Cash On Delivery Aid for Health: What Indicators Would Work Best?

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Abstract

The idea of applying a Cash on Delivery Aid (COD Aid) approach to the health sector has been raised many times, particularly in relation to addressing malaria, HIV/AIDS, maternal health, and water. After assessing the challenges of applying COD Aid in the health sector, this paper considers 10 indicators related to reducing child mortality, maternal mortality, and infections of malaria and HIV/AIDS. It provides guidance to those interested in designing COD Aid approaches to improve health outcomes in developing countries.

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The Center for Global Development (CGD) has been working on a new approach to foreign aid called Cash on Delivery Aid (COD Aid) in which donors commit to make payments in direct proportion to measured progress towards a shared objective. The COD Aid approach builds on a trend in foreign aid modalities to pay for results and give greater autonomy to recipient countries in determining how to spend aid funds (summarized by the term "country ownership"). The approach has been described in detail in Birdsall and Savedoff, *Cash on Delivery: A New Approach to Foreign Aid* (2010), which includes a specific proposal to help countries achieve universal primary schooling and a chapter exploring applications of the concept to other sectors. Additional materials are available on the CGD website (www.cgdev.org).

The idea of COD Aid emerged from an analysis of the basic relationships between those who fund and receive international assistance (Barder and Birdsall 2006) and is applicable to almost any sector if the challenges of identifying, defining, measuring, and verifying an appropriate indicator can be met. The idea of applying a COD Aid approach to the health sector has been raised in a number of different contexts, with particular interest expressed in addressing malaria, HIV/AIDS, maternal health, and water. Birdsall and Savedoff (2010) describe how the Global Alliance for Vaccines and Immunizations (GAVI) shared similar features with COD Aid in the case of immunization. Hallett and Over (2010) describe a strategy through which donors could provide incentives to developing countries to achieve measureable reductions in the rate of new HIV infections. Kaplan (2010) has explored the issues in utilizing a COD Aid approach to increase access to drinking water in developing countries.

This paper assesses the challenges of applying COD Aid in the health sector by providing information on a number of indicators that could be used for a COD Aid agreement. It is meant to serve as a starting point for anyone considering the use of a COD Aid approach to improve health outcomes in developing countries.

What is Cash on Delivery Aid (COD Aid)?

COD Aid generally involves a contract between a donor and a recipient country government linking disbursements to progress toward an agreed-upon goal, such as completion of primary school or access to potable water. Key elements of COD Aid are as follows:[1]

[1] Birdsall and Savedoff 2010, pp. 18ff.

- Payment for outcomes, not inputs. The outcomes have to be related to an objective shared by funder and recipient. Outcomes should be measurable and continuous so that incremental progress can be rewarded over time.

- Hands-off funders, responsible recipients. Funders do not specify or monitor inputs, but rather verify progress and pay for outcomes in accordance with the COD Aid contract.

- Transparency through public dissemination. Both the contract and progress measures should be as simple as possible and publicly disseminated. This increases credibility and accountability, and encourages broader social engagement in aspects of progress that are not part of the contract.

- Independent verification. Both the funder and the recipient need to have confidence in the integrity of the measurement of progress.

- Complementary with other existing aid programs. COD Aid is intended to complement and not disrupt ongoing programs, whether funded by local or external sources. A COD Aid program aims to facilitate the more effective use of available resources.

The benefits of such agreements, in terms of increasing country ownership, coordinating donor activities, reducing transaction costs, encouraging innovation, and promoting local learning, are contrasted with other aid modalities and discussed in Birdsall and Savedoff (2010).

Because the COD Aid approach pays for outcomes, it shares similarities with a range of initiatives that are already being used extensively in the health sector, including performance-based incentives (Eichler and Levine 2009); results-based financing (Musgrove 2010); performance-based financing (Soeters and others 2006); and output based aid (GPOBA 2010). However, COD Aid differs in at least two major ways: it is focused on the relationship between donors and recipient countries and it is explicitly "hands-off."

First, COD Aid is aimed at altering the relationship between donors and recipient countries. This contrasts with most other results-oriented approaches which envision financial incentives as an instrument to influence the behavior of health personnel, facilities and districts so as to improve the quantity and quality of care or to influence families and individuals so that they engage in healthier behaviors (Musgrove 2010 and Savedoff 2011). By contrast, COD Aid is primarily envisioned as a proposal for a donor to provide payments directly to a national (or provincial) government. The recipient then has the discretion to choose its own strategy for accelerating progress. It can choose to disburse funds as incentives to districts, facilities, families or patients. It could, alternatively, choose to address national political constraints, reform institutions or engage with the private sector. By focusing on a high-level outcome and transferring funds directly to the recipient

government, COD Aid can address problems at a level that most other results-based approaches cannot reach: the political context within which health care personnel, communities and citizens function.

The second way in which COD Aid differs from most other results-oriented approaches is that it is explicitly "hands-off," with conditions in the contract restricted to independently verifying the outcome measure and publicly disseminating results. This differs from most other results-oriented approaches in the health field, which usually require funders and recipients to maintain close engagement in the design and operation of the program. This can lower transaction costs, allowing recipients to spend less time and effort explaining, negotiating and reporting to donors and more time and effort focused on implementing the strategies they have chosen. With COD Aid, funders can engage closely with the recipient country but only if explicitly requested by the recipient. Furthermore, recipients have full discretion over the use of funds, which can be applied inside or outside the health sector as they choose.

Applying COD Aid to Health

A basic prerequisite for using a COD Aid approach is that funders and recipients have some shared goal to which they are willing to commit. In the health sector, funders and recipients have adopted a large number of goals, sometimes stated as legal commitments and obligations, other times as targets of specific programs. One of the most widely cited international agreements on development are the Millennium Development Goals (MDGs) – a list of eight international development goals endorsed by 192 countries and 23 international organizations. Three of these MDGs are health objectives – reducing child mortality (Goal 4), improving maternal health (Goal 5) and combating HIV/AIDS, malaria and other diseases (Goal 6) (see Appendix 1). Any one of these goals could serve as the basis for developing a COD Aid agreement. Due to their prominence in international policy debates and public commitments, this paper will focus on these goals as the most likely focus of a COD Aid initiative in health.

A second key issue in applying COD Aid to health is finding an appropriate measure of progress toward the shared goal. The choice and definition of this indicator is critical because financial incentives can be extremely powerful. To improve the chances of success, the outcome measure should be closely related to the goal and minimize the risk of inducing distortions and unintended consequences. In health, broader outcome measures such as reductions in mortality are less likely to create distortions than measures related to specific interventions, diseases or health risks. So, for example, while increasing the use of insecticide-treated bednets in areas where malaria is common may be an effective intervention in many cases, creating a large financial incentive for increased coverage and use of bednets might lead recipients to shift resources towards this method of combating malaria even when alternatives might be preferable or innovations would be beneficial. Similarly, paying for reductions in the prevalence of an infectious disease like malaria might lead to

overtreatment and encourage the emergence of drug-resistant pathogens. A further advantage of broad outcome measures is that they may promote the development of public health policies and stronger health institutions necessary for coordinating and implementing a range of activities rather than fragmenting or privileging a particular component of a country's health system.

A third issue that commands special attention in the health sector is whether outcomes can be measured with sufficient precision. For example, reductions in the maternal mortality ratio would seem to be the ideal indicator for reducing maternal mortality, but measuring this indicator can be rather difficult in practice for several reasons. Maternal mortality is sufficiently rare (even in developing countries) that it requires very large samples or comprehensive vital registration systems to be captured reliably and with adequate precision. Consequently, the indicator might not be measurable with sufficient provision to serve as the basis of a COD Aid agreement at present. Similarly, it is probably better to pay for reductions in new infections for HIV/AIDS rather than a reduction in prevalence, because the latter measure is affected by both new infections and the success of life-preserving treatments (Over 2010a). Nevertheless, prevalence can be measured more precisely than incidence in most contexts.

Fourth, the chosen indicator has to be relatively simple to explain. Birdsall and Savedoff (2010) note that the success of a COD Aid arrangement requires transparency if it is to encourage better accountability. This means that when an agreement is signed, policymakers understand what they are trying to achieve, funders understand what they are paying for, and constituents in both funder and recipient countries understand what is a success and what is a failure. For example, it is easier to explain that a funder has paid US$1,000 for "a child who has survived to the age of five" than to explain that US$1,000 was paid for "a change in child mortality rates relative to a trend that was projected on the basis of a sophisticated epidemiological model."

Thus, the choice of indicator is crucial and requires work to assure that it represents a shared goal and is strongly associated with outcomes associated with that goal, is measurable with sufficient precision, and is easily explained and disseminated to the public. Our experience with convening experts and policymakers to develop an agreement for the education sector, along with our initial research into the health sector, make us optimistic that a process of research, consultation, debate and analytical work can lead to a viable proposal for applying COD Aid to one or more of the health MDGs.

To guide this process, the following questions need to be addressed:

Would a COD Aid approach work better with a broad or narrow goal?

Broad indicators – such as reducing maternal or child mortality – are preferable in a number of ways. They are more likely to be associated with important shared goals. They also encompass a wider range of potential interventions and health risks and are thus less likely to

encourage distortions in allocations across diseases or strategies. However, narrow indicators – such as increased Skilled Birth Attendance or reduced incidence of malaria – also have advantages. They may be easier to measure with precision and they may be more responsive to efforts undertaken by the aid recipient.

Are the costs of measurement and verification manageable?

Most developing countries that would participate in a COD Aid agreement do not have comprehensive vital registration systems and even census data, used for developing sampling frames, can be problematic. Yet a COD Aid agreement relies heavily on the quality and timeliness of reports on the outcome. Therefore, most of the attention in developing a COD Aid agreement is focused on establishing a credible, reliable and precise measurement system. One approach would be to rely on reports from a Health Management Information System which are then verified by an independently administered population survey. Another approach would be to rely exclusively on an independent survey. It is also possible to include incentives for better vital registration – such as a nominal payment for each pregnant woman who is identified and recorded in a registry – which would then strengthen subsequent measurements of maternal or child survival.[2]

How should a COD Aid agreement relate to existing streams of international financial assistance?

