Burden of Malaria and other Infectious Diseases in the Asia and Pacific Region

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### Acronyms

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<th>Acronym</th>
<th>Description</th>
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<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
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<tr>
<td>APLMA</td>
<td>Asia Pacific Leaders Malaria Alliance</td>
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<td>APNHAN</td>
<td>Asia-Pacific NHA Network</td>
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<tr>
<td>DMC</td>
<td>Developing Member Countries</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>IHME</td>
<td>Institute for Health Metrics and Evaluation</td>
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<tr>
<td>IHP</td>
<td>Institute for Health Policy</td>
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<tr>
<td>MNCH</td>
<td>Maternal Neonatal and Child Health</td>
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<tr>
<td>NCD</td>
<td>Non-communicable Disease</td>
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<tr>
<td>NHA</td>
<td>National Health Accounts</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
</tr>
<tr>
<td>OOPE</td>
<td>Out-of-pocket Expenditure</td>
</tr>
<tr>
<td>PNG</td>
<td>Papua New Guinea</td>
</tr>
<tr>
<td>SHA</td>
<td>System of Health Accounts</td>
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<tr>
<td>UHC</td>
<td>Universal Healthcare</td>
</tr>
<tr>
<td>USD</td>
<td>US Dollar</td>
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<td>WHO</td>
<td>World Health Organization</td>
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Executive Summary

Infectious disease represents the major difference between the health outcomes in low and high mortality countries in the Asia-Pacific region. Three infectious diseases, HIV/AIDS, TB, and malaria, account for about 10% of all deaths in low- and middle-income countries. Fundamental differences between these three diseases require different strategies for dealing with them. Another 10% of deaths in low- and middle-income countries are attributed to other infectious diseases, but for many of these diseases, vaccines are available and universal coverage is practicable, although millions of children remain unvaccinated and consequently risk illness or death. Given the success in mobilizing funds for HIV/AIDS, TB and vaccine preventable diseases, malaria stands out as the infectious disease where the most needs to be done in mobilizing additional funding.

Although the incidence of malaria has been declining throughout the Asia-Pacific region and average infection rates are lower than in Africa, accelerated control of the disease matters for the region and the world as a whole. Most of the global population at risk from malaria and the bulk of the disease burden and deaths is in the region, and the global hot spot for artemisinin-resistance lies in South-East Asia. Further, the very success of many regional countries achieving elimination paradoxically increases the risk caused by persistent malaria in other regional countries, with its potential to revere the hard-won and expensive gains made elsewhere. For the region as a whole, there are two goals with respect to malaria:

(i) To accelerate control of malaria where it exists in significant levels, both to place countries on a pathway to eventual elimination and to reduce the risk of new artemisinin resistance emerging.

(ii) To protect and maintain the elimination status that several countries have achieved.

Micro-level studies demonstrate the negative impacts on households of malaria, and global studies and several regional country experiences demonstrate that malaria has had a substantial impact on economic growth. These alone justify the efforts to control and eliminate malaria in the region, which in turn creates the rationale for increased spending on malaria control and treatment.

Unfortunately, the distribution of the burden of malaria and other infectious diseases matches poorly the availability of families and nations to mobilize the needed funds. These diseases are now concentrated in the poorest countries of the region, with the weakest health systems and lowest levels of domestic healthcare spending. In addition, private out-of-pocket spending which dominates in many of these countries is highly concentrated in the better-off households, who face the least burden in terms of these diseases. The first aspect explains and provides the rationale for significant external financing in these countries, and the second the importance of mobilizing public financing.

The rapid rate of economic growth in much of the region, and the sheer size of its leading developing economies, makes it increasingly important for the region to develop new sources of financing for malaria control to replace the likely reduction in external financing from outside the region. A major challenge that many regional countries will face is how to maintain adequate levels of investment in malaria programs once elimination is achieved, and there remains no visible threat from malaria. Such funding and programs will need to maintain indefinitely until such time malaria is eradicated from the world as a whole.

This and the need to optimize resource use in countries point to the need to improve the availability of data on what diseases countries spend their money on. Recent evidence indicates that most published statistics underestimate the level of domestic financing for malaria and other diseases. However, reliable data and statistics on how much countries spend on priority diseases do not currently exist, and improving this situation will require supporting countries to develop more robust methods of tracking expenditures by disease, based on using a health accounts framework. However, experience in such methods is limited, and a concerted regional effort is need to share what regional expertise exists, and to support countries in building such capacity. Such efforts should build on investments that Global Fund is making in improving resource tracking through health accounts, and regional technical collaboration led by the regional NHA network and OECD.

