less important than poor countries. Because there is so much need in middle-income nations, any GSPF fund administration

Box 3 Additional considerations for a GSPF. While the scope of this analysis is to specifically address the level and extent of funding needed for a GSPF, and metrics to determine these numbers, there are several other debates involved in GSPF implementation. We outline some key questions here.

**Issues for a GSPF:**

- **Participation**
  - How many countries are likely to participate? (Barrett 2001)
  - Will participating countries agree to a multilateral pooling of funds, as in the Global Fund for AIDS, Tuberculosis and Malaria? (Poore 2004)
  - Will countries often omitted from bilateral funding schemes due to political conflict be included in this multilateral scheme? (Milner and Tingley 2010)

- **Scope of social protection**
  - Will the GSPF be focused on health insurance or broader social security benefits? (Bachelet 2011)
  - Will funding be designed for long-term recurrent needs, or additionally for short-term (e.g. disaster relief) funding strategies? (Dhanani and Islam 2002)

- **Financing mechanisms**
  - Will sufficient funding be available through a financial transactions or currency transactions tax? (Schulmeister 2008)
  - How many countries are likely to support such a tax? (Schulmeister 2011)
  - Will other financing that is less tax-based be likely to sustain funding for a GSPF? (Atun et al. 2012)

- **Financing targets**
  - Should the $50 target calculated previously be used as an international metric? (Mills 2009)
  - Are there rigorous and replicable methods to establish a target? (Andrews et al. 2012)
  - When correcting for currency and purchasing power, will a single target be sufficiently consistent between nations to establish the desired social protection level? (Cichon et al. 2011)

- **Governance**
  - Will an international governing board administer the fund, as with the Global Fund for AIDS, Tuberculosis and Malaria? (Schwartlander et al. 2011)
  - What rules will be decided to administrate disputes? (Gilmore and Fooks 2012)
  - Who will be charged with calculating the ability to pay and need for funding, and validating the metrics for this? (Stuckler et al. 2013)
  - Are enforcement mechanisms to ensure payment into the fund following international agreement (treaty mechanisms) possible, and will they be applied? (Hathaway et al. 2012)

- **Distribution mechanisms**
  - What will be the absorptive capacity of the GSPF? (Lu et al. 2006)
  - Will funds be distributed exclusively to government ministries, or also to non-governmental organizations? (Doyle and Patel 2011)
  - How will funds be logistically transferred, at what frequency, and to what accounts? (Biesma et al. 2012)
  - What monitoring mechanisms will be developed to prevent misuse of funds, and will penalties ensue? (Maxwell et al. 2011)
country inequalities by pooling funds according to a metric of need among low and middle-income countries. First, what metrics of need we choose will critically affect the distribution of funds among low and middle-income nations under the premise that their absolute need is still high. Here, we have simulated one proposal to reduce funding to those middle-income countries who have higher inequality than would be expected for their income, suggesting they have domestic resources to use to fund internal protections before they receive international financing; however, this correction may be flawed because it does not account for numerous complexities that generate inequality in middle-income nations. For example, there are many historical and political reasons why a country may have difficulty reducing internal inequalities, and may still require substantial aid to achieve social protections domestically.

Greater concerns have been expressed about how to finance the large volume of capital that states would need to contribute to sustain a GSPF. This has been more extensively researched, and it is worth noting that the $190 billion target (0.29% of GNI) estimated here is within the range of expected annual capital raised through a financial transactions tax or currency tax (while estimates vary greatly, in part according to the position of those estimating them, a conservative figure is at least $40 billion) (United Nations Department of Economic and Social Affairs 2012). The politics of implementing such a tax, as well as related political and philosophical debates about GSPF funding targets and what social protections should be included in the GSPF have been described extensively in other recent articles (Box 2).