In the last decade, the amount of international health assistance provided to low-income countries has increased substantially and much of it is directed toward recurrent costs – staff salaries, drugs and supplies. This raises two questions which have proved tractable in other sectors. First, how large do COD Aid payments have to be if they are going to command the attention of policymakers who are already dealing with large aid flows in the sector? For example, a contract that promises a country a few extra million dollars for reducing maternal mortality may not have much impact when policymakers are concerned with assuring disbursement of programs worth hundreds of millions of dollars from GAVI, GFATM or PEPFAR.[3] Secondly, is there a risk that commitments to a COD Aid agreement might displace commitments to upfront costs such as investments and recurrent expenditures? In most other sectors, foreign aid is a relatively small share of total expenditure and such a shift would not compromise service delivery. However, in a significant number of low-income countries, foreign aid to the health sector provides a significant share of recurrent costs. In such a context, the implications of introducing a COD Aid approach for sustaining these activities needs to be carefully considered.

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[2] The payment would have to be nominal to avoid the unintended consequence of encouraging increases in fertility.

[3] GAVI is the Global Alliance for Vaccines and Immunisations; GFATM is the Global Fund to Fight Aids TB and Malaria; and PEPFAR is the US President's Emergency Plan for AIDS Relief. As one example, Ethiopia received $351 million from GAVI, GFATM and PEPFAR in 2006 compared to taxpayer-funded health spending that same year of $130 million (Savedoff and Grépin, forthcoming).

How much should a COD Aid agreement pay?

Birdsall and Savedoff (2010) argued that COD Aid payments do not need to be related to the costs of service provision but rather should be scaled in relation to the amounts needed to attract the attention of policymakers. As noted above, the large amount of foreign assistance for health creates a higher threshold for COD Aid to establish an incentive that is salient to the recipient's decision processes. In the education sector, Birdsall and Savedoff (2010) proposed paying US$200 for each additional child who takes a competency test in the final year of primary school. This generated initial aid flows of US$2 million per year, rising to US$30 million per year as progress accelerates, for a country with more than half a million children in each age cohort. Similar simulations are required for assessing different amounts of payment for reducing maternal and child mortality and averting infections.

What is the appropriate structure of payment, a single indicator or multiple ones?

The simplest COD Aid agreements are those for which a single good indicator can be identified. Such indicators are usually easier to find for outcomes that represent measurable investments that are concluded at a particular time or outcomes that, once achieved, require no further maintenance. Most health outcomes, however, do not fall into these categories. The most intuitive indicator for combating infectious diseases is the number of infections averted. However, for most diseases, slowing the rate of new infections this year does not necessarily keep new infection rates low in subsequent years without continuing efforts. Some of the health indicators proposed for discussion in this paper are single indicators, such as the standard Parasite Rate for measuring malaria. Others are multiple indicators, such as creating a schedule that includes small payments for registering births and with sequentially larger annual payments for children surviving to age five. The latter payment schedule is more complex but may be justified because it rewards birth registration, a worthwhile goal in itself, and then creates an appropriate sequence of incentives through a child's riskiest years.

Should an agreement be based on additional or total achievements?

Most funders see financial assistance as a way to help recipient countries go above and beyond their current efforts to improve development. For a long time, most funders would not even consider financing recurrent costs of public services. This issue comes to the fore with COD Aid payments because they are intended to be incentives for recipients to do something *additional* to already-existing programs in achieving the goal. All of this suggests that COD Aid payments should be aimed at additional achievements. For example, rather than paying for every child who survives to age five, a COD Aid agreement would be rewarding additional effort if it only paid for every child who survives to age five *above and beyond* the number who currently survive to age five. Similarly, a COD Aid agreement to combat the spread of infectious diseases might pay for reductions in incidence relative to that which would have been expected in the absence of additional effort.

The advantages of paying only for additional achievements are twofold: they concentrate the incentive on the additional efforts required by the recipient and they satisfy the funders' desire to create an improvement over current conditions. Paying for additional achievements, however, can be difficult in cases where an accurate baseline or counterfactual cannot be easily estimated or explained. For example, paying for "additional children who survive to age five" makes the most sense in a context where each cohort has the same number of newborn infants and faces similar levels of risk. Under these conditions, additional efforts by the recipient to increase the number of infants who survive to age five can be measured by subtracting the number of children who survived to age five last year from the number who survived this year. However, when the number of children in each cohort and the kinds of risks they face vary significantly over time this baseline might lead the indicator to over or underestimate the additional survivors. In such cases, the COD Aid agreement can establish a baseline estimated from underlying trends or it may simply choose to pay for total achievement.

In many cases, baselines can be estimated using existing data and models. For the example of child survival, it would be relatively easy to take current survival rates and adjust them for changes in the size of the cohort. A detailed discussion of estimating counterfactuals can be found in Hallett and Over (2010) who show how a COD Aid agreement could pay for "averted infections" measured as the difference between actual HIV infection rates and those predicted using mathematical models. A comparable effort could establish a counterfactual prediction for maternal or child mortality against which the number of registered deaths would be compared, with COD Aid paying for the difference.

When estimated baselines appear to complex, a COD Aid agreement could be structured to pay for total achievements, e.g. all children who survive to age five or all mothers who survive childbirth. The choice between paying for additional achievements (e.g. additional children who survive to age five) and paying for total achievements (e.g. all children who survive to age five) involves tradeoffs Paying only for additional achievements creates a stronger incentive for additional efforts and is preferable for funders who do not want to finance current and ongoing efforts. However, in those cases where paying for additional achievements requires elaborating complicated baseline estimates, it may be preferable to pay for total achievements. Paying for total achievements in these cases can be simpler to measure and explain but harder to promote. We generally find, however, that credible baselines can be established against which to measure additional effort.

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The remainder of this document describes a series of indicators that have been proposed as candidates for COD Aid in health and which are associated with the MDGs for reducing child mortality; improving maternal health; and combating HIV/AIDS, malaria and other diseases (See Table 1). The first three indicators are directly associated with reducing child mortality: the *under-five mortality rate*, *stunting* (height-for-age), and *low birth weight*. A discussion of immunization coverage, which would necessarily involve the Global Alliance for Vaccines

and Immunization (GAVI), can be found in Birdsall and Savedoff (2010). Low birth weight is also associated with improving maternal health, but we consider reducing maternal mortality as well as other proxies for maternal health such as the *intrapartum death rate* and *skilled birth attendance*. For combating disease, we present measures for *sustaining HIV/AIDS treatment*, *averting HIV/AIDS infections*, *sustaining reductions in the incidence of malaria* and *reducing the incidence of malaria*. The final indicator, *improved birth registration*, is not directly associated with MDGs but is linked to improving information necessary for long-term improvements in health policy. In each case, the indicator's definition is provided along with information about its reliability as a proxy for a health outcome, its responsiveness to policy, its vulnerability to unintended consequences, and its amenability to precise measurement. Options for structuring payments on each indicator are also presented.

Table 1: Health Indicators Discussed in this Paper

Indicators for Reducing Child Mortality
Under-Five Mortality
Child Stunting (Height-for-Age)
Low Birth Weight
Indicators for Reducing Maternal Mortality
Maternal Mortality
Intrapartum Death Rate
Skilled Birth Attendance
Indicators for Combating HIV/AIDS and Malaria
HIV/AIDS: Sustaining Treatment
HIV/AIDS: Averted Infections
Malaria: Reducing or Sustaining Reductions in the Prevalence of Malaria
Indicator for Improving Health Information for Public Health Policy
Number of Accurately Registered Births

Indicators for Reducing Child Mortality

Under-Five Mortality

Definition. The child mortality rate is defined as the probability that a child born in a specific year or period will die before the age of five, expressed as a rate per 1,000 live births. In 2007, the global under-five mortality rate was 67 deaths per 1,000 births (roughly 9 million children died). Sub-Saharan Africa has the world's highest child mortality rates (143 deaths per 1,000 births) (UN Millennium Development Goals Report, 2009).

Is the indicator a good proxy for a health outcome? Child survival is a direct health outcome. The under-five mortality rate is not only considered a leading indicator of a country's level of child health but it is also used outside the health field as a measure of overall development (Becker and others 2006). Of the roughly 9 million under-five deaths that occur each year, nearly 70 percent of these are directly attributable to six causes: respiratory infections, diarrhea, malaria, neonatal infection, preterm delivery, and lack of oxygen at birth (WHO 2005).

Is the indicator responsive to policy? The majority of child deaths are due to causes that are either preventable or treatable (Becker and others 2006). Immunization campaigns, micronutrient supplement programs, and improved access to clean water are proven cost-effective interventions that have significantly reduced child mortality. A COD Aid agreement paying against reductions in the country's child mortality rate would provide the recipient with an incentive to choose a mix of interventions that are likely to reduce mortality in this age group. Another advantage of this indicator is that it is a widely recognized gauge of a country's overall health and development. This provides intuitive appeal and makes the indicator more useful for marshaling political support (Becker and others 2006).

Is this indicator quantifiable with sufficient precision? Because child mortality is a broad, widely-acceptable indicator of a population's health and development, its measurability is considerably better than many others. For example, the Knowledge, Practice and Coverage (KPC) Surveys have long been the standard tool used by donors and researchers for their population-level baseline studies (USAID 2005). The Demographic and Health Surveys (DHS) conducted by MACRO are another standards source of information on child mortality rates.

Administrative reporting and surveys can be combined to produce reliable and precise estimates. Reports from health facilities, hospitals and vital registration campaigns do not reach everyone and this undermines their reliability and precision. Survey methods can provide less biased estimates but their confidence intervals may be wide unless sample sizes are sufficiently large and good sampling frames can be developed.