In improving the financing options for infectious disease consideration needs to be given to the nature of each disease. In the case of malaria, most key interventions represent excellent value for money, with very high cost-effectiveness ratios, comparable to those of childhood vaccination. In addition, there are significant externalities to increased malaria spending. Acceleration of malaria control protects past
investments in malaria control in countries that have reached the elimination stage, as well as helping to prevent the emergence of artemisinin-resistance.

For various reasons, domestic private financing is poorly suited to provide the necessary new funds. This indicates that the region should focus on the following strategies to increase and sustain financing for malaria prevention and control:

(i) Explore innovative ways to leverage current external financing, in particular from Global Fund, to facilitate and incentivize regional governments to mobilize and allocate additional financing from domestic sources, including taxation. This should also pay attention to the challenge of maintaining adequate malaria financing after countries enter the elimination stage.

(ii) Explore options for innovative borrowing methods to finance an initial push on malaria control throughout the region.

(iii) Using public financing to expand key services.

(iv) Improve the capacity of regional countries to track accurately spending by disease.
1. The burden of malaria and other infectious disease in the Asia-Pacific region – Current levels and trends

Overview

Infectious diseases account for less than 2% of deaths in high-income countries, but are responsible for 21% of deaths in low-and middle-income countries. This difference in health status between rich and poor countries is glaring precisely because cost-effective interventions are available to prevent and treat so many of them (Jamison et al. 2006). Infectious disease represents the major difference between the disease profile of low and high mortality countries in the Asia-Pacific region.

Infectious diseases pose a range of challenges. Some are transmitted directly from one person to another, others through contact with insects or other animals. The human body's immune system readily resists some, whereas others, including auto-immune diseases, attack and weaken the immune system itself. Some present visible and obvious symptoms in a short time, while others are harboured for years before becoming active. Infectious diseases also vary in their virulence, infectiousness, and duration, and the infectious agents of some develop resistance to medications more rapidly than others.

Three infectious diseases, HIV/AIDS, TB, and malaria, account for about 10% of all deaths in low- and middle-income countries. Looking at just these three diseases indicates the immense variety of infectious diseases and demonstrates why strategies for dealing with them must be so different. HIV/AIDS is transmitted primarily through sexual contact, TB through inhaling infectious droplets in the air, and malaria exclusively from mosquito bites. HIV/AIDS attacks the body's immune system, while TB primarily attacks the lungs and malaria impairs the bloodstream and can attack the brain, liver, and other organs. Untreated HIV/AIDS is almost invariably lethal, and TB and malaria can also be fatal. Another 10% of deaths in low- and middle-income countries are attributed to other diseases caused by infectious or communicable agents. For many of these diseases, such as pertussis, tetanus, and diphtheria, vaccines are available and universal coverage is practicable. Nevertheless, millions of children remain unvaccinated and consequently risk illness or death.

Contribution of malaria and other infectious disease to regional disease burden

Although the incidence of malaria has been declining throughout the Asia-Pacific region and average infection rates are lower than in Africa, more than ~2.2 billion people remain at risk of malaria in Asia-Pacific, which represents ~67% of the world population at risk of malaria. Six of the ten countries worldwide with the largest populations at risk are also located in the Asia-Pacific region – India, China, Indonesia, Bangladesh, Viet Nam and the Philippines. The region reports the highest rates of anti-malarial drug resistance in the world, and the spread of resistance from South-East Asia to the rest of the world is the primary potential threat to the success of global malaria eradication efforts. Further, whilst the decline in malaria infection has been substantial across the region, this has not removed the mosquitoes that transmit malaria, and until malaria is eradicated globally, the region as a whole will continue to face the ever-constant risk of massive resurgence of malaria, should surveillance and response systems cease.

Whilst malaria was the leading cause of death in many regional countries just over half a century ago, its incidence has substantially declined overall and in terms of relative importance. That decline was very much part of and is also central to the general shift from infectious disease to non-communicable diseases (NCDs) in the disease burden facing countries. In line with global trends during the past two decades, the contribution of communicable, newborn, nutritional, and maternal causes to the disease burden has declined across all countries of the Asia-Pacific region, and that of NCDs has increased (Institute for Health Metrics and Evaluation, Human Development Network, and World Bank 2013a, b). Amongst infectious diseases, there has been a significant increase in the disease burden from HIV/AIDS, but the burden from other infectious diseases, including malaria, has generally declined. Consequently, malaria and other neglected tropical diseases account for a declining share of the overall disease burden in the region. It terms of DALYs (disability-adjusted life years), in 2010 they represented just 1.7% of the burden in South Asia, and 2.6% in South-East Asia (Figure 1). Although malaria does not contribute a large share of the overall disease burden, in a few countries it does, principally Myanmar, Timor-Leste, Papua New
Guinea, where it still accounts for 3.1–5.5% of all deaths (Institute for Health Metrics and Evaluation (IHME) 2013b).

