

BEYOND COMMUNICABLE DISEASE CONTROL: HEALTH IN THE AGE OF GLOBALIZATION

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Health concerns have triggered systematic international cooperation for more than 150 years. Disease control was also the core concern of the first formal international organizations. After World War II this tradition of international cooperation was strengthened with the creation of the World Health Organization and expanded with the establishment of official development assistance. During the 1950s medical science and technology progressed, and ambitious initiatives for the eradication of communicable diseases were launched, creating great optimism that such diseases would be eliminated. Today, however, communicable diseases remain a challenge. Old diseases have reemerged, and new infectious diseases—especially HIV/AIDS—are causing living and health standards to regress in many developing countries. Why has this happened, and what is being done about it? Moreover, how can current responses be improved? These questions propel this chapter's analysis.

The chapter starts by summarizing international efforts to fight communicable diseases in the 19th century and the first half of the 20th century. It then describes the results of international cooperation on public health since the 1950s. To help understand why some communicable diseases have been tamed while others remain a problem, the chapter analyzes three health challenges. The main finding is that problems tend to persist when the publicness of the response is limited. Here publicness refers to three inputs crucial for controlling disease: available and accessible medical knowledge, a national public health infrastructure, and private household spending on complementary goods and services. The chapter's analysis focuses on the first two inputs. It then explains why health concerns have returned to the top of the international agenda and characterizes current actions to address international health challenges as efforts to enhance the publicness of responses. The chapter concludes by suggesting steps to consolidate and improve these responses.

A BRIEF HISTORY OF COMMUNICABLE DISEASE CONTROL

For the purposes of the analysis in this chapter, international efforts to control communicable diseases can be divided into two periods: responses before the 1950s and those since.

Focusing on “at the border” controls: responses until the 1950s

Past epidemics have led to an increasingly coordinated, centralized approach to communicable disease control. Desai (in this volume) describes how care for sick people evolved beyond the realm of the family and the church into the hands of public authorities—first local governments, then central governments.

As human activity expanded geographically, so did the spread of communicable diseases. Technological developments in transportation throughout the 19th century (the steam engine, railroads) made the global spread of communicable diseases easier than ever before. For example, in the early 19th century a cholera epidemic took eight years to spread globally: it broke out in India in 1826, reached eastern Russia in 1827, moved to Germany, Hungary, and Austria through 1831, and hit Paris, London, and New York in 1832, the U.S. Pacific coast in 1833, and Mexico City in 1834, where it apparently stopped (Cooper 1989, pp. 107–08).

The public policy response to global epidemics started by imposing strict quarantines at ports (Cooper 1989, pp. 103–07). But with each country fending for itself, quarantine requirements were often redundant, imposing a great burden on commerce and travel. As a result in 1834 the French government issued the first call for international cooperation to prevent the spread of diseases. But it took another global epidemic of cholera, in 1848–49, for the first international sanitary conference to be held, in 1851 (Lyons 1963, p. 240). Three more conferences followed—in 1859, 1866, and 1874.

Across the Atlantic yellow fever (of little worry in Europe) was as much a concern as cholera. Endemic to West Africa, yellow fever reached the Americas in the 17th century, becoming “the disease that sparked the greatest fear, claimed enormous numbers of lives, and ignited public health policies for decades to come” (Garrett 2000, p. 281). After a continentwide epidemic in the 1870s, and because the European-led sanitary conferences had failed to address yellow fever, a fifth international conference, called by North and South American states, was held in 1881 in Washington, D.C. (PAHO 1992).

None of these conferences resulted in binding agreements between countries. The main obstacle was a lack of understanding of diseases and of how communicable diseases were transmitted. Only as science and practical knowledge progressed was it possible to reach consensus. In 1892 countries finally adopted an International Sanitary Convention, agreeing on steps to fight the cross-country transmission of cholera (Cooper 1989, p. 210). Although the measures adopted continued to focus on quarantine, there was an effort to rationalize quarantine

requirements and to improve the reporting and communication of the health condition of travelers. Thus international coordination focused on “at the border” controls, but countries were also starting to build national public health systems.

In 1902 North and South American nations went further, establishing the International Sanitary Bureau—the precursor to the Pan-American Health Organization (PAHO), the first formal international organization for public health (PAHO 1992). In Europe a second international organization dealing with international health issues was created in 1907: the International Office of Public Hygiene, based in Paris. The Health Organization of the League of Nations, created after World War I, became the third entity devoted to international public health. All three organizations became engaged in monitoring diseases and in sharing epidemiological and other scientific information (Zacher 1999). Still, their focus remained on at-the-border controls (especially quarantine regulations)—so much so that because influenza could not be quarantined and smallpox was considered a universal disease, neither was among the diseases addressed by these international organizations (Cooper 1989, p. 228).

International cooperation in health was not limited to governments and formal intergovernmental organizations. Volunteers and nongovernmental organizations have always played important roles, contributing to the diffusion of ideas and to the development of actions to mitigate ill health in the context of social, religious, and humanitarian movements (Loughlin and Berridge 2002, p. 9). For example, the International Committee of the Red Cross (created in 1863) contributed to the establishment of the Geneva Convention on the treatment of combatants, setting ethical standards and safeguards that were a precursor to later international health regimes (Dodgson, Lee, and Drager 2002). In 1913 the Rockefeller Foundation became active in the international promotion of public health, including by financing the Health Organization of the League of Nations.