A COD aid agreement could pay for the absolute number of children who survive or for increasing the share of survivors registered at birth relative to an earlier cohort. The absolute

number of children who survive is easier to explain than the shares of survivors. The former would be explained as "US$250 paid for each registered newborn who survives to age five in a given year" while the latter would have to be explained as, perhaps, "US$2.5 million paid for each 1 percent increase in the share of registered newborns who reach age five in a given year compared to the share of survivors in the cohort born one year before them". Difficulties associated with showing progress under both payment methods would differ depending on the country's demographic patterns. In high fertility countries, the rapid increase in birthrates would probably make achieving progress on the absolute measure easier than on the increase in shares.

The reward structure could incorporate both intermediate and final outcomes, for example, by paying for each birth that is officially registered and then paying for each year of subsequent child survival.

Unintended consequences. Paying for the absolute number of survivors could potentially encourage higher fertility, while paying for survival as a fraction of registered births may provide disincentives for birth registration (recipients may be less likely to register unhealthy newborns if it is believed that they are unlikely to survive). Paying for birth registration could redress the latter imbalance. Regarding the former, the risk of encouraging fertility may be small if payments are made to the government and not directly to households and individuals. This risk might also be diminished if the payments per child are set high enough to provide an incentive in the aggregate to the government but low enough that they have negligible effects on personal fertility decisions.

Options for payment. In developing a COD Aid agreement for reducing child mortality, a working group would have to consider the advantages and disadvantages of different terms of payment. For example:

a. The agreement could pay for registered births and provide additional payments for each registered child who survives up to the age of five. The payment could be annual or only at specified intervals (e.g. at ages one, three and five).

b. The agreement could restrict its payments for child survival among families from the poorest 40 percent of the population or in rural areas. While this would target groups in which children face the greatest health risks, it would also introduce complications in measurement and verification.

c. The agreement could focus on raising the number of children surviving to age five, that is, only paying for the number of children who survive over and above a baseline or projected trend. This approach creates a clearer incentive for progress and incremental efforts. However, it requires establishing and updating a baseline. It also becomes somewhat more difficult to explain, i.e. which of the children that survived were the "additional" ones?

For Discussion: A COD Aid Proposal for Improving Child Survival

Payments

- First 5 years, funders pay US$5 for each registered birth (in order to establish baseline and improve vital registration – fee large enough to create incentive and provide an initial flow of unrestricted funds without creating risk of increased fertility).
- Years 3 to 5, funders pay US$25 for each registered child who receives a health checkup at ages 3 and 5.
- After 5 years, funders pay US$250 for each registered child who survives to age 3 and 5 above the numbers who survived 5 years earlier. In subsequent years, the baseline is updated annually (i.e. always measured against a five-year lag). (Note: the agreement then has a self-limiting feature with funding declining to zero five years after both registration and survival stop increasing).

Eligibility

Any low-income country that can meet the reporting standards would be eligible to sign an agreement up to a cap established by available funds. The reporting eligibility requirements would include:

- A national vital registration system for reporting births and tracking children through their 5th birthday.
- A national registration system for reporting birthdates and the total number of children of a certain age at a given time.

Conditions

Countries that sign the agreement would agree:

- To allow independent verification of the vital registration process
- To allow independent verification of the number of births and survival data (by permitting audits and independent surveys)
- To publicly disseminate information regarding the agreement (number of registered births and number of children who survive to age 3 and 5, payments received, child mortality estimates, etc.).
- To assist researchers in evaluating the COD Aid agreement.

Child Stunting (Height-for-Age)

Definition. Stunting occurs when a child fails to grow at a normal rate, usually due to malnutrition or illness. Children are considered to be stunted if their measured height is more than two standard deviations below the median height for children their same age as reported in the height-for-age charts of the National Center for Health Statistics

(NCHS)/WHO for a reference population. ("Severe stunting" is defined as more than three standard deviations below the NCHS /WHO reference median) (Becker and others 2006).

Is the indicator a good proxy for health outcomes? Child stunting is associated with higher morbidity and mortality, greater risk of illness, reduced educational achievement, and lower productivity in adulthood. Growth patterns in childhood are strong indicators of future health, human capital, and social development (Monteiro and others 2010).

Because stunting is characteristically a sign of poor nutrition, it is often used as a proxy for food security and nutrition-related programs rather than health status (Becker and others 2006). However, the relationship between stunting and (1) maternal health services, (2) neonatal health services, and (3) childhood illness make height-for-age a useful proxy for a population's overall health, and an indicator of a government's overall investment in health (Sethuraman and others 2003). The 2005 CGD Global Health Indicators Working Group concluded that stunting may be an appropriate proxy for health, nutrition, women's education, discrimination against women, and family planning (Becker and others 2006).

Is the indicator responsive to policy? Poor nutrition is the main contributing factor to child stunting. Child stunting is also influenced by related factors such as: household food insecurity, low parental educational attainment, and lack of access to health care and poor living conditions. Interventions that specifically address aspects of maternal and child health (including immunization), nutrition, birth spacing, and education (including literacy programs) have been shown to reduce stunting prevalence among children under five in developing countries (Milman and others 2005, Gribble, Murray and Menotti, 2009).[4]

The Nutrition Framework of the United Nations Children's Fund provides more information on the underlying (family purchasing power, maternal education); intermediate (access to health care, water and sanitation, food security, and appropriate health care); and proximate (diarrheal diseases) determinants of undernutrition (UNICEF 1990). One study of child stunting in Brazil from 1996 to 2007 showed that two-thirds of the observed decline could be attributed to four factors, all of which are responsive to policy. These factors were maternal educational attainment, family purchasing power, maternal and child health care services, and coverage of water supply and sanitation services (Monteiro and others 2010).

Is the indicator quantifiable with sufficient precision? Previous studies have used Demographic and Health Surveys to measure rates of stunting at the country level. Nationwide probability household samples can be obtained using census-based, multistage, stratified, and cluster sampling procedures (Monteiro and others 2010). Measurements of recumbent length of children aged up to 23 months and the standing height of older

[4] The fact that family planning and longer birth spacing help poor households sustain the nutrition of their children suggests that a COD agreement for reduced stunting could offset any unintended incentive for higher fertility generated by a COD agreement for birth registration and child survival. The two programs could be explicitly combined by increasing the payments for child survival with the stature of the child.

children can be obtained in these surveys through the use of trained personnel, while birth dates can be obtained from birth certificates and other official documents where they exist. The standard for what constitutes stunting could be determined through the use of Child Growth Standards of the World Health Organization (WHO) to calculate length-for-age and height-for-age Z scores. A child would be classified as stunted if his or her height-for-age Z score was below -2 (the prevalence of stunting and its 95 percent confidence interval will also be calculated) (Monteiro and others 2010). Factors to address would include the need for improved vital registration, data collection, and trained personnel to identify and validate height-for-age statistics.

Unintended Consequences. The most likely unintended consequences for this measure are likely to involve either manipulation of the measurements or interpretation of measurements. For example, if children are intentionally reported to be younger than they are, then stunting will be underestimated.[5] In an extreme case, paying for increases in height-for-age could encourage obesity. While recognizing that obesity is an increasing problem in many developing countries, it is our judgment that a payment to the government for reducing the number of children with stunting is unlikely to generate policy changes that would promote obesity. Nevertheless, this is the kind of potential consequence that should be monitored and addressed if it proves to be a problem.

Options for payment. In developing a COD Aid agreement for reducing stunting in child populations a working group would have to consider the advantages and disadvantages of different terms of payment. For example:

a. The agreement could pay a fixed amount for each child between the ages of 0 and 5 who is not stunted, i.e. whose height-for-age Z score is above -2.

b. The agreement could restrict its payments to children from the poorest 40 percent of the population or in rural areas on the presumption that targeting this disadvantaged population is of greater priority and that paying higher income families to assure their children's appropriate growth is unnecessary. However, this approach does introduce additional difficulties in establishing a family's socioeconomic status or geographic residency.

c. The agreement could pay for children who are not stunted or only for the number above a baseline. Paying only for increments above a baseline creates a clearer incentive for progressing beyond current conditions. However, establishing a baseline might be problematic and the agreement might be easier to verify and explain if it were a simple payment for all children who are not stunted.

[5] This unintended consequence could be avoided by combining a COD agreement for stunting with a COD agreement for birth registration and child survival as suggested in footnote 4.

d. The agreement could pay for the absolute number of children whose height-for-age Z score is above -2 or for the share of children with acceptable height-for-age over the total number of children in the same age group in a given period of time. The latter, however, introduces additional sources of error or manipulation (i.e. the recipient could skew the studies by targeting regions with lower shares of stunting).

e. Payments could be based on simple binary criterion (i.e. whether or not the child meets the height-for-age standard) or disburse against total increases in height-for-age (e.g. an additional payment for every additional unit increase, to be capped at an agreed-upon level).

f. Payments could also be made relative to a counterfactual. The funders and recipients would agree on the model that would be used to predict how many children would be stunted without additional efforts. Progress would be measured as the difference between the actual and projected numbers of children who are stunted, with the COD Aid agreement paying a fixed amount for each stunted condition averted.

For Discussion: A COD Aid Proposal for Reducing Stunting

Payments

- First 5 years, funders pay US$5 for each registered birth in order to establish baseline and improve vital registration. The fee should be large enough to create a significant incentive and provide an initial flow of unrestricted funds without creating risk of providing an incentive for increased fertility.
- First 5 years, funders pay US$25 for each child (age 1 to 5) whose height for age has a Z score of above -2.
- After 5 years, funders pay US$250 for each child (age 1 to 5) whose height for age has a Z score above -2 above the number of children whose height for age had a Z score of above -2 5 years earlier. In subsequent years, the baseline is updated annually (i.e. always measured against a 5-year lag). (Note: the agreement then has a self-limiting feature with funding declining to zero 5 years after registration stops increasing and after stunting approaches zero.)