**Figure 1: Causes of DALYs, both sexes, Asia-Pacific regions, 2010**

Source: Institute for Health Metrics and Evaluation (IHME) (2013a)

**Current regional patterns and trends in malaria**

As recently as the 1940s, malaria occurred in all areas of the region, except Mongolia, Micronesia and Polynesia, but its coverage has since been steadily reduced to 22 countries or territories in the region:

- South Asia (7): Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka
- Southeast Asia (9): Cambodia, Democratic Republic of Timor-Leste, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Thailand and Viet Nam
- East Asia (3): China, DPR Korea and Republic of Korea
- Pacific (3): Papua New Guinea, Solomon Islands and Vanuatu

**Figure 2: Status of malaria elimination and control in Asia-Pacific region, 2013**

Source: World Health Organization (2013b)
Of these, DPR Korea, Republic of Korea, Bhutan and Malaysia have all entered the pre-elimination stage of malaria eradication, whilst Sri Lanka is in the elimination stage. All have in effect stopped or are close to stopping local transmission. In the others, rates of transmission range from low to very high, such as in parts of PNG, Timor Leste and Myanmar, and the objective of current global and national strategies is to control and steadily reduce the incidence of malaria (Figure 2).

In contrast to Africa, transmission in the Asia-Pacific region is mixed, involving both *P. falciparum* and the harder to treat *P. vivax* in most countries, although where transmission is at low levels, *P. vivax* dominates. The region had an estimated 32 million cases in 2012, and 48 thousand deaths in 2012 (7.6% of global deaths), but these are highly concentrated, with India accounting for 40% of all cases in the region, and six countries (India, Myanmar, Bangladesh, Indonesia, PNG, Pakistan) accounting for approximately 65% of the death toll in the region (World Health Organization 2013b) – Figure 3. This picture also hides considerable variations within countries, with particular hot spots of malaria transmission in the eastern provinces of Indonesia and the border zones of Thailand.

However, whilst the incidence of malaria varies considerably between regional countries, the continuing transmission of malaria in several countries has direct relevance to the disease burden in the other countries. Even when local transmission has been stopped, all regional countries will continue to face the significant risk of re-infection from imported cases, and countries in elimination phase will need to maintain health system investments to detect and manage cases imported from countries still in the control phase.

**Figure 3: Malaria cases and deaths in Asia-Pacific**

Size representing absolute number of cases (sample ~1 million malaria cases)

Note: China and Sri Lanka (negligible burden) not shown.  
Source: World Health Organization (2013b)

**Distribution of artemisinin resistance**

A particular problem in the Asia-Pacific region is the emergence of resistance to artemisinin, with global incidence confined to four countries in the Greater Mekong subregion: Cambodia, Myanmar, Thailand and Viet Nam (Figure 4). Causative factors include weak government health systems with a high degree of reliance on weakly regulated private provision, and widespread use of artemisinin monotherapies. Contributing to this is the continued manufacture of oral artemisinin monotherapies by manufacturers in the region, with most of the responsible firms being located in India. The risk of transmission and spread of parasite resistance poses a significant threat to malaria elimination efforts in the wider region, and also globally. Although efforts to control the problem in the affected areas are in place, they indicate the importance for the region of accelerating progress towards elimination in these resistance-breeding hotspots, and taking more concerted action at the regional level to persuade all regional governments to shutdown production of artemisinin monotherapies.
Figure 4: Location of artemisinin resistance, Greater Mekong subregion

![Map of Greater Mekong subregion showing the location of artemisinin resistance tiers.]