### Table 3 Funds given and received

<table>
<thead>
<tr>
<th>Income level</th>
<th>% of fund given</th>
<th>% of fund received</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-income countries</td>
<td>0.26</td>
<td>23.09</td>
</tr>
<tr>
<td>Lower middle-income countries</td>
<td>10.26</td>
<td>39.74</td>
</tr>
<tr>
<td>Upper middle-income countries</td>
<td>24.01</td>
<td>20.23</td>
</tr>
<tr>
<td>High-income countries</td>
<td>58.80</td>
<td>10.27</td>
</tr>
<tr>
<td>(B)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-income countries</td>
<td>0.11</td>
<td>29.87</td>
</tr>
<tr>
<td>Lower middle-income countries</td>
<td>9.20</td>
<td>50.50</td>
</tr>
<tr>
<td>Upper middle-income countries</td>
<td>26.29</td>
<td>19.32</td>
</tr>
<tr>
<td>High-income countries</td>
<td>64.40</td>
<td>0.32</td>
</tr>
</tbody>
</table>

(A) Under the baseline model in which unadjusted human development indicators are used to assess need for funds (displaying averages among the alternative metrics in Table 1); and (B) under the adjusted model in which funds are collected after adjustment for poverty relief needs domestically (defined as $1.25/person/day) and distributed according to typical need for country income according to the graph in Figure 2. Countries were classified into income groups by standard World Bank criteria.

would need to decide whether to gain ‘efficiency’ by actively overriding objective measures of need by directing more funds to poor income countries, or gain greater transfer to middle-income nations under the premise that their absolute need is still high. Here, we have simulated one proposal to reduce funding to those middle-income countries who have higher inequality than would be expected for their income, suggesting they have domestic resources to use to fund internal protections before they receive international financing; however, this correction may be flawed because it does not account for numerous complexities that generate inequality in middle-income nations. For example, there are many historical and political reasons why a country may have difficulty reducing internal inequalities, and may still require substantial aid to achieve social protections domestically.

Greater concerns have been expressed about how to finance the large volume of capital that states would need to contribute to sustain a GSPF. This has been more extensively researched, and it is worth noting that the $190 billion target (0.29% of GNI) estimated here is within the range of expected annual capital raised through a financial transactions tax or currency tax (while estimates vary greatly, in part according to the position of those estimating them, a conservative figure is at least $40 billion) (United Nations Department of Economic and Social Affairs 2012). The politics of implementing such a tax, as well as related political and philosophical debates about GSPF funding targets and what social protections should be included in the GSPF have been described extensively in other recent articles (Box 2).

### Conclusion

We identified some key issues that any GSPF proposal should consider. First, what metrics of need we choose will critically affect the distribution of funds among low and middle-income countries. The GSPF proposal is intended to address within-country inequalities by pooling funds according to a metric of ability (typically GDP or GNI) and distribute funds according to a metric of need (such as poverty rates). As shown in Figure 2, metrics of need empirically decline geometrically as metrics of ability increase. However, there are often large within-country inequalities that affect metrics of need such that high need can be apparent in middle-income nations that have some domestic capital to address this need. We found that there are strategies available to direct funds towards the poorest set of countries, and to incentivize within-country equality among middle-income countries as they grow rather than ‘rewarding’ high-inequality states who have the internal capital to address their poverty more effectively. These are many factors related to governance, policy precedence, area of country, isolation of regions, different land productivity and political economy that play into determining the degree of internal inequality within a country relative to its absolute income. Hence, further discussion must take place about how more comprehensive considerations of how funds should be distributed from a global fund to middle-income nations with high inequality. This issue of within-country inequality has not been a focus of current debate but, as revealed by the modelling exercise, is critically important to the successful implementation of the GSPF proposal. Second, achieving a current target of funding for low-income nations would require a contribution to the GSPF that is higher than existing typical overseas development assistance contributions and current revenue-generating proposals. Finally, over time, the size of contribution from current high-income nations would likely proportionately decrease even if a high target is set to redistribute capital to low-income countries, as a result of economic growth among middle-income nations.

These insights reveal that a GSPF may present a new mechanism for international aid distribution that does not follow the conventional rules or expectations for global aid. It therefore serves us well to facilitate open debate about what the best mechanisms for operating such a fund would be, in light of the great need for social insurance systems around the world and the lack of current measures to address this need.

### Authors’ contributions

S.B. constructed the model and conducted the analysis. All authors contributed to revision of the model and writing of the paper.

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References