Eligibility

Any low-income country that can meet the reporting standards would be eligible to sign an agreement up to a limit established by available funds. These reporting standards would include:

- The country has an internationally acceptable standard for reporting births and vital registration
- The country has an internationally acceptable standard for reporting height-for-age (e.g. Demographic and Health Surveys)

Conditions

Countries that sign the agreement would agree to the following:

- To allow independent verification of indicator (by permitting audits and independent surveys).
- To publicly disseminate information regarding the agreement (number /share of children above a certain height-for-age, payments received, child mortality estimates, etc.)
- To assist researchers in evaluating the COD Aid agreement.

Low Birth Weight

Definition. *Low birth weight* is defined by the WHO as weight of less than 2500 grams (irrespective of gestational age). For live births, the WHO definition states that "birth weight should ideally be measured within the first hour of life before significant postnatal weight loss occurs." Over 95 percent of the 20 million low birth weight infants born annually are in less developed countries (WHO 2005).

Is the indicator a good proxy for health? Low birth weight is closely associated with a variety of health outcomes. Children born with low birth weight have significantly higher risks of neonatal and infant death and are also more vulnerable to a range of diseases (McCormick 1985). In addition, low birth weight is strongly linked to poorer chances of survival, chronic conditions during adulthood, and lower long-term individual economic productivity (Barber and Gertler 2008). The relationship between low birth weight and health outcomes has led the United Nations to call for reducing the proportion of infants with low birth weight by one-third as one of the seven major goals of its current campaign for "A World Fit for Children."

Is the indicator responsive to policy? Although firm evidence is not available, experts believe that promising strategies for increasing birth weight include utilization of prenatal care services among expectant mothers, improving the quality of prenatal care services, and addressing maternal nutritional deficiencies (Institute of Medicine 1985; Alexander and Korenbrot 1995; Merialdi and others 2003; Bhutta and others 2005; Barber and Gertler 2008). Barber and Gertler (2008) evaluated a Mexican program that provided cash transfers to pregnant women who obtained healthcare and nutritional supplements and attended health education sessions. They found the conditional cash incentives were effective in increasing the birth weight of children of beneficiaries relative to non-beneficiaries and attributed most of the improvement in birth outcomes to better quality of prenatal care.

Is the measure quantifiable with sufficient precision? Birth weight data is frequently unavailable because it is not always recorded and, when recorded, it is often inaccurate. In 2005, WHO estimated that only one third of babies worldwide are weighed at birth (WHO

Bulletin 2005). Improving the coverage and quality of birth weight data would therefore require improvements in vital registration, greater coverage of professional birth attendance, and training for those professionals in administering and recording weight at birth. Since birth weight is supposed to be recorded within the first hour after birth, it would be extremely difficult to retroactively verify whether birth weight is being accurately recorded. This difficulty would need to be addressed by any COD Aid contract since verification is so critical to the agreement.

Administrative data from health facilities, hospitals and vital registration campaigns could be used to measure this indicator but suffer from biases due to incomplete coverage and weaknesses in reporting systems. Survey-based methods are likely to be less biased but have their own deficiencies. According to Blanc and Wardlaw (2005), current survey-based estimates of the prevalence of low birth weight are biased significantly downwards. They discuss two adjustments to address bias in reported data: a weighting method that merges reported birth weight with mothers' estimation of the child's size at birth, and categorization of one-quarter of the infants reported to weigh exactly 2500 grams at birth as having low birth weight. The Demographic and Health Survey (DHS) core questionnaire has included a question on birth weight since 1990. Other surveys have questions on birth weight, birth size and prematurity such as the UNICEF-sponsored Multiple Indicator Cluster Surveys (MICS), Pan Arab Project for Child Development, and the Reproductive Health Surveys supported by the US Centers for Disease Control (Blanc and Wardlaw 2005).

Potential unintended consequences. While payments for birth weight are aimed at reducing low birth weight, they could unintentionally encourage excessive weight gain, which can lead to birthing complications for the mother and obesity for the child. A program that provides incentives for increased birth weight would be inappropriate outside of contexts where malnutrition and low birth weight are a significant cause of infant and child morbidity (for example, Sub-Saharan Africa) and where the risks posed by obesity and other chronic diseases are low. Alternatively, the indicator could include a penalty or limit to assure that payments do not reward excess weight.

Options for payment. In developing a COD Aid agreement for reducing low birth weight, a working group would have to consider the advantages and disadvantages of different terms of payment, such as:

a. The agreement could pay for all infants who weigh more than 2500 grams at birth and who are born to women who registered during pregnancy.

b. The agreement could be restricted to paying for infants who weigh more than 2500 grams at birth to families from the poorest 40 percent of the population or in rural areas, although this raises difficulties in establishing a family's socioeconomic status or geographic residency.

c. The agreement could pay for all infants who weigh more than 2500 grams at birth or for the number above a baseline measured for an earlier cohort.

d. The agreement could pay for the absolute number of infants born weighing 2500 grams or more or for increasing the share of healthy infants as a portion of total number of births the same year. The absolute number of newborns that survive is easier to explain and does not require accurately measuring total births, although paying for the absolute number of children runs the risk of encouraging higher fertility. However, paying for survival as a fraction of total births may encourage recipients to underreport total births, especially among disadvantaged populations.

e. Payments could be based on simple binary criterion (i.e. whether or not the newborn weighs 2500 grams or more) or be disbursed at an incremental rate with increases in weight (e.g. an additional payment for every 5 grams of weight above 2500 grams, to be capped at an agreed-upon level).

For Discussion: A COD Aid Proposal for Reducing Low Birth Weight

Payments

- First 5 years, funders pay US$5 for each pregnant woman who registers with a health care provider (in order to establish baseline and improve vital registration – fee large enough to create incentive and provide an initial flow of unrestricted funds without creating risk of increased fertility).
- First 5 years, funders pay US$25 for each newborn who weighs 2500 grams or more at birth.
- After 5 years, funders pay US$250 for each newborn who weighs 2500 grams or more at birth in excess of a baseline set by the number of newborns with appropriate birth weight 5 years earlier. In subsequent years, the baseline is updated annually (i.e. always measured against a 5-year lag). (Note: the agreement then has a self-limiting feature with funding declining to zero 5 years after pregnancy registration stops increasing and the proportion with low birth weight stops declining).

Eligibility

Any low-income country that can meet the reporting standards would be eligible to sign an agreement up to a cap established by available funds. The reporting standards would involve:

- The country has a system for registering pregnant women
- The country has demonstrated the capacity to accurately record birth weight.
- The country has a system for reporting births.

Conditions

Countries that sign the agreement would agree:

- To allow independent verification of the number of children born at a given weight (by permitting audits and independent surveys).
- To publicly disseminate information regarding the agreement (number of total, preterm and underweight births, number/portion of children born at a healthy birth weight, the proportion of infants not weighed at birth, payments received, preterm and infant mortality estimates, etc.)
- To assist researchers in evaluating the COD Aid agreement.

Indicators for Improving Maternal Health

Maternal Mortality

Definition. *Maternal mortality* is defined as the death of women during pregnancy, childbirth, or in the 42 days after delivery. In 2008, between 302,000 and 394,000 women died from maternal causes – causes of death which are largely preventable (Hogan and others, 2010). Maternal mortality is also a significant focus of many international development efforts and a primary target for Millennium Development Goal 5 (see Appendix 1). The majority of maternal deaths take place in developing countries, and the burden of maternal mortality is greatest in sub-Saharan Africa and South Asia.

Is the indicator a good proxy for health? Maternal mortality is a direct health outcome. Maternal mortality is also strongly correlated with infant mortality during childbirth (McClure and others 2007) and is caused by similar issues (particularly obstructed or very long labor, eclampsia and infection such as syphilis) (Lawn, Cousens and others 2005). In addition, maternal mortality has significant implications for the long-term health of a mother's older children and their life chances (National Research Council 2001).

Is the indicator responsive to policy? The discrepancy between the burden of maternal mortality in developed and developing countries has been cited as the "largest of all public health statistics" (Ronsmans and others 2006) since it strongly suggests that high rates of maternal mortality in developing countries are largely preventable. While the main medical causes of death vary greatly by region, obstetric hemorrhage is the main medical cause of maternal death worldwide, with unsafe abortions and indirect causes (such as malaria and HIV/AIDS) playing a large role in some populations (Ronsmans and others 2006). Recent research from the Institute for Health Metrics and Evaluation (IHME) suggests that only 23 countries are on track to reach the MDG 5 goal of a 75 percent reduction in maternal mortality ratios (MMR), although some countries (including Egypt, China, Ecuador and Bolivia) have seen accelerated progress since 1990 (Hogan and others 2010).

Although the medical interventions needed to prevent deaths due to pregnancy and childbirth exist, the empirical evidence surrounding the effectiveness of programs to reduce maternal mortality in developing countries is inconclusive. Between 1960 and 1986, Malaysia and Sri Lanka reduced their maternal mortality ratios by more than 50 percent. Researchers have attributed these successes to a combination of public policies that include: long-term investments in midwifery training and referral hospitals; broad, free access to healthcare and a supportive system with regulation, control, and supervision of medical and midwifery professions; gathering and use of information to guide policymaking; and targeted quality improvements to vulnerable groups (Ronsmans and others 2006). However, micro-level studies of specific interventions (including skilled birth attendance, access to clean delivery kits, and training of traditional birth attendants, and increased antenatal visits) have not conclusively shown significant impact on improving maternal health outcomes (Ronsmans and others 2006; Hogan and others 2010). This paradox may be resolved in the future by better micro-level studies or it may indicate that maternal health at the population level is not responsive to micro-level interventions – only to society-wide or system-wide efforts.