Note: Tier I are areas where there is credible evidence of artemisinin resistance; tier II are areas with significant inflows of people from Tier I areas, including those immediately bordering Tier I; Tier III are areas with no evidence of artemisinin resistance and limited contact with Tier I areas. Source: World Health Organization (2013b)

2. The economic impact of malaria and other infectious diseases

Malaria and other infectious diseases can impose significant burdens on households and on the overall economy. Until the emergence of HIV/AIDS, malaria was probably the disease with the greatest impact on economies and societies in the Asia-Pacific region. Its effects were magnified both by the specific effects it had on individuals, as well by as its widespread prevalence. These effects include:

- The debilitation that it causes in infected individuals, which impairs or even removes their capacity to work. In areas of high prevalence this can have a significant negative impact on labour productivity, which is often worse in rural areas because of its tendency to infect in particular those involved in agricultural work.
- The direct medical expenses incurred by sick individuals and their families in obtaining treatment, often in the context of poor performing healthcare systems which are unable to provide effective coverage with free or subsidized services. In many countries in the region, particularly those with substantial reliance on out-of-pocket financing, such forced expenses frequently impoverish households.
- The indirect costs imposed on families who have to devote significant time and resources to look after sick family-members or who suffer significant income losses when this reduces the ability of the family to work. Such impacts can be large – a high incidence of such hardships during malaria epidemics in Sri Lanka were a critical factor in that country’s decision to expand provision of hospital services from the 1930s.
- A high prevalence of malaria has often discouraged settlement in affected areas, denying nations the ability to make effective use of their available land. At a large scale, such factors may have been the primary reason behind the decline of the irrigation cultures of Cambodia and Sri Lanka.
- The risk of malaria infection can discourage foreign investors and tourists, holding back economic growth. This is particularly the case in many of the affected areas of South-East Asia.
The available evidence (Gallup and Sachs 2001) indicates that the presence of malaria may have reduced economic growth by 1–2% a year in affected countries during recent decades, and that eliminating malaria has the potential to improve economic growth by a similar amount, if other supportive economic policies are in place. In several countries, malaria elimination has also opened up large areas of land for routine cultivation, and promoted agricultural growth.

The impoverishing effects of malaria and other infectious disease on individual families are almost universal in the absence of universal healthcare coverage (UHC). In many countries in the region, illness is the leading cause of families becoming impoverished. It is likely that malaria contributes significantly to impoverishment in countries such as Cambodia and Laos, and in parts of India and Indonesia. Addressing this requires investing in expansion of effective healthcare coverage, and has the added benefit of promoting poverty reduction.

The size of its effects on families and economies, and the economic benefits of eradication, justifies prioritizing investment in control of malaria over most other infectious diseases.

3. The health financing context and health expenditures in the region

The financing challenge

Amongst infectious diseases, malaria and HIV/AIDS presents health systems in the region with the largest challenges. The Global Malaria Action Plan (Roll Back Malaria 2008) estimates a funding need of USD 24 billion for malaria control in the Asia-Pacific region during 2015–2025. These levels reflect the availability of effective malaria interventions and the need to scale up coverage.

Countries that are attempting to control malaria need to make major investments in both prevention and treatment strategies. Historical estimates from the Global Malaria Eradication Program in the 1950s and 1960s suggest costs ranging between $0.50 and $2.00 per person per year, or $3 to $13 per person per year in today’s dollars. Estimates from current programs suggest levels of $2 to $25 per person per year, which are not too dissimilar (Feachem and The Malaria Elimination Group 2009). Since the highest burden countries also tend to be poor, the required funding represents significant shares of their overall healthcare spending, in some cases as much as 20%. The ability of countries to mobilize such funding depends not only the level of current financing, but also how their health systems are financed and structured, and ultimately the political commitment of governments.

Financing levels in Asia-Pacific countries

Levels of healthcare spending vary immensely across the region, but in general spending levels increase with increasing per capita GDP. These patterns mirror global patterns. As per capita GDP increases, countries are more able to mobilize public financing, particularly general revenue taxation but also including social insurance, and overall public spending increases as a share of GDP (Figure 5). In the Asia-Pacific region, public financing for health increases from 1.6% of GDP in the low-income economies to 2.7% of GDP in the upper-middle income economies. However, mobilization of financing from private sources as a share of GDP generally falls as incomes rise, because of the tendency of countries to improve public financing (Table 1). Small countries and Pacific Island economies are the only exception to this pattern. These often benefit from high inflows of external financing relative to their GDP, and sometimes have above average capacity to mobilize taxes in the case of islands.