Under these initial international arrangements for communicable disease control, action tended to follow crises. The first responses came at the local or national level, but as the ineffectiveness and difficulties of these uncoordinated actions became clear, calls for international cooperation emerged. International cooperation focused on limiting the international spread of diseases, especially by harmonizing border controls. The second half of the 20th century saw a new era of international cooperation in health: meeting diseases at their sources.

Meeting diseases at their sources: the creation of the World Health Organization and the emergence of aid

After its creation in 1948, the World Health Organization (WHO) became the locus of international cooperation on health. The WHO absorbed the International Office of Public Hygiene and the Health Organization of the League of Nations. The International Sanitary Bureau was renamed PAHO and became the WHO’s regional office for the Americas (PAHO 1992, p. 42). In a period of

great vitality in the scientific understanding of infectious diseases and of progress in medical technology—in vaccines for prevention and drugs for treatment—the WHO added eliminating communicable diseases at their sources to its mandate of containing their spread through its more traditional functions of coordinating international health regulations and serving as an information clearinghouse.

Addressing diseases at their sources required a new type of interaction between governments and the WHO. National health authorities provide most of the control of diseases at their sources. But for developing countries without the capacity or resources to control communicable diseases, the WHO helped do so—a move made possible by the recent creation of official development assistance, funded by industrial countries. The WHO's expanded mandate, coupled with official development assistance, also made possible systematic attempts to eradicate diseases, which require international coordination beyond the capacity of any one country.

POLICY RESPONSES AND ACHIEVEMENTS: LIMITED PUBLICNESS

So what have been the results of this new international framework for addressing communicable diseases? Some impressive achievements have been made. For example, the Onchocerciasis Control Programme was created in 1968 to control river blindness in 11 West African countries—and is ending in 2002 having achieved its goal. The program has also established national capacity so that countries can continue to control the disease.

In addition, smallpox has been eradicated. In 1967, when the eradication effort was intensified, smallpox infected 15 million people and caused 2 million deaths. Had smallpox not been eradicated, between 1967 and 1998 there would have been 350 million infections and more than 40 million deaths (<http://www.who.int/archives/who50/en/smallpox.htm>). Smallpox eradication cost nearly \$300 million, with industrial (donor) countries paying for about one-third. It is estimated that the United States recoups the costs it incurred once every 26 days—every 26 days the benefits accruing from not having to deal with smallpox are equal to the total U.S. eradication cost (<http://www.unfoundation.org/campaigns/polio/challenge.asp>).

Other eradication efforts were less successful. In the mid- to late 1950s initiatives were launched to eradicate malaria. Although malaria was eliminated in some parts of the world (Southern Europe, Jamaica), in others (India, Sri Lanka) it recurred after eradication efforts stopped. The strategy for eradicating malaria presumed that its vector—certain mosquitoes—could be eliminated using the chemical DDT. But mosquitoes' ability to develop resistance to DDT was underestimated, and subsequent concerns about DDT's environmental effects made this strategy impossible to pursue. Aylward, Hennessey, and others (2000) find that successful eradication depends on a number of conditions: biological (no non-

human reservoir for the infectious agent), technical (availability of an effective vaccine or treatment), economic (with benefits exceeding costs), political (political commitment), and social (social support). Malaria eradication was impeded by imperfect understanding of its biological feasibility and dwindling support for its strategy.

Today we know that the optimism of the mid-20th century was premature: communicable disease control is an enduring challenge. Communicable diseases account for one-third of the global disease burden (WHO 2001b, table 3) and in 1998 were the leading cause of premature death, causing nearly half of all deaths before age 45 (WHO 2000, p. 1). Old “killer diseases” have resurged: in 2000 malaria caused more than 1 million deaths, childhood infectious diseases caused 1.4 million deaths, and tuberculosis killed more than 1.5 million people (WHO 2001b, table 2). In 1999 there were 8.5 million new tuberculosis infections (WHO 2001b, table 10). And new diseases, especially HIV/AIDS (see below), are killing several million people a year. All of this is happening in a context where resistance to treatments for communicable diseases is limiting the available options for disease control.

To understand the challenges of communicable disease control, the analysis below focuses on three health challenges, chosen for the intriguingly different policy responses to them: poliomyelitis (polio), acquired immunodeficiency syndrome (AIDS) caused by the human immunodeficiency virus (HIV), and infections with antimicrobial-resistant agents. (Later in the chapter a noncommunicable condition, sickle cell disease, is also considered.) These three cases are of worldwide reach, and resolving any of them constitutes a condition-specific global public good: eradicating polio, controlling HIV/AIDS, and containing antimicrobial-resistant infections (table 1). Protecting a single individual from

TABLE 1

Characteristics of and responses to the four cases

Case	Criterion for adequate provision	Global reach?	Global awareness?	Inputs developed?	Global access to inputs?
Polio	Eradication	Yes	Yes	Yes	Yes
HIV/AIDS	Control	Yes	Yes	Yes, partially	Limited
Infections with antimicrobial-resistant agents	Containment	Yes	Yes	Minimally	Limited
Sickle cell disease	Control	Yes	No	Minimally	Very limited

infection has positive externalities because it constrains the spread of communicable diseases (“herd immunity”). Thus eradicating (when possible) or controlling communicable diseases that can spread globally is a global public good (Sandler and Arce M. 2002).