Is the indicator quantifiable with sufficient precision? Accurately measuring the maternal mortality ratio is quite difficult. An extensive literature examines these difficulties, citing a number of problems related to weak vital registration systems, low professional birth attendance, poor data quality, and inadequate training in information collection, storage and processing (Ronsmans and others 2006; Graham and others 2008). Furthermore, maternal deaths are frequently under-reported due to misclassification of causes, uncertainty regarding diagnoses or existence of pregnancy, and sensitivity around issues such as abortion, miscarriage and HIV/AIDS. Maternal deaths are also relatively rare, even in developing countries, which means that survey-based estimates require large samples if they are to be measured within reasonable confidence intervals.

Unintended Consequences. Reducing maternal mortality is a health outcome of great importance, and paying for it is unlikely to generate substantial distortions in terms of allocations of resources across disease groups, health risks or interventions. The greatest concerns in paying for reductions in maternal mortality are likely to be related to manipulation of data such as under-registering high-risk pregnancies.

Options for payment. Because the share of births that result in a mother's death are relatively rare, paying for all mothers who survive labor would not be a very discriminating incentive. For example, in Ethiopia, with a maternal mortality ratio of approximately 700 per 100,000 live births, a COD Aid agreement that failed to distinguish incremental progress would be paying for more than 99,000 women who would be expected to survive labor under current conditions for every thousand who face high risks of mortality and the corresponding incentives to reduce mortality among this latter group would be rather low. On the other hand, paying for deaths averted or reductions in the maternal mortality ratio would be difficult for two reasons: the ability to project a counterfactual trend in maternal mortality is quite limited at this time, even in large countries; and the amounts that would be required to pay for each incremental advance would be quite large, making the total

payments very sensitive to the precision of the estimates. Taking into account these considerations, a working group might consider the following options:

a. The agreement could pay for all women who are registered during pregnancy and survive to a first postnatal consultation between 2 and 30 days after the birth. This would provide a systematic incentive to develop tracking systems and access to health care services for pregnant women, but would not provide a very discriminating incentive for specifically reducing maternal mortality. The payment per woman would be relatively low, though the annual payment could be quite large and would not be subject to large volatility.

b. The agreement could focus payments for women who are registered during pregnancy and survive to a first postnatal consultation from among the poorest 40 percent of the population or in rural areas, although this raises difficulties in establishing a woman's socioeconomic status or geographic residency.

c. The agreement could pay for the "number of maternal deaths avoided" – counting the number of maternal deaths each year and comparing it to a baseline in the initial year or relative to an epidemiological model.

d. The agreement could pay for the absolute number of deaths avoided or for a reduction in the maternal maternity ratio. The absolute number of deaths avoided is easier to explain and does not require accurately measuring total pregnancies and births.

e. The agreement could pay for every pregnant woman referred to a hospital maternity service and who the service certifies to be at high risk of birth complications.

Intrapartum death, fresh stillbirths and neonatal deaths

Definition. *Intrapartum death* refers to the death of a newborn that occurs during the time between onset of labor and the third stage of labor. Reliable cross-country data on intrapartum deaths is unavailable. Lawn, Shibuya and others (2005) estimated two related measures: stillbirths occurring intrapartum and neonatal deaths related to intrapartum events.

Stillbirths occurring intrapartum, or "fresh stillbirths", refer to late fetal deaths weighing more than 1000 grams or occurring after 28 weeks gestation, excluding those with severe lethal congenital abnormalities (Lawn, Shibuya and others 2005). Definitions also include those deaths without signs of skin disintegration or maceration, whose death is assumed to have occurred fewer than 12 hours prior to delivery (Lawn, Shibuya and others 2005; Buchmann and others 2002; Hinderaker and others 2003). For obstetric classifications, acute intrapartum events causing death such as antepartum hemorrhage and obstructed labor may also be considered equivalent (Lawn, Shibuya and others 2005).

Neonatal deaths related to intrapartum events includes neonatal deaths resulting from neonatal encephalopathy, neonates born at term who could not be resuscitated (or for whom resuscitation was not available) or specific birth trauma. Where possible, other causes such as lethal congenital malformations and extreme preterm birth (less than 34 completed weeks of gestation or birth weight < 1500 g) are excluded.

Intrapartum stillbirths are more common than intrapartum-related neonatal deaths, especially in settings with limited emergency obstetric care (Barros and others 1987). Despite the significant global burden of preterm birth and stillbirths, these issues have received relatively little international attention (stillbirths are currently not included in MDG tracking and remain largely invisible in global policies) (Barros and others 2010). Neonatal deaths related to intrapartum events and intrapartum stillbirths are roughly two to four times more common than maternal mortality (Lawn, Shibuya and others 2005).

Is the indicator a good proxy for health outcomes? Intrapartum deaths, fresh stillbirths and neonatal deaths are direct health outcomes. They are more common than maternal deaths and there is some evidence that they are correlated with poor maternal health.

Neonatal deaths, or deaths within 28 days of birth, now account for more than 37 percent of under-five mortality (Lawn, Shibuya and others 2005). Complications that arise from preterm birth are the leading direct cause of neonatal mortality, accounting for an estimated 27 percent of neonatal deaths every year (Lawn and others 2006). Annually, there are an estimated 3.2 million stillbirths in addition to the estimated 4 million neonatal deaths worldwide (Lawn and others 2010).

Some studies have shown that maternal mortality is correlated with stillbirths (McClure and others 2007). Maternal mortality and stillbirths are associated with similar factors, particularly obstructed or very long labor, eclampsia and infections such as syphilis (Lawn, Cousens and others 2005). Poor maternal health before and during pregnancy increases the likelihood of maternal mortality as well as the likelihood that the child will die during labor or childbirth. Concerted efforts to address stillbirths, preterm births, and intrapartum deaths could significantly reduce both infant and maternal mortality and advance progress towards the fourth and fifth Millennium Development Goals.

Is the indicator responsive to policy? The leading causes of intrapartum deaths are largely preventable, which increases the likelihood that programs aimed at addressing these causes will be successful. A number of hospital-based studies indicate that 25 to 62 percent of intrapartum stillbirths could be prevented with improved obstetric care and rapid responses to intrapartum complications, including reducing delays in both the initial recognition of complications and the amount of time it takes to travel to the hospital (Lawn, Shibuya and others 2005). In addition, preterm births can be prevented by smoking cessation and progesterone, and stillborn deaths can be prevented by interventions such as protein energy supplementation, screening and treatment of syphilis, intermittent presumptive treatment for malaria during pregnancy, insecticide-treated mosquito nets, birth preparedness, emergency

obstetric care, cesarean section for breech presentation, and elective induction for post-term delivery (Barros and others 2010).

Is the indicator quantifiable with sufficient precision? Accurately and reliably measuring intrapartum deaths, fresh stillbirths or neonatal deaths is difficult. Only about 2 percent of the estimated 3 million stillbirths per year are counted through vital registration systems (Lawn and others 2010). Global estimates are currently based on household surveys or modeling. While vital registration systems have improved in many countries, the tracking of stillbirths remains incomplete and is highly variable by country; therefore the total number of annual births is largely unknown at the country level. Accurately and reliably measuring these indicators would require improvements in vital registration, increased coverage of professional birth attendance and public health outreach to pregnant women, as well as training and support for correctly classifying and reporting causes and timing of death. The one advantage that these measures have over measuring maternal mortality is that they are almost an order of magnitude more common and therefore could be estimated accurately and verified with smaller surveys.

Potential unintended consequences. The agreement could pay for the absolute number of children that survive labor or for increasing the share of survivors over the total number of births in a given time period. The absolute number of infants who survive childbirth is easier to explain and measure, and does not require accurately measuring the total number of births. Deficiencies regarding stillbirth and preterm birth estimates make the denominator particularly difficult to estimate and measure, and may render the option of paying for the share of intrapartum survivors infeasible in many developing countries. As with the child survival indicator, paying for the absolute number of children runs the risk of encouraging higher fertility while paying for survival as a fraction of total births may provide disincentives for accurately registering all births.

Options for payment. In developing a COD Aid agreement for reducing intrapartum deaths, a working group would have to consider the advantages and disadvantages of different terms of payment. For example:

a. The agreement could pay for infants who are born to women whose pregnancies were registered and who survive at least one day after their birth.

b. The agreement could pay only for infant survival among those born into families from the poorest 40 percent of the population or in rural areas.

c. The agreement could pay for all infants who survive the intrapartum stage or only for the number above a baseline in order to create an incentive for progressing beyond current conditions.

d. The agreement could pay for the absolute number of children that survive or for increasing the share of survivors relative to an earlier cohort. The absolute number of newborns that survive is easier to explain and does not require accurately

measuring total births, although paying for the absolute number of children runs the risk of encouraging higher fertility. However, paying for survival as a fraction of total births may discourage accurate reporting of pregnancy, stillbirths and preterm births (i.e., recipients may be less likely to report a birth or having been pregnant if the child did not survive).

e. The agreement could pay for every pregnant woman referred to a hospital maternity service whom the service certifies to be at high risk of birth complications.

Skilled Birth Attendance

Definition. Skilled Birth Attendance (SBA) refers to a birth attended by a person who has the appropriate skills and operates within an "enabling environment" that includes transport and referral facilities for emergency obstetric care. The proportion of births attended by a skilled attendant is currently used as a proxy for maternal deaths for the purposes of tracking the fifth MDG (de Bernis and others 2003).

WHO defines a "skilled birth attendant" as an accredited health professional (doctor, nurse or midwife) who has been educated and trained to proficiency in the skills needed to manage uncomplicated pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in women and newborns. WHO emphasizes the importance of skilled birth attendance, and this policy has been incorporated into a continuum of maternal and child care policy established with the formation of the Partnership for Maternal, Newborn and Child Health in 2005.