This financing pattern is closely linked to how health services are delivered in most of these countries. In most low and lower middle-income Asia-Pacific countries, overall and public healthcare spending is low (<US$ 75 per capita), and private spending accounts for more than half of all expenditures by default. This private spending is almost all household out-of-pocket spending, and most of it finances private providers, with the exception of countries like Viet Nam, where the public sector relies heavily on official

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1 It is important to note that the high reliance on private financing in these low-income countries does not imply that they mobilize more private financing than richer countries. In practice, they mobilize similar levels of private financing.
user charges. In most of these countries, the bulk of this private expenditure finances less than fully qualified providers, pharmacies or drug shops. Where this is the case, e.g., Bangladesh, India, Cambodia, these providers are generally not licensed, and are effectively outside the control and influence of government. The inability to regulate and influence providers is the corollary of the weak capacity of these governments to mobilize public financing and is also linked to weak public healthcare delivery systems. Typically in these countries, this heavy reliance on household spending is considered a key problem and impediment to achieving UHC, because the barriers it creates to accessing care and the significant problem of impoverishment that it creates (Rannan-Eliya et al. 2012a).

Figure 5: Sources of financing in health systems, Asia-Pacific countries, 2010

Table 1: Composition of health expenditures by income level of countries, Asia-Pacific region and globally, 2012

<table>
<thead>
<tr>
<th>Grouping</th>
<th>Per capita health expenditure (USD)</th>
<th>Public health expenditure (% of GDP)</th>
<th>Private health expenditure (% of GDP)</th>
<th>Total health expenditure (% of GDP)</th>
<th>External financing (% of total health expenditure)</th>
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<tr>
<td><strong>Asia-Pacific</strong></td>
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<tr>
<td>Low-income countries</td>
<td>71</td>
<td>1.6</td>
<td>3.6</td>
<td>5.0</td>
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<td>Lower middle-income</td>
<td>166</td>
<td>2.3</td>
<td>2.2</td>
<td>4.5</td>
<td>11.5</td>
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<td>countries</td>
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<td>Upper middle-income</td>
<td>514</td>
<td>2.7</td>
<td>1.7</td>
<td>4.4</td>
<td>0.6</td>
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<td>countries</td>
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<td></td>
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<tr>
<td>High income countries</td>
<td>3,228</td>
<td>5.8</td>
<td>2.9</td>
<td>8.3</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Note: Unweighted values used for each group.
Middle-income countries are much more able to mobilize public financing from taxation and also social insurance, and they rely far less on private financing. These countries generally spend US$100–500 per capita on healthcare, and most of this is in the form of public financing. Again most of this public financing is used to finance public providers. In only a few countries in the region, are substantial amounts of public money used to pay private medical providers, and these are for the most part only the high income economies, such as Japan and Korea, with the exceptions being two middle-income countries with substantial social insurance programs that can pay private doctors and hospitals, i.e., Indonesia and Philippines. This inability of governments in the poorer countries to use public money substantially to finance private treatment is linked to their much weaker capacity to manage such a split between purchasing and provision, and also the reality that private provision is often more expensive than their already underfunded public providers. Most public financing of private medical care is linked to the existence of social insurance schemes, and poor countries lack the capacity to scale up social insurance (Hsiao and Shaw 2007).

These patterns of financing and delivery have a number of important implications for increasing spending on infectious diseases, such as malaria, because the countries who face the largest burdens and challenges in responding to such diseases are generally the poorest countries, with the lowest levels of healthcare spending:

1. Adequate levels of financing to target specific diseases will represent very large shares of their available resources, in a context where other priorities are also underfunded. This implies that by themselves the priority countries for scaling up control of malaria are least able to self-fund the funding requirements.
2. They have the least capacities to mobilize public financing, have low and inadequate levels of public financing and usually high levels of medical impoverishment due to greater reliance on private spending.
3. They are least able to use public funds to effectively finance or influence private providers, and their private providers tend to be predominantly disorganized and beyond regulation.

Consequently, many of these countries receive above-average levels of external financing. Both their poverty and the fact that underinvestment in managing their infectious diseases has negative effects on other countries provide a strong rationale for such sharing of the financing burden with richer economies. However, where such aid flows are substantial, it often acts as a disincentive for the country to mobilize their own government financing, and so the net impact on overall funding is less than donors might hope for. This effect of the fungibility of aid has been well documented at the global level, and in individual countries such as Bangladesh where the data indicate that the government has reduced its own expenditure effort almost a dollar per dollar of external financing. The other problem with such high levels of aid flows is that it almost guarantees inefficiencies in health care delivery in the recipient countries, making further expansion most costly.