The difference among the first three cases in table 1 lies in the extent to which inputs to control them have been developed and deployed. Thus the analysis of the cases focuses on the three types of inputs that communicable disease control (or containment of antimicrobial-resistant agents) typically requires:

- Type 1: available medical knowledge (implying the generation of scientific knowledge and production of medical technologies) and access to pharmaceutical and other medical technologies (including their affordability in developing countries).
- Type 2: a functioning public health care system to detect disease outbreaks, channel interventions, and monitor and report progress on communicable disease control.
- Type 3: private spending—even if the previous two inputs are available and affordable, individuals and households need to have the means to make complementary expenditures.

In this analysis a disease is considered to have been met with a fully public response if all three types of inputs are developed and made available. Most of the analysis focuses on the first two. The first, medical knowledge and drugs for treatment or vaccines for prevention, can be considered global public goods for health (Sandler and Arce M. 2002; Mills 2001). These global public goods are often necessary (though insufficient) for communicable disease control. Knowledge about how a disease is transmitted can be used to control it. For example, the strategy for dracunculiasis (guinea worm) eradication is based largely on the knowledge that infection occurs after drinking contaminated water. Infection can be prevented through measures as simple as using water filter cloths. Because dracunculiasis control was associated with safe water, guinea worm eradication was one of the objectives for the International Water Supply and Sanitation Decade (the 1990s). The number of infections dropped from 3.6 million in 1986 to 75,000 in 2000, mostly as a result of providing access to filtered drinking water (<http://www.who.int/ctd/dracun/progress.htm>).

In other cases, as discussed below, effective control intervention requires developing and deploying medical technologies, including drugs for treatment and vaccines for prevention. Underprovision of or limited access to these global public goods reflects a limited publicness in the policy response. In many cases access is limited because the needed medicines are unaffordable in developing countries, even if there are no formal restrictions on access. However, the publicness of the response—and thus its success—also depends on the other two types of inputs, especially the public health care system.

Policy response to polio: public, determined, and inclusive

Polio is caused by three strains of polioviruses that destroy nerve cells, causing paralysis. Historically, polioviruses infected almost all infants, paralyzing and permanently disabling about 0.5 percent of all children (Aylward, Hull, and others 2000). Of those, 4–10 percent died. Before its accelerated control through vaccination, polio had global reach, affecting both industrial and developing countries—and within countries, both rich and poor people (Woodward, Smith, and others 2001).

The response to polio was spearheaded in the United States in the 1930s, driven by public concern accentuated by the fact that the disease affected public figures and mobilizing a strong response from civil society.¹ In the early 1950s polio figured in public opinion polls as the second most important concern of Americans, right after the threat of a nuclear confrontation (Seavey, Smith, and Wagner 1998). The National Foundation for Infantile Paralysis (known as the March of Dimes) funded treatment and vaccine research, leading to the development of the first polio vaccine in the mid-1950s by Jonas Salk. The March of Dimes also funded initial clinical tests for and mass delivery of the vaccine in the United States. The research outcomes funded by the March of Dimes were not allowed to be patented: they were made public by design.² Thus access to the vaccine was not impeded by a patent—so medical knowledge and technology (type 1 inputs) were widely available.

Mass vaccination reduced the number of polio cases in industrial countries by 86 percent between 1955 and 1957, but developing countries were excluded from the response. Polio had not been immediately recognized as a threat in developing countries. As a result, even in 1988, 350,000 cases of polio were detected in 125 countries. Making the formulation of the vaccine public was a crucial step toward controlling polio in industrial countries but was not sufficient in developing countries. Most of the costs of polio vaccination stem from support staff, vehicles, storage facilities, and other equipment—not from the vaccine—so successful vaccination initiatives depend on local health facilities and the ability to buy private goods (type 2 and 3 inputs). Lack of access to these inputs excluded many developing countries from benefiting from the polio vaccine.

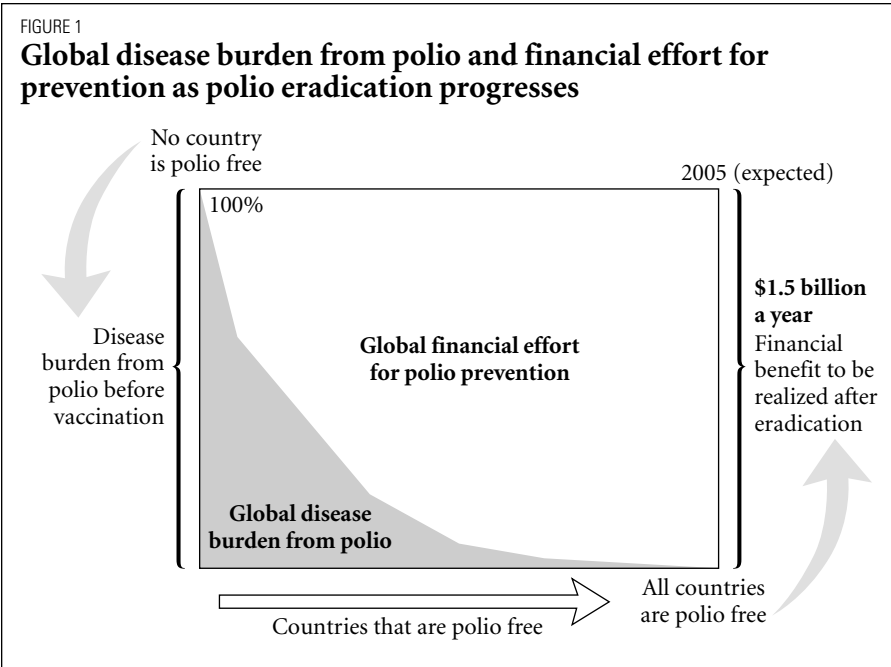
In 1988 a combination of national self-interest and commitments from international organizations (WHO, United Nations Children's Fund) and philanthropic foundations (Rotary International) led to the Polio Eradication Initiative.³ The initiative, still under way, mobilizes resources to deliver the vaccine even where public health facilities are inadequate. Between 1988 and 2000 the incidence of polio around the world was reduced by 99.9 percent (from the 350,000 cases in 1988 to less than 500 in 2001; WHO 2002, p. 100; http://www.polioeradication.org/all/news/_files/pdf/PN15-05-02.pdf). Almost half a century had passed since a similar response had been provided in industrial countries.