Is the indicator a good proxy for health outcomes? SBA is not a health outcome, rather it is a health service or output of the health system. Nevertheless, the difficulty of obtaining accurate estimates of maternal mortality has led WHO and others to use the percentage of live births attended by skilled health personnel as a proxy for maternal mortality due to reasonable levels of correlation between the two indicators (Graham and others 2008).

Research suggests that SBA may reduce or prevent a large share of the four most common causes of maternal death and morbidity during childbirth: obstructed labor complications, eclampsia, puerperal sepsis, and obstetric hemorrhages (Graham and others 2001). Improving maternal health through increased access to skilled attendance at birth is also associated with a reduction in the number and frequency of stillbirths and perinatal mortality (Gelband and others 2001). Some research argues that the presence of skilled personnel at birth is a significant predictor of maternal mortality, while recognizing limitations in the design of these studies that make it difficult to identify a causal relationship between SBA and maternal mortality ratios (Buor and Bream 2004). A recent literature review of 10 individual studies goes even further, finding "little evidence that giving birth with a health professional reduces a woman's risk of dying, and in some settings it appears to be associated with an increased risk of death" (Scott and Ronsman 2009). Therefore, utilizing

SBA as a proxy for maternal mortality in a COD Aid agreement may be premature; better evidence is needed to be certain it is an appropriate indicator.

One of the attractions of this indicator is that it may be highly correlated with the coverage and quality of health care services more generally. Interventions aimed at expanding coverage of SBA seem to require basic reforms to strengthen health systems, improve health education, assure availability of medical supplies, and address problems in management and contracting. In addition, the lack of pre-service training at the primary health care level has been identified as a major issue in major developing countries. In this way, SBA may be a better proxy for health system capacity than of health outcomes, per se.

Is the indicator responsive to policy? Because SBA is a health output and not an outcome, it is more directly responsive to public policy action. Even so, achieving high rates of SBA coverage is a difficult task in most low- and middle-income countries because it requires policies that address a full range of health system functions related to financing, health care personnel, contracting, accreditation, supplies, facilities, transportation, information management and reporting. Nevertheless, it is quite likely that policies can increase SBA coverage. The more important question is whether whether the desired health outcome – improved maternal health – is responsive to SBA.

Many developing countries have been able to improve access to skilled birth attendance and costs associated with doing so are relatively low. Depending on the level of complications that arise from giving birth, the cost of a skilled attendant ranges from US$2 to US$100, while each maternal and perinatal death averted is estimated to cost between US$1,000 to US$3,000 (Gelband and others 2001). Some studies show that programs to train and deploy skilled midwives in resource-poor settings have been successful (cited in Becker and others 2006).

Is the measure quantifiable with sufficient precision? Despite the fact that the ratio of births attended by skilled health personnel is an established indicator of maternal health for the MDGs and for the World Banks 14th IDA Replenishment, lack of regular data collection presents a major challenge for using this indicator (Becker and others 2006). Accurate measurement would not only require comprehensive registration of pregnant women and births, but also a national registry of individuals who are recognized as "skilled birth attendants." Furthermore, it would be necessary to find some way of establishing whether these individuals are supported by the necessary "enabling environment," taking into account, for example, the 1997 UN Process Indicators which assess the availability, use and quality of Emergency Obstetric Care (EmOC).

Potential unintended consequences. A program directed at increasing SBA would privilege one particular form of public health policy over others, even if this policy comprehends a wide range of activities to assure the availability of trained personnel throughout the country with adequate support for medical supplies, facilities, and emergency referral. If countries that increase SBA coverage really do, in that process, strengthen their health systems in ways

that reduce maternal mortality without compromising other important activities that draw on similar financial and human resources (such as prenatal care, family planning, nutrition, prevention of unwanted and teenage pregnancies, prevention and management of unsafe abortion, and even prevention and management of common diseases in pregnant women, such as malaria and anemia), then the risks of distorting policy decisions is small. If, however, SBA is not the most effective way of reducing maternal mortality and it diverts attention from other important activities, then payment to increase SBA coverage could generate perverse outcomes.

Options for payment. In developing a COD Aid agreement for increased skilled birth attendance, a working group would have to consider the advantages and disadvantages of different terms of payment. For example:

a. The simplest agreement would simply pay for all births attended by skilled birth attendants each year.

b. The agreement could specifically pay for all births attended by skilled birth attendants for women from the poorest 40 percent of the population or in rural areas.

c. The agreement could pay for all births attended by skilled birth attendants or only for the number above a baseline in order to encourage progressing beyond current conditions. In general, paying for progress above a baseline would draw greater attention to women from socioeconomically disadvantaged backgrounds who are less likely to already have access to SBA.

d. The agreement could pay for the absolute number of births or for increasing the share that are appropriately attended. The absolute number of births attended is easier to explain and does not require accurately measuring the total number of births; however, paying for the number of births attended might encourage higher fertility. By contrast, paying for the share of births attended removes the incentive to increase fertility. It does, however, create an incentive not to count pregnant women who are unlikely to receive care, thereby reducing the denominator of the indicator.

e. The agreement could pay for reducing the number of women in rural areas with obstetric complications who fail to receive emergency care. The indicator "Unmet Need for Emergency Obstetric Care" is defined as the share of women with obstetric complications who are treated at a health facility which offers emergency obstetric care and may be more closely related to reducing maternal mortality. It would also create an incentive for skilled birth attendance so as to assure appropriate and timely referral of women at risk for and facing complications in birth.

f. The agreement could pay for every pregnant woman referred by a skilled birth attendant to a hospital maternity service whom the service certifies to be at high risk of birth complications. By restricting rewarded referrals to those made by a SBA, the program would increase the incentives to train SBAs and delegate triage and referral decisions to this class of personnel.

Indicators for Combating HIV/AIDS and Malaria

HIV/AIDS: Sustaining Treatment

Definition. A COD Aid agreement could agree to pay a country for providing anti-retroviral treatment (ART) or other appropriate medications to HIV-positive individuals who need treatment.

Is the indicator a good proxy for health outcomes? Most people whose CD4 counts have dropped substantially and exhibit AIDS symptoms experience significant improvements in life quality and extended years of life when they adhere to an appropriate ART regimen. Some evidence indicates that by reducing the viral load, ART can reduce the risk of transmitting the virus to sexual partners. It can also reduce the risk of mother to child transmission of HIV (Li and others 1998, Hogg and others 1998). Since AIDS treatment programs in poor countries lose as many as 20 percent of those enrolled during the first year of treatment and approximately 5 percent every subsequent year, sustaining patients on treatment is a challenge. Health care providers are often compensated more highly for complicated procedures, which are more likely to be required by new patients than by established patients whose successful treatment needs to be sustained. This is particularly likely for new patients who initiate treatment later. New WHO guidelines recommend patients be started earlier because earlier treatment initiation leads to greater survival (Over 2010b).

Is the indicator responsive to policy? Successful ART programs and reduced HIV infections at the national level are associated with strong national leadership that encourages testing and counseling, supports access to trained medical personnel and outreach services, subsidizes the costs of care, creates incentives for individuals to stay on treatment, and provides appropriate support services (Mokomane and others 2002; Nattrass 2008; Over 2010b).

Is the indicator quantifiable with sufficient precision? ART is a relatively costly service due to the price of medications and the need for trained personnel to supervise treatment. Therefore, most individuals who are receiving ART in developing countries are registered in administrative systems. The count of individuals is likely to be accurate and verification under a COD Aid agreement would provide useful information to improve the accuracy of administrative reporting – especially when health systems are vulnerable to corrupt practices such as stealing drugs or registering phantom patients in order to file false claims.

Unintended consequences. Paying for countries to sustain treatment of individuals living with AIDS could have several negative effects. The main concern is that it could divert attention away from preventing infections and toward treatment because the country receives no financial benefit from an averted infection but does receive a positive financial incentive for treating those who are infected. With a limited treatment budget, this payment would reward national health systems for sustaining existing patients more than it would reward recruiting new patients. However, this bias could be beneficial if it counters existing biases in the other direction. Risks that countries might register people for treatment who are not ill are probably minimized by the high cost of treatment.

Options for payment. Hallett and Over (2010) propose to reward countries that sustain individuals on treatment. They note that AIDS treatment in the developing world currently costs between US$500 and US$1,500 per patient-year and propose a COD Aid agreement that would pay somewhat more for incremental months the longer a patient survives. For example, the donor could pay US$100 for every patient starting treatment in a given year, US$125 for every patient in the second year of treatment, US$150 for every patient in the third year, US$175 for every patient in the fourth year, and US$200 for every patient in the fifth or any subsequent year of treatment. The COD Aid payments would complement existing aid flows or domestic funds that currently pay for AIDS treatment inputs. This arrangement would maximize the number of life-years saved by AIDS treatment expenditures for any given treatment budget (Hallett and Over 2010).

HIV/AIDS: Averted Infections

Unlike a health outcome such as stunting or maternal mortality, which always reflects poor health and is therefore always to be discouraged, the total number of people living with HIV/AIDS, called the "prevalence" of HIV, reflects both new infections which the country has failed to prevent and survival of those with HIV/AIDS, whose lives the country has successfully extended. For this reason, a COD agreement to encourage HIV prevention should reward a reduction in the *new* cases of HIV, i.e. a reduction in the "incidence" of HIV, instead of attempting to reward a reduction in HIV prevalence.[6]

Definition. Averted HIV infections is defined as the difference between the number of new HIV infections that are expected in a given period (the counterfactual) minus the number of new HIV infections that actually occur.

Is the indicator a good proxy for health outcomes? To the extent that the indicator accurately measures averted infections, it is a very close proxy for reducing the morbidity and mortality that follow HIV infection, with a median lag-time of about nine years. Reduction in adult HIV incidence also prevents mother to child transmission of HIV, prevents orphan-

[6] It is noteworthy that the original statement of the Millennium Development Goal number 6, which calls for combating AIDS, malaria and other infectious diseases, mandated a reduction in overall adult HIV prevalence without regard to the fact that effective treatment would increase prevalence.

hood and its attendant health and poverty risks to the orphaned children and prevents the need for AIDS treatment.