4. Spending on malaria and other infectious diseases

The overall patterns of financing in a country’s health system significantly influences how specific diseases are financed. When infectious diseases have only modest impacts on patients and when the typical outpatient provider is readily able to provide treatment, the financing of treatment tends to resemble that of the overall healthcare provision. So in countries, where there is a significant level of private financing and provision, financing of most treatment of infectious disease is often private. It is not surprising that the countries where a substantial part of all malaria treatment occurs privately are also the same countries with heavy reliance on private financing, e.g., Cambodia, India, Myanmar, etc. The major exceptions arise when the treatments involved require interventions that are either expensive or require specialized services, HIV/AIDS being a typical example. In contrast, most interventions that involve collective or population-based actions tend to be predominantly publicly financed, e.g., vector control.

During the past three decades, there have been increasing demands and recommendations for countries and the global community to track resource flows for specific diseases and conditions. These have been pushed both as a means to aid accountability and monitoring, as well as to enable national policy-makers to better allocate national resources or plan and monitor specific disease control efforts.
The most effort has been made in tracking spending on the priority infectious diseases, HIV/AIDS, malaria and TB. For example, UNAIDS has for almost three decades encouraged countries to conduct National AIDS Spending Assessments (NASA) to analyse and profile spending on HIV/AIDS. These were intended both to promote the need for additional spending and to assist countries better allocate and target resources. Since 2002, UNAIDS has also asked countries to report key indicators of annual spending on HIV/AIDS as part of the global monitoring of the commitments made in the 2001 UN General Assembly Special Session to scale up action against the HIV/AIDS epidemic. Other WHO-led disease initiatives, such as Roll Back Malaria (RBM) and StopTB, ask countries to report annually on national expenditures on malaria and TB, and UNFPA leads a multiagency effort to track resource flows for reproductive health, family planning and STD/HIV/AIDS. The emergence of major donor initiatives to provide external funding for specific diseases has also led to a proliferation of demands on beneficiary countries to track and report a range of disease-specific spending information. For example, US PEPFAR and the Global Fund to Fight AIDS, TB and Malaria (GFATM) both require recipient countries to report spending on relevant diseases, including expenditures by domestic sources.

Despite these considerable efforts to do so, accurate and comprehensive estimates of how much is spent on different diseases are in practice not readily available for most countries, and what estimates exist often suffer from significant errors. Numerous problems and issues bedevil these efforts:

(i) Generally efforts to estimate spending focused on single diseases suffer from considerable inaccuracies owing to errors in consistently allocating spending on services benefitting more than one disease. Often this leads to overestimation of spending on a disease, and in some cases estimates of spending on different diseases that sum to more than total national health expenditures.

(ii) The various efforts to track spending on individual diseases use different methods and frameworks, and so their different estimates are not compatible or comparable to one another.

(iii) Many of these efforts work with disease programs, which lack the information or expertise to estimate spending outside their own program budgets. This is a particular problem for diseases and conditions that are largely managed by routine health services, e.g., treatment of malaria and typhoid. For example, the Global Fund estimates that the Solomon Islands under-reports government spending on malaria by 90%, largely because it ignores spending in general healthcare facilities. Such problems are commonplace in most of the disease expenditure reports filed with the Global Fund.

(iv) Most initiatives to track spending on specific diseases are not coordinated at the country level, and both fail to work with one another, or to work with national agencies with the lead responsibility for tracking national health spending using national health accounts, the tool recommended by all international agencies. This results in duplication of efforts, considerable wastage of resources, and failure to institutionalize national capacity to track resource use.

(v) The profusion and complexity of the different reporting requests that are being made creates a significant burden for countries, in terms of data requirements, resources and coordination.

Recently, consensus has emerged amongst key international agencies and funders that the solution for better tracking lies in supporting countries to extend national health accounts (NHA) systems to track spending on all diseases. In 2011, WHO, OECD and Eurostat collaborated to release a new global standard to track national health expenditures, SHA (System of Health Accounts) 2011, which builds on recent global experience by providing a more formal framework for tracking disease-specific expenditure flows within internationally comparable and standardized health accounts systems. WHO has also supported two pilot studies in Sri Lanka and Thailand, which explored and demonstrated the feasibility of extending NHA to track disease-specific expenditures in developing countries, and identified solutions to a number of common methodological problems. These projects also demonstrated that it was possible to estimate expenditures across the full range of diseases, and suggested that this approach was likely to be cheaper, less resource intensive and more reliable than attempting to track spending one disease at a time. More recently, ADB has funded work in Bangladesh that has demonstrated the feasibility of these approaches even in low-income countries, and which also indicate that domestic expenditures on malaria are several times greater than what the country officially reports to Global Fund (Figure 6).
Recognizing the potential for this type of approach to yield more reliable estimates of spending on the diseases of priority to it, the Global Fund has recently endorsed the use of health accounts as a basis to track spending by disease, and has committed to providing recipient countries with financing to establish the process. Currently, only two developing countries in the Asia-Pacific region have reliable estimates of how healthcare spending is distributed across all diseases – Sri Lanka and Thailand, whilst Bangladesh has partial estimates. If the technical expertise available in the Asia-Pacific region can be shared, and adequate financing mobilized, it should be feasible to substantially expand the number of countries in the region with similar capacity, and to substantially increase the availability of reliable estimates of how much each country spends on malaria and other infectious disease. The increased availability of better estimates would significantly help countries to better plan resource allocation and mobilization to address the challenges of malaria and other priority diseases.

5. Key economic issues in the response to malaria and related diseases

There is no straightforward answer to the question how much should be spent on specific diseases, and how. Even if healthcare spending and interventions are effective in combating a disease, it does not necessarily mean that such spending is appropriate or desirable. Nor is this sufficient to tell us how this money should be financed and spent. The fundamental constraint is that available resources are limited, and there is always an opportunity cost to spending money on a specific disease. First, the more money spent on health purposes means less money available for other purposes of value to society, such as education, infrastructure or enhancing income security. Second, healthcare spending allocated to one disease or one intervention means less money available for other diseases and interventions. The opportunity costs of spending must also be balanced by the potential benefits. These benefits are not only restricted to the cure of individual patients, and might include prevention of disease in others and improving income and living standards.

Cost-effectiveness of available interventions

The most cost-effective interventions currently available include immunization for childhood infectious diseases, malaria prevention, HIV/AIDS prevention, and treatment of TB. From purely cost-effectiveness
grounds and given the high disease burden from these diseases, it makes sense to invest in adequate access to these interventions in most developing countries. Most prevention and even treatment options for malaria represent extremely good value for money.

**Externalities**

Treating or preventing infectious diseases in particular generates significant externalities, because stopping disease transmission in a few individuals often results in reduced risk of infection in others. Such benefits are classically associated with childhood immunizations, but also attach to malaria and TB treatment. Because malaria depends on the transmission of parasites from one infected human to another via mosquitoes, treatment in many contexts substantially reduces risks others in the community. There are significant externalities also in reducing malaria transmission in critical hot spots where artemisinin resistance occurs, since by stopping malaria in these areas, the risk of resistance can be substantially reduced.

This issue becomes more important as more countries successfully control malaria and enter the elimination stage. For these countries the major risk they face is of resurgence of malaria as a result of importation of infection from other areas. Significant resurgence automatically devalues previous investments in control, and so reducing malaria infection in control areas has significant externalities for other countries.

**Public goods**

Many aspects of infectious disease control have the potential to represent public goods, that is have benefits that cannot be confined to specific individuals. These include most forms of vector control, and also efforts to generate new interventions for disease control, e.g., new vaccines for malaria or typhoid. Other public goods type activities include efforts to increase evidence on about the performance of health systems including tracking resource flows, strengthening national and regional capacities in developing countries to conduct health systems and health services research, and creating regional mechanisms to facilitate collaboration between countries on disease response.

**The profile of spending needs over time**

For several infectious diseases, policy-makers need to pay more attention to the long-term evolution of spending requirements and how interventions can affect this. For example, in the case of HIV/AIDS, time limited investments to expand coverage of antiretroviral treatments inevitably creates a long-term future expenditure obligation, since HIV/AIDS patients treated in this way can now expect to have life-expectancies of 30–40 years, and it will not be socially or politically feasible for most donors to withdraw such funding once coverage is provided. Whilst the initial investment might make sense today, this effectively denies funding to other interventions in the future as well.

A similar issue applies to malaria. The global experience in the 1960s–70s, was that when investment in malaria control was reduced in countries, which had achieved elimination, this resulted in huge resurgence of the disease, rendering valueless all the previous efforts to achieve elimination. This problem exists today as countries enter the elimination stage of malaria control. In order to preserve the value of the huge investment made to achieve elimination, these countries will continue to need to invest substantial funds to maintain the program infrastructure to continue surveillance, and manage new cases as they appear. This investment will need to continue until the risk of re-introduction has been eliminated by global eradication or the unlikely event that a cheap mass vaccine to prevent malaria is developed. Unfortunately, whilst this problem is well understood by malaria experts, it is proving a challenge to persuade relevant policy-makers. There continues to be doubt about whether Global Fund is able to and willing to continue funding countries for indefinite periods once they achieve elimination, and within countries, including Sri Lanka today, there remains considerable concerns about the political feasibility of maintaining adequate funding levels once the disease no longer presents an obvious and visible threat.

The time course of investment needs also affects the benefits of different financing options. For diseases where the benefits of an initial investment persist, as is the case with TB treatment, it may make sense to bring forward investments and borrow funds to invest now, in effect transferring the funding burden to the future. In such scenarios, it makes economic sense to explore the options for borrowing funds for current interventions, and ideas such as special bonds to raise money for specific diseases makes sense.
Availability and sustainability of domestic and external financing

The ability of countries to mobilize domestic or external financing is an important consideration in developing disease strategies. Poor countries have weak capacities to mobilize domestic public financing for health, which justifies providing them with external financing if targeting the relevant diseases has significant benefits for other countries or if the desire for international solidarity is strong. Since poor and small countries are able to mobilize such external funding in large amounts, it makes sense for these countries to expand coverage of critical interventions if the external financing picks up much of the costs. However, over the longer term, sustainability depends on countries being able to switch the burden to domestic sources if external financing reduces.

To the extent that most countries in the Asia-Pacific region enjoy relatively good economic growth and are transitioning out of low-income status, and given that many of them are large economies, sustainability at the regional level must involve significantly the ability of the region to translate higher per capita GDP into greater public financing for health. In the case of HIV/AIDS and malaria where continuing levels of investment are needed into the indefinite future, shifting more of the burden of financing from external to domestic public sources may be highly advisable. This creates a significant challenge of how to facilitate and encourage governments to give attention to increased domestic resource mobilization, whilst external financing remains substantial. Linking external funding to increasing domestic financing levels is likely to be a key component in such a strategy. Generating better evidence on how much domestic financing already is might also help disease programs justify increasing budget allocations to disease programs over time.

Feasibility of alternative financing sources to provide effective funding

The source of domestic financing affects how it can be used to combat infectious diseases. Within public financing, general revenue taxation has significant advantages over social insurance schemes, because most major infectious disease threats preferentially affect the poor and informal workers, who are the least likely to be covered by contributory insurance mechanisms. In addition, the countries with the greatest burden of infectious disease are least able to use scale up social insurance coverage, which ultimately requires significant tax subsidies (Hsiao and Shaw 2007).

The high proportion of private financing in total healthcare expenditures in the countries with the highest burden of diseases such as malaria and TB, have led to calls to better utilize such funding to address these diseases. However, there are significant constraints to mobilizing this private financing. First, the very countries with high levels of private financing have the weakest capacity to regulate and control private sector providers, so in practice are the least able to channel substantial private financing to priority goals. Second, such private financing is usually mostly out-of-pocket spending, the distribution of which does not match well the distribution of the relevant infectious diseases. For example, a recent ADB study shows that in most of the relevant countries with high out-of-pocket spending shares in total health financing and high rates of infectious disease, usually only one third or less of out-of-pocket spending is by the poorest one half of the population which bears most of the infectious disease burden (Figure 7). Third, in most of these countries with limited state capacity and limited public sector services, the majority of private provision is by unqualified private providers, who are inherently more difficult to engage in the provision of quality healthcare. In practice, these realities indicate that domestic private financing will be difficult to mobilize effectively to these priority health goals.
6. Recommendations

1) Amongst infectious diseases, there is a strong rationale to prioritize malaria ahead of other diseases after HIV/AIDS, TB and vaccine-preventable childhood diseases.

2) Accelerating control of malaria in high incidence regional countries should be prioritized further because of the significant externalities arising from preventing resurgence of malaria in other countries.

3) Regional countries and partners should invest in rapidly expanding capacity of regional countries to track spending by disease to supplement efforts by Global Fund, by supporting existing regional knowledge sharing and collaboration.

4) Explore innovative ways to leverage current external financing, in particular from Global Fund, to facilitate and incentivize regional governments to mobilize and allocate additional financing from domestic sources, including taxation. This should also pay attention to the challenge of maintaining adequate malaria financing after countries enter the elimination stage.

5) Explore options for innovative borrowing methods to finance an initial push on malaria control throughout the region.

6) Continue to rely on public financing to expand key elements of the regional efforts against malaria.
Bibliography