Action on eradication was driven by the technical feasibility of the endeavor (made possible by past investments in technology and a track record of success associated with the response to the disease in industrial countries) and by its significant health and economic benefits (prospects of future, and permanent, health and financial gains). Looking at polio eradication as a disease-specific global public good helps in understanding the evolving structure of incentives that led to the eradication effort. After the initial vaccination effort in industrial countries, incentives for eradication became different for industrial and developing countries. Successfully controlling polio in industrial countries amounted to national elimination of the disease. National elimination is a national public good. Once a country is disease-free, its incentives to invest in global eradication are limited—and in fact diminished if only health benefits are considered (see Barrett in this volume and Philipson 1999).

Because polio-free countries had fewer health-related incentives, the effort to eradicate polio at the global level moved toward an “international effort.” International organizations and foundations assumed a leadership role in eradicating polio, in conjunction with countries not yet free of it.⁴ Does that mean that global eradication has no benefits for countries already free of polio? There are benefits, but less of a health nature, since polio does not represent a direct health threat to polio-free countries. Whether global eradication is achieved or not, polio-free countries will not have the disease. But without global eradication, they will still have to pay a price: they have to continue to vaccinate. Providing the national public good of national elimination is costly to a country as long as the disease exists elsewhere. At the global level, polio eradication provides two types of benefits: financial, to countries that are polio free (which have to pay for this national public good), and health, to countries that still have the disease.

As the vaccination effort encompasses more countries, the cumulative global cost of defending against polio increases but the global disease threat becomes limited to fewer people. As the cost increases, the financial benefits of eradication become more appealing, since eradication would render vaccination needless, eliminating the costs. And as vaccination expands, what is required to achieve eradication, in light of past investments, becomes less demanding. Thus the incentive structure is eventually tipped to make the prospect of eradication attractive. The benefits of stopping all control measures once polio eradication has been achieved are estimated at \$1.5 billion a year (Aylward, Hennessey, and others 2000).⁵

Figure 1 illustrates this coevolution of the global disease burden from polio and the global financial effort for polio prevention. As the world moves toward the right along the horizontal axis (that is, as it advances in time), fewer and fewer countries have polio but more and more need to vaccinate. Thus as the cumulative global threat of polio decreases, the financial effort of vaccination increases. The financial payoff occurs only when all control measures are stopped.⁶



So, the case of polio shows how a fully public response developed, with the creation and deployment on a global scale of all the needed inputs for communicable disease control. Concern about polio in industrial countries led to investments in understanding the disease and in creating a vaccine (type 1 inputs). The vaccine was rapidly deployed in industrial countries, which had well-functioning public health systems. When the feasibility of eradication became clear and recognition of the health and financial benefits generated enough support, the global eradication campaign was launched, providing type 2 and 3 inputs to the developing countries that lacked them.

Policy response to HIV/AIDS: determined but partial

HIV attacks the immune system, exposing it to opportunistic infections and eventually causing AIDS. HIV has five major genetic subtypes. HIV-1B is the prevailing subtype in Europe and the United States. HIV-1C is the most common in Sub-Saharan Africa. Epidemiological studies suggest that HIV-1C is transmitted faster than the others because it is more transmissible through heterosexual intercourse and is inherently more pathogenic (Arhin-Tenkorang 2001). HIV/AIDS was initially regarded as a national public health problem. In Europe and the United States HIV/AIDS was made visible by politically active groups of homosexuals and intravenous drug users. These groups also influenced the design of control approaches and advocated for research and development on the disease.

As with polio, awareness increased as famous people became infected with the disease. Indeed, the pattern of the initial response to HIV/AIDS in the United States resembles that of the response to polio: acute public concern that mobilized society to respond to the threat.

As the epidemiology of HIV/AIDS became known, early responses in Europe and the United States focused on prevention. With the 1987 global AIDS program, the WHO took these responses to the international level. But by the early 1990s it was clear that prevention alone was not enough. A “risk and vulnerability” paradigm emerged, based on the idea that, beyond prevention, there would need to be measures to care for vulnerable populations so that they would have the economic and social capabilities to function. The resources mobilized for prevention and care in developing countries were never sufficient, but the limited publicness of the response has worsened because in recent years industrial countries have benefited from treatment. Antiretroviral therapy has added years of healthy, productive life for those infected with HIV. Lichtenberg (2001) estimates that each new HIV drug approved in the United States saves about 34,000 lives there. Developing countries have been largely excluded from this new dimension of the response to AIDS: type 1 inputs (though treatment drugs have been developed, their availability has been limited).

The reasons for the exclusion of developing countries result from the evolution of the response. New HIV/AIDS drugs are often protected by patents; in industrial countries concern about HIV/AIDS created markets for pharmaceuticals. In addition, most developing countries lack the infrastructure and human capacity needed for safe and effective antiretroviral therapy (type 2 inputs), though recent studies suggest that community-based alternatives can overcome a lack of fully functioning health systems as long as there is an uninterrupted supply of high-quality drugs (Farmer and others 2001). This suggests that community-based delivery can work, at least in the short run, overcoming the obstacles imposed by the lack of type 2 inputs.

The international community’s focus on HIV prevention is being reconsidered. Scientific and empirical arguments for combining treatment with prevention have mounted. Antiretroviral therapy not only benefits those infected but also aids prevention (UNAIDS, International AIDS Society, and Bill and Melinda Gates Foundation Expert Group 2001). Reduced viral loads have been achieved in patients receiving antiretroviral treatment, lowering the probability of sexual transmission. The effectiveness of treatment in controlling the spread of HIV is reflected in the strategies recommended by the U.S. Centers for Disease Control and Prevention (USCDC 2001). Various scientific groups, including a team from Harvard University, have outlined modalities for the introduction of treatment that would minimize the risk of generating drug-resistant strains of HIV (Harvard University, Individual Members of the Faculty 2001).

The limited publicness of the response to HIV/AIDS, reflected in the lack of access to some key medical technologies, is impeding its control. By the end of 2001, 40 million people worldwide were infected with HIV/AIDS, up from 36.1 million in 2000. Since 1981 HIV/AIDS has been responsible for 24.8 million deaths. There were 5.3 million new infections in 2000 and another 5.0 million in 2001. In 2001 about three-quarters of AIDS deaths occurred in Sub-Saharan Africa (all figures from UNAIDS 2000, 2001). The incidence of HIV/AIDS is highly asymmetric, imposing an exceedingly high burden especially in Sub-Saharan countries. In Botswana, for example, life expectancy without HIV/AIDS would be 70 years; it is now 36. In Lesotho, Namibia, South Africa, Zambia, and Zimbabwe life expectancy without HIV/AIDS would be close to (in some cases more than) 20 years longer (UNDESA 2001, p. 59). It is now also recognized that the world may be witnessing the early stages of the global HIV/AIDS epidemic and that its long-term evolution is far from clear, with a high likelihood of explosive growth within the next few years (UNAIDS 2002).

In addition, medical technologies specific to the strain of HIV that most affects Sub-Saharan countries have not been developed. The scale and breadth of the efforts to treat HIV/AIDS in industrial countries often lead to results that, by chance, are also beneficial to developing countries. For example, antiretroviral drugs developed in industrial countries contribute to controlling the epidemic in Africa. But these spillovers are not always there. If vaccines are developed for the HIV strains prevalent in industrial countries, they are unlikely to work for the African strains.

Thus for HIV/AIDS the limited publicness of the response goes beyond restrictions on access to existing technologies: not even the incentives to invest in developing vaccines specific to African countries are in place. The limited publicness of the response to HIV/AIDS starts with lack of access to type 1 inputs (in the case of drugs in developing countries) and lack of availability of type 1 inputs (in the case of vaccines, not yet developed). Moreover, the lack of type 2 inputs (functioning public health care systems) adds even more to the exclusion, since it is used as a justification not to deploy existing interventions. After a long period of nationally centered responses (Tarantola 2001), HIV/AIDS is only now starting to receive an international response (Piot and Seck 2001).

Policy response to antimicrobial resistance: neglect

Antimicrobial resistance (AMR) is a natural biological process. Microorganisms evolve to develop resistance to the effects of antimicrobials. Resistant strains coexist with strains sensitive to antimicrobials, but over time the share of resistant microorganisms can reach 90 percent—rendering the antimicrobials ineffective. AMR has worsened recently as a result of the growing use and misuse of antimicrobials. About 10–15 years ago the share of resistant strains of *Staphylococcus*

aureus (the most common cause of blood infection and postsurgical infection) was close to 0 percent, but today it ranges from 28 percent in the United States to 70 percent in Japan and the Republic of Korea (Smith and Coast 2001). The costs of AMR-related infections are mounting: in the United States treating resistant infections cost more than \$4 billion in 1995, more than \$7 billion in 1997, and more than \$10 billion in 2001 (Woodward, Smith, and others 2001).

AMR is neither new nor surprising. But the depth and burden of the problem have increased substantially in recent years. In industrial countries excessive prescription and use of antimicrobials contribute to AMR, while in developing countries underconsumption of antimicrobials contributes to AMR (Smith 1999). Underconsumption in developing countries is due to high prices, low incomes, limited access to quality health care, and minimal regulatory capacity. Since it is easier to constrain and regulate excessive supply than to ease the budget constraints of households and governments in developing countries, the problem may be tackled more easily in industrial countries (Woodward, Smith, and others 2001).

Findings from a recent study illustrate the scale of the problem in developing countries. In Tanzania 91 percent of antibiotics are prescribed with incorrect dosages. In India 90 percent of prescriptions did not have dosage specifications. Inappropriate prescriptions of antibiotics were reported for viral respiratory tract infections in 97 percent of cases in China and 81 percent in Ghana (Holloway 2000). Irregular supplies, unofficial supplies, and incorrect prescriptions result in infections that are more drug resistant in developing countries.

In addition, there has been a marked decline in antimicrobial research (Kettler 2000; WHO 2000). Pharmaceutical companies see higher rewards in developing drugs for the chronic diseases of the affluent that require long (even lifelong) treatment than in doing so for the infections that overwhelmingly affect the poor and require treatment only until the infection has been controlled. Moreover, new drugs are often reserved for “last line” interventions, precisely to contain AMR, further limiting the scope of the market. The end result is a lack of sorely needed pharmaceuticals, often for “old” diseases—such as malaria and tuberculosis—that are acquiring fierce multidrug resistance.

Awareness of AMR is increasing, with some industrial countries presenting strategies for its containment. The increase in awareness has resulted from the role played by the scientific community, which has often sounded the alarm on important public health issues. But AMR containment is a case where national action alone will be ineffective. The WHO (2001a) has taken steps toward a coordinated international effort, formulating international policy advice and guidelines. But the response has been timid and lacking in the development of new medical knowledge and technologies—once again, limited in publicness, since not even type 1 inputs are being developed.

NEW INTERNATIONAL CONCERN ABOUT HEALTH: ENHANCING THE PUBLICNESS OF THE POLICY RESPONSE

Health is a major concern of the international community. An abundance of recent policy statements have expressed this concern and called for urgent, forceful action.⁷ What explains the renewed interest in health? Why do past strategies apparently no longer work? This section addresses these questions and examines recent policy responses to global health concerns.

Why is health back at the top of the international agenda?

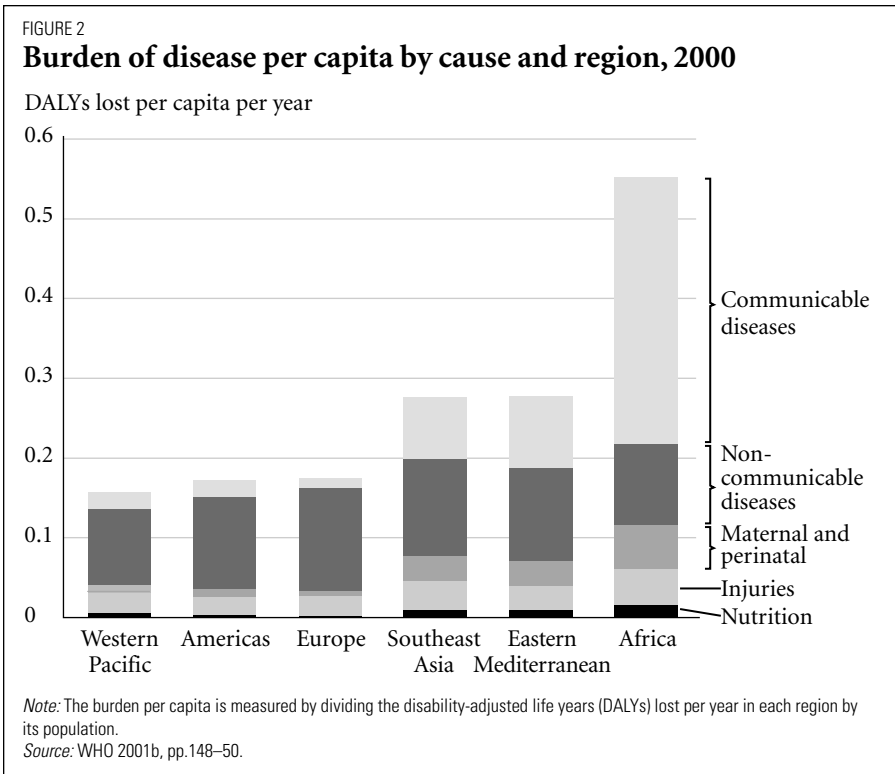
Two main forces are raising awareness and driving the renewed concern about health. The first is the crushing burden of disease (including noncommunicable diseases) in developing countries. The second is associated with new global risks generated by this excessive burden.

The crushing, unsustainable disease burden in developing countries. The asymmetry in the burden of disease between industrial and developing countries has increased (Evans and others 2001; Farmer 2001). Moreover, it is safe to assume that if communicable diseases receive only a partial policy response, the response to noncommunicable diseases is even more limited. Although the burden of communicable diseases is much larger in Africa than in other regions, the burden of noncommunicable diseases is about the same in all regions (figure 2).

In some cases the burden of noncommunicable diseases results from the “diffusion of behaviors,” leading to the global spread of health conditions that lack the epidemiological characteristics of communicable diseases. Chen, Evans, and Cash (1999) show that international trade and the globalization of advertising campaigns have contributed to the spread of health conditions associated with smoking. In addition, genetic disorders—which spread slowly and only when children inherit them from their parents—have become less geographically circumscribed.

Consider sickle cell disease, a genetic disorder that spreads slowly and silently (see table 1). The disease is characterized by unusual red blood cells that are shaped like sickles and destroyed rapidly, causing a number of health conditions, including recurrent acute infections. Sickle cell disease was once confined to parts of Sub-Saharan Africa, northern Greece, southern Italy, southern Turkey, eastern Saudi Arabia, and central and southern India (Serjeant 1994). The slave trade introduced sickle cell disease to North and South America, but increased migration and interethnic relations have facilitated its global spread. An estimated 10 percent of the U.S. population is at risk for sickle cell disease (Arhin-Tenkorang 2001).

Poor people’s large burden of communicable and noncommunicable diseases means that today’s health challenges require more than monitoring and taking preventive action against infectious diseases. There is an important moral and



ethical challenge: too many people are suffering from avoidable illness and premature death. And as discussed in the next section, this burden is becoming unsustainable, because it generates serious cross-border spillovers and growing global risks.

New global risks from the disease burden in developing countries. The excessive disease burden in developing countries has adverse effects on countries other than those suffering the direct consequences of high rates of illness and premature death. These adverse effects create new forms of negative global externalities:

- *Infections spread to industrial countries from developing countries with large disease burdens.* One example is the possible increased prevalence in industrial countries of Africa's HIV strain. New HIV infections in Switzerland have characteristics similar to those fueling the epidemic in Africa: a predominance of heterosexual transmission and a high frequency of the African strain of the virus (Böni and others 1999). Another example is the increased share of tuberculosis cases among foreign-born residents; in the United States this share rose from 30 percent in 1992 to 46 percent in 2000. Tuberculosis is seven times as common among foreign-born as among U.S.-born residents. While the proportion of tuberculosis cases

exhibiting multidrug resistance fell from 3 percent in 1992 to 1 percent in 2000, the share of those cases occurring in foreign-born residents increased from 31 percent to 72 percent (USCDC 2002).

- *Large disease burdens harm economic growth and increase poverty.* Several studies have found a correlation between good health and other human development indicators, such as education, employment, and income.⁸ The exceedingly large burden of disease in developing countries is crushing past development achievements and curtailing future development prospects. The disease burden exacerbates poverty, hinders economic performance, and augments population growth (Commission on Macroeconomics and Health 2001)—undermining the future of the countries affected as well as the international objective of global poverty reduction. These effects also limit investment and trade opportunities for firms in industrial countries. (About 42 percent of U.S. exports go to developing countries; Kassalow 2001.)
- *Large burdens of disease also threaten political stability and foster social unrest,* with possible global consequences. High infant mortality is strongly correlated with state collapse.⁹ Indicators of disease-induced death are negatively correlated with state capacity (Price-Smith 2002). In industrial countries the rationale for public funding to control communicable diseases in developing countries is often associated with national and international peace and security (CIA 1999). Failure to control communicable diseases can heighten the perception of some countries' exclusion from growing economic integration, or at least exclusion from its benefits (UN Security Council 2000). Conceição (in this volume) presents preliminary estimates of the costs of the excessive disease burden.
- *Globalization risks losing its legitimacy,* because disease-stricken people in developing countries are likely to feel disenfranchised and abandoned. Directly or through their advocates, they may question why the asymmetries in addressing health challenges are so dramatic, especially now that politics and technology are bringing the world closer together.¹⁰

Recent policy responses: enhancing the publicness of the response

To address global health challenges, new responses are being designed and implemented that aim at moving toward “health for all,” called for by the WHO in 1978 (WHO 1978). Achieving this goal requires acting to control communicable and noncommunicable diseases alike. The new responses are more public in the sense defined above: an effort is being made to develop and deploy all the inputs needed to improve the health conditions of all. Three main strategies are evident, with the first and second oriented toward the first type of disease control inputs and the third toward the second type:

- *Making health-related knowledge more public by design.* Lack of medical knowledge and technologies (drugs, vaccines) constrains the response to health challenges. As a result a number of initiatives, often taking the form

of public-private partnerships (see appendix), have been established to conduct and support targeted research and development to create needed medical technologies. One example is the International AIDS Vaccine Initiative (<http://www.iavi.org>). The initiative has a dual objective: accelerating the development of HIV vaccines while ensuring that vaccines that receive support from the initiative will be made accessible worldwide. The Malaria Vaccine Initiative (<http://www.malariavaccine.org>) focuses on the same goals for malaria vaccines, while the Medicines for Malaria Venture (<http://www.mmv.org>) supports research and development for malaria drugs (see also <http://www.emvi.org> and <http://www.amvtn.org>). The Global Alliance for TB Drug Development (<http://www.tballiance.org>), similar to the Medicines for Malaria Venture, focuses on developing tuberculosis drugs that are more effective and easier to deploy.

- *Making medicines more affordable.* The response to diseases is often hindered not by the nonexistence of drugs and vaccines but by their cost. Protected by patents and priced according to the purchasing power of industrial countries, existing interventions may be beyond the reach of developing countries (Abbott 2002). Thus, at the urging of several developing countries¹¹ and civil society organizations,¹² the international community has reexamined rules for protecting intellectual property rights, notably the World Trade Organization (WTO) agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). Oxfam's "cut the cost" campaign insistently urged the WTO to revise its intellectual property rules to make medicines more affordable (<http://www.oxfam.org.uk/cutthecost>), and the rules have been discussed in UN debates on human rights (UN Economic and Social Council 2000). At the 2001 WTO ministerial conference in Doha, Qatar, a declaration on TRIPS and public health recognized the scope and urgency of the public health problems posed by diseases such as HIV/AIDS, malaria, and tuberculosis. The declaration also recognized that the TRIPS agreement should not impede countries from declaring and dealing with public health emergencies, and acknowledged the possibility of allowing compulsory licensing. Correa (in this volume) explores mechanisms being considered to improve developing countries' access to medicines, including differential pricing, differential patenting, compulsory licensing, and parallel imports.
- *Strengthening capacity in developing countries.* Providing developing countries with needed interventions requires more than affordable medicines; it also requires type 2 inputs, that is, a national health infrastructure capable of delivering vaccines, administering treatments, and monitoring sickness and death. Some recent responses are trying to develop such infrastructure. For example, the Global Alliance for Vaccines and Immunization (<http://www.vaccinealliance.org>) is a public-private partnership that purchases and delivers vaccines in developing countries. The Global Fund to Fight AIDS, Tuberculosis, and Malaria (<http://www.globalfundatm.org>), created on the recommendation of the

UN Secretary-General (UN 2001), helps deliver interventions to control the three diseases. Both efforts work on the same principle of funding credible (externally and independently evaluated) country-based proposals. The aim is not only to deliver the urgently needed interventions, but also to build national health care capacity.¹³

POSSIBLE NEXT STEPS

This chapter has interpreted the health challenges facing the international community as resulting from the limited publicness of responses to communicable diseases and other health concerns. The ensuing—and exceedingly large—disease burden in developing countries is not only dashing their hopes for development; it is also generating negative externalities that affect, or will likely soon affect, industrial and developing countries alike.

The international community has started to address these challenges by enhancing the publicness of the responses: making medical knowledge more public by design and more affordable and accessible (type 1 inputs) and implementing programs to deliver existing interventions within countries (type 2 inputs). Although some recent responses to global health concerns have been more public, additional steps may be required to consolidate and strengthen the publicness of such efforts.

Recognizing mutual benefits and tapping new sources of funding

Developing countries receive considerable direct benefits when their disease burden is reduced, but other benefits are shared around the world. Beyond moral and ethical considerations, further easing the burden would attenuate or eliminate the global spillovers described above. Because the benefits are shared by all, the costs of global health interventions should also be shared by all.

This could mean, for example, that health programs in developing countries would be financed not just by those countries' domestic resources and aid allocations. Additional sources could include the health budgets of industrial countries. Resources could also come from industrial country tax credits or from defense or national security budgets.¹⁴ In addition, international pooling of resources, as in the Global Alliance for Vaccines and Immunization and the Global Fund to Fight AIDS, Tuberculosis, and Malaria, is becoming an important instrument.

Current resources are insufficient, and there has been reluctance to commit long-term financing on the scale required. The Commission on Macroeconomics and Health (2001) estimates that substantially reducing the disease burden of developing countries—including controlling major diseases such as HIV/AIDS, malaria, and tuberculosis—would require about \$27 billion a year from industrial countries by 2007. About \$8 billion of this should be devoted to the Global Fund to Fight AIDS, Tuberculosis, and Malaria. In early 2002 the fund had

\$700–800 million available for disbursements, but by March 2002 it had received 316 proposals requiring \$1.15 billion (<http://www.globalfundatm.org>). Increasing resources is crucial, and aid alone may not be sufficient.¹⁵

Some new financing could come at no additional net cost—for example, from a domestic tax on cigarette sales. Such a tax would reduce tobacco consumption and generate revenues that could pay for interventions and for administration and enforcement of the tax. Public policy incentives should be reviewed to identify the scope for possible budget restructuring.

Increasing incentives for global health research

Without knowledge about health conditions and without technologies to prevent and treat them (type 1 inputs), little can be done to fight disease. Research and development to improve basic knowledge about diseases and to deliver products to fight them have long been encouraged and conducted by both the public and the private sector. Beyond biomedical research, knowledge about health conditions also requires better understanding of the social and economic determinants of health—which calls for investments in research on social behavior, economics, and health systems (Kettler 2002).

During the first half of the 20th century developing and industrial countries had similar priorities in drug and vaccine development. Finding vaccines and cures for diseases ranging from yellow fever to smallpox, from polio to tuberculosis, was in the interest of both groups of countries. But priorities in developing medical technologies have since diverged. Private industry has little incentive to address poor people's diseases. And basic research, supported largely by public entities in industrial countries, only incidentally relates to the health problems of poor people.

At the international level, incentives to develop medical technologies produce a gap in the generation of much-needed medical knowledge and create large asymmetries in the ability to use existing technologies. According to the Global Forum for Health Research (<http://www.globalforumhealth.org>), only 10 percent of world spending on health research and development is related to the health conditions that account for 90 percent of the global burden of ill health (the 10/90 gap). Of 1,223 new medicines commercialized between 1975 and 1997, only 13 were specifically oriented toward tropical diseases, with 2 resulting from military research and 5 from veterinary research. Only 4 (0.3 percent) resulted from purposeful research on tropical diseases (Pécoul and others 1999). Efforts are being made to correct this imbalance (see appendix), but even these fail to address some of the most neglected diseases affecting developing countries (Trouiller and others 2002). Much more needs to be done.

Michael Kremer suggests