Is the indicator responsive to policy? Several countries – Thailand, Brazil and Uganda – have demonstrated that the HIV epidemic can be slowed through public policy. A number of specific public policy interventions have also been shown to lower the rate of new infections, including male circumcision, couples counseling, "test and treat" strategies, voucher programs, and paying girls to stay in school (Auvert and others 2005; Allen and others 2003; Thornton and others 2008; and The World Bank 2010[7]). Increasingly, HIV/AIDS experts believe that prevention efforts work best in combination with one another. Furthermore, like a country's fertility rate or age of marriage, HIV incidence also responds to shifts in cultural trends which may respond to national leadership more than they do to individual government policies. These characteristics of the HIV prevention challenge suggest that an overarching incentive like COD could be particularly useful to incentivize the synergistic cooperation of people in different government bureaucracies and in the private sector under the leadership of motivated national figures towards the joint goal of achieving the COD objectives.

Is the indicator quantifiable with sufficient precision? As is the case for maternal mortality or any rare negative health outcome, the precise measurement of the number of new HIV infections requires a large sample size. In any given year, fewer than 2 percent of individuals will become newly infected and precisely measuring the difference from one period to the next would therefore require relatively large surveys, involving blood tests for between 50,000 and 100,000 individuals. (Currently the DHS collect blood and estimate HIV prevalence on samples of 5,000 to 10,000 individuals.) Finally, the precision of measuring averted infections depends on the accuracy of the counterfactual. Estimating the number of new HIV infections that are likely to have occurred in a given period depends on the accuracy of data used to estimate model parameters and on the validity of the selected mathematical models.

Two methods have been proposed for measuring the number of averted infections (Hallett and Over 2010): a prevalence modeling approach and a "tests of recent infection" approach. The prevalence modeling approach compares the observed trend in prevalence between a baseline and follow-up survey to a counterfactual projection of the prevalence that would have been observed after incorporating information on the uptake of antiretroviral therapy and assuming no other change in historical trends in incidence and mortality. The tests of recent infection approach uses technological advances in diagnostic tools to directly measure how many individuals are newly infected. These tests differentiate new from old infections by taking advantage of the fact that the immunological response to HIV evolves over the

[7] This report is unpublished, but the study results were announced by the "The World Bank News and Broadcast," July 18, 2010. *Malawi and Tanzania Research Shows Promise in Preventing HIV and Sexually-Transmitted Infections.* http://bit.ly/9EwW4G

first months of infection. While initial efforts showed these tests to be biased upwards, recent advances have increased their accuracy.

Unintended consequences. The most cynical concern for a program that pays to avert HIV infections is that the recipient would find some way to increase the rate of infection at the time of the baseline survey in order to inflate later payments. Another concern is that it could encourage recipients to engage in practices that would violate the human rights of those currently infected.

Options for payment. Hallett and Over (2010) propose ten different payout functions for the two measurement approaches (prevalence modeling and tests of recent infection) and assess them in terms of their attractiveness to funders and recipients and the impact of precision in estimating the number of averted infections. Six of the measures are threshold functions, paying a fixed amount if the ratio of the new to the old estimated incidence rate is below a certain level or the change is statistically significant. The other four are continuous functions, paying in proportion to the estimated reduction in incidence up to a maximum.

The continuous functions are more compatible with the principles of COD Aid as described by Birdsall and Savedoff (2010). These include paying linearly in proportion to the reduction in incidence or paying linearly, convexly or concavely in proportion to the reduction in incidence with a bonus if the reduction reaches statistical significance. The simplest example would be to measure the number of new infections every two years and pay US$100 for every HIV infection averted relative to the counterfactual estimate.

For Discussion: A COD Aid Proposal for Reducing New HIV Infections

Payments

- First year, funders pay costs of a large comprehensive population-wide survey of the HIV infection status of the adult population. Funders and recipients agree on a team of modelers to construct a prediction for how many people will be infected with HIV in the next 5 years. Funders commission that team to estimate future HIV infection, an estimate which will serve as the counterfactual.
- First through third year, funders pay for data collection on the number of HIV-infected adults who are enrolled in antiretroviral treatment programs.
- Third year, funders pay costs of a second large comprehensive population-wide survey of the HIV infection status of the adult population. The modeling team is charged with estimating how many HIV infections have been averted.
- Third year, Recipient country is paid US$100 for every infection averted.
- This process is repeated every three years.

(Note: the agreement has a self-limiting feature with funding declining to zero as the annual number of new infections reaches a floor, which will hopefully be the elimination of the disease.)

Eligibility

Any low-income country with a high baseline rate of HIV incidence would be eligible to sign an agreement up to a cap established by available funds.

Conditions

Countries that sign the agreement would agree:

- To allow independent verification of the survey sampling procedure.
- To agree with the donor on a mutually acceptable group of modelers to generate the estimate of the number of new infections that would occur according to historical trends (the counterfactual).
- To allow an independent "social audit" to monitor HIV prevention programs to assure that the programs reflect internationally agreed human rights standards
- To accept the estimates of the counterfactual number of HIV infections provided by the mutually acceptable modeling group.
- To assist researchers in evaluating the COD Aid agreement.

Malaria: Reducing or Sustaining Reductions in the Prevalence of Malaria[8]

Since malaria is an acute disease, not a chronic disease like HIV infection, the number of cases at any one time, or the prevalence of the disease, is an adequate measure of the burden of the disease and the reduction in prevalence adequately measures accomplishments in the struggle against it.

Definition. Malaria is a disease caused by infection with a parasite, most commonly *P. falciparum* or *P. vivax*. A number of indicators are available that vary in terms of their appropriateness for different goals (e.g. eradication or control, reducing or sustaining reductions in incidence) and different contexts (e.g. hyperendemic, endemic). In places with high rates of infection, the *standard Parasite Rate* (standard PR) can be used, defined as the prevalence of non-infective asexual blood-stage parasites in children between the ages of 2 and 10. In places where malarial incidence has been reduced and is being sustained, the *Annual Parasite Index* (API) may be more useful; it measures the number of malaria fevers per year per 1,000 people.

Is the indicator a good proxy for health outcomes? The standard PR and the API are closely associated with morbidity and mortality from malaria; in addition, they are useful for tracking

[8] A more detailed proposal for addressing malaria through a COD Aid agreement can be found in Arkedis 2011.

the effectiveness of control or elimination programs (Smith and others 2009). Nearly half a billion people each year are infected by malarial parasites (Snow and others 2005), and the disease kills more than a million people each year (Greenwood and others 2005). In endemic areas, malaria infection during pregnancy accounts for up to 25 percent of all cases of severe maternal anemia, and is the cause of 10-20 percent of low birth weight babies (Guyatt and others 2001). The majority of malaria-related deaths occur in Africa.

Is the indicator responsive to policy? Infection rates from malaria are responsive to a number of policies but effectiveness varies across contexts due to differences in mosquito vectors, human behavior, availability of health care services, differences among parasites and levels of drug-resistance, etc. Effective interventions currently available include killing adult mosquitoes by increasing the use of insecticide-treated bed nets (ITNs) and indoor residual spraying (IRS); controlling larvae through biological or chemical agents and environmental management; and treating infections with artemisinin-based combination therapies (ACTs) (Over and others 2004).

The appropriate strategies for addressing malaria vary significantly between areas with high rates of infection and those with low rates. They also differ between contexts in which the goal is to control or eliminate malaria. COD Aid agreements aimed at reducing malaria infection rates are feasible but may involve substantial risks of diverting resources or distorting strategies (see unintended consequences below). By contrast, a COD Aid agreement aimed at sustaining malaria control and elimination in countries that have achieved low infection rates could be quite promising – creating a financial incentive to sustain efforts whose benefits may otherwise be less visible to public policymakers.

Is the indicator quantifiable with sufficient precision? Relying on administrative reporting is problematic because individuals do not always seek care for malarial symptoms and diagnoses are frequently inaccurate. The reported number of cases of fever overestimates the number of malaria cases, while the number of cases confirmed by blood tests underestimates that number (Over and others 2004). Nevertheless, advances in technology have simplified and lowered the costs of diagnostic tests and, when combined with survey methods, can accurately measure the standard PR. In countries that have achieved malaria control or elimination and are trying to sustain those gains, health services are usually good enough to provide reliable epidemiological surveillance to support accurate measurement of the API.

A further difficulty with measuring progress in combating malaria is the difficulty of establishing a counterfactual. Depending on context, the incidence of malaria varies seasonally and year-to-year for reasons related to environmental changes along with trends in human settlement and behaviors. While it is possible to model trends in malarial incidence, the accuracy of the projections may be difficult to explain and use as a counterfactual in COD Aid agreements. As with the discussion of averting HIV/AIDS infections above, payment terms could include provisions that modify payments in proportion to accuracy. One advantage of paying for sustained reductions in malarial incidence is that the counterfactual is relatively easy to define – a country that has eradicated malaria or reached a

low level of incidence could be paid against a baseline established by the prevalence of malaria prior to the success of the eradication or control program. Thus, funders would be paying to sustain the gains in averting malarial infections based on a clear counterfactual.

Unintended consequences. A COD Aid agreement that paid for reductions in the standard Parasite Rate or declines in API could provide a strong incentive for combating malaria in a way that empowers recipient countries to choose the appropriate mix of strategies while reducing the transaction costs involved in traditional aid modalities. However, such an agreement could still have problematic unintended consequences, either by distorting anti-malarial efforts or diverting attention from other health needs.

The first risk is that countries being paid to reduce the standard Parasite Rate might choose to focus exclusively and extensively on treating children between the ages of 2 and 10. Intensely treating this population might reduce the standard PR and lower morbidity among children but without affecting infection among adults or reducing the reservoir of parasites among mosquitoes. Such a strategy focusing excessively on treatment could also lead to overuse of anti-malarial drugs, unintentionally increasing drug resistance. Finally, treatment among children could also delay the emergence of natural immunity among this subpopulation, deferring morbidity and mortality until later in life. Because malaria control is more effective when different strategies are combined (e.g. larva control, ITNs, IRS and treatment), anything that encourages focus on a particular strategy is likely to hinder progress against the disease overall (Over and others 2004).

A second risk of paying for reductions in the standard Parasite Rate or declines in API is that resources might be diverted from other more urgent health needs. In many places, malaria *is* the leading cause of morbidity and mortality among children and a leading cause of morbidity and mortality among adults. But there are also places where respiratory infections like pneumonia are more prominent and are even misdiagnosed as malaria. Even when funds are additional, the demands on the time of health professionals or community workers could be stretched by efforts to combat malaria.

Addressing these risks might require establishing eligibility criteria that focus on countries or regions where malaria is clearly a high priority. Alternatively, the indicator could be changed to measure, say, the Parasite Rate in the entire population (though this poses other technical challenges) rather than focusing on children. A program aimed at sustaining malaria control, paying for sustaining a low API, would be less likely to generate some of these unintended consequences. Instead, it would provide a financial incentive to sustain investments in activities whose benefits (maintaining low infection rates) are invisible to the public, yet necessary for controlling the disease.

Options for payment. The payout function would differ between agreements aimed at reducing the Parasite Rate in areas with endemic malaria and those aimed at sustaining the elimination or control of malaria at low rates of prevalence. Once the focus is established – sustaining control or reducing malarial prevalence – a working group would have to consider

the advantages and disadvantages of different terms of payment. These include paying linearly in proportion to the reduction in incidence or paying linearly, convexly or concavely in proportion to the reduction in incidence with a bonus if the reduction reaches statistical significance (as described in Hallett and Over 2010 with respect to HIV/AIDS). The simplest example would be to measure the number of new infections every year and pay a fixed sum for every malarial infection averted relative to the counterfactual estimate. Alternatively, recipients could be paid a fixed amount for reducing incidence below the established baseline (similar to the "threshold function" outlined in Hallett and Over 2010 with regard to HIV/AIDS). The agreement could pay for reducing or sustaining reductions in malaria infection among the entire population or could focus on specific populations such as pregnant women and children. Focusing on subpopulations has the advantage of focusing attention on groups that are at higher risk but also increase the difficulties of establishing a counterfactual and obtaining precise estimates of incidence.

Indicator for Improving Health Information for Public Health Policy

Number of Accurately Registered Births

Definition. Vital registration systems provide public records for monitoring and tracking births, deaths, cause of death, and pregnancy. Accurately registering births in a country is one of the pillars of an effective vital registration system, which is critical to a country's ability to conduct public policies of many kinds but especially for public health policy. Good vital registration systems improve the accuracy of all social survey data; provide registered individuals with greater access to social welfare, health care, education and employment services; improve governments' ability to track health risks; and make it possible to accurately measure relatively rare events such as maternal mortality.

Is the indicator a good proxy for health outcomes? Accurately registering births is not a good proxy for health outcomes at all; however, it is important to any assessment of a country's health status and the evaluation of any intervention. Improved birth registration systems are necessary to generate estimates of the magnitude and prevalence of health issues, to identify determinants of key problems, to detect differences in levels of health status and service delivery within a country, to recognize emerging health issues, to permit cross country comparisons, and to facilitate monitoring of health programs and policies (Graham and others 2008).

Is the indicator responsive to policy? While the links between accurate birth registration and health outcomes are quite indirect, the links between public policy and accurate birth registration are quite strong. Accurately registering births is an activity which is well within the purview of most governments so long as they pass appropriate legislation, implement regulations, elicit cooperation from the medical and health community, and reach out to citizens and communities to explain the benefits of registration.

Is the indicator quantifiable with sufficient precision? The indicator can be accurately measured and verified through a combination of population surveys and audits. However, it may not be appropriate for a COD Aid agreement because it is not a payment for an *outcome*. It may be difficult to convince funders that paying an incentive for birth registration, rather than for a health outcome, is of sufficient benefit to justify the effort and funds. Nevertheless, concerns over the poor quality of population health and demographic data needed for tracking the use of foreign aid could make this an attractive initiative. The growing interest in results-based financing mechanisms has highlighted the need for better health outcome data in developing countries (Graham and others 2008).

Potential unintended consequences. Paying for the number of registered births could create an incentive to increase fertility which may be problematic in countries with high birth rates and poverty. For this reason, the amount paid per registered birth should probably not be very large. The effect on fertility would depend upon the strategies employed by the recipient to increase registration. Strategies that provide incentives to health care professionals to seek out pregnant women and assure their births are registered are less likely to increase fertility than direct incentives to women and families. Nevertheless, this risk would have to be carefully monitored.

Options for payment. The simplest approach for a COD Aid agreement to increase birth registrations would provide a small fixed payment for each registered birth. This would give countries almost a guaranteed minimum payment based on the coverage of their existing vital registration system but by requiring verification it would also create a powerful check on the quality of the existing system.

A second alternative would be to pay for the number of birth registrations above a baseline established when the agreement is signed. In countries with growing or stable populations, there would be an incentive to seek out and register larger and larger shares of each birth cohort. In countries where the number of births is declining, however, this would create a relatively weak incentive to improve the reach of birth registration.

A third alternative would be to pay for increases in the *share* of births that are registered, such as a fixed amount of money for each 1 percent increase in coverage. The difficulties with this approach are that the vital registration system itself provides key information for estimating the denominator, i.e. the size of the birth cohort. Detailed surveys and investigative work could provide verification but would be difficult.

It might be most effective to combine this approach with others. For example, small payments for registration of each pregnant woman and each birth could establish a baseline for making payments for maternal and child survival as discussed above.

Conclusion

A COD Aid proposal for health will need to clarify the objective, identify an indicator, set payment amounts, and establish a mechanism for independent verification. The indicators presented above may provide useful proxies for the outcome of improved health. Each should be assessed with regard to its relation to the overall goal, feasibility, precision, and verifiability, as well as whether it will introduce distortions or create unintended consequences in the specified setting. It is hoped that this note will contribute to the discussion for further refining a COD Aid proposal for health that could then be submitted for consideration for donors and recipient countries.

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Appendix 1: Millennium Development Goals Four, Five and Six

Millennium Development Goal Four (MDG 4) – Child Mortality

Target 1: To reduce by two-thirds, between 1990 and 2015, the under-five mortality rate

- In low-income countries, one out of every ten children dies before the age of five. In wealthier nations, this number is only one out of 143.
- When we include stillbirths in infant mortality statistics, about half of all deaths of children under age five occur under the age of 28 days.
- Persistent high levels of infant and child mortalities are one of the greatest failures of the global health sector.
- If current trends continue, the MDG will not be achieved until 2045 – 30 years late.

Millennium Development Goal Five (MDG 5) – Maternal Health

Target 1: Between 1990 and 2015, reduce the maternal mortality ratio by three quarters.

- Although most maternal deaths are preventable, MDG 5 is proving hard to reach – despite maternal health being high on the international agenda for more than two decades.
- More than half a million women continue to die each year from complications of pregnancy and childbirth, almost all in sub-Saharan Africa and Asia. Some progress has -been made in reducing maternal deaths, although not in the countries where giving birth is most risky
- In some parts of Africa (for example, Malawi and Zimbabwe) maternal deaths are increasing. This is attributable to high HIV prevalence, conflict, and deteriorating health systems (DFID 2010).

Target 2: Achieve universal access to reproductive health

- More women are receiving antenatal care
- Inequalities in care during pregnancy are striking

- Only one in three rural women in developing regions receive the recommended care during pregnancy

- Progress has stalled in reducing the number of teenage pregnancies, putting more young mothers at risk

- Poverty and lack of education perpetuate high adolescent birth rates

- Progress in expanding the use of contraceptives by women has slowed

- Use of contraception is lowest among the poorest women and those with no education

- Inadequate funding for family planning is a major failure in fulfilling commitments to improving women's reproductive health

Millennium Development Goal Six (MDG 6) – Combat HIV/AIDS and Malaria

Target 1: Have halted by 2015 and begun to reverse the spread of HIV/AIDS

- The spread of HIV appears to have stabilized in most regions, and more people are surviving longer

- Many young people still lack the knowledge to protect themselves against HIV

- Empowering women through AIDS education is indeed possible, as a number of countries have shown

- In sub-Saharan Africa, knowledge of HIV increases with wealth and among those living in urban areas

- Disparities are found in condom use by women and men and among those from the richest and poorest households

- Condom use during high-risk sex is gaining acceptance in some countries and is one facet of effective HIV prevention

- Mounting evidence shows a link between gender-based violence and HIV

- Children orphaned by AIDS suffer more than the loss of parents

Target 2: Achieve, by 2010, universal access to treatment for HIV/AIDS

for all those who need it

- The rate of new HIV infections continues to outstrip the expansion of treatment

- Expanded treatment for HIV-positive women also safeguards their newborns

Target 3: Have halted by 2015 and begun to reverse the incidence of malaria

& other major diseases

- Production of insecticide-treated mosquito nets soars

- Across Africa, expanded use of insecticide-treated bed nets is protecting communities from malaria

- Poverty continues to limit use of mosquito nets

- Global procurement of more effective antimalarial drugs continues to rise rapidly

- Children from the poorest households are least likely to receive treatment for malaria

- External funding is helping to reduce malaria incidence and deaths, but additional support is needed

- Progress on tuberculosis inches forward

- Tuberculosis prevalence is falling in most regions

- Tuberculosis remains the second leading killer after HIV

Source: United Nations Millennium Development Goals: http://www.un.org/millenniumgoals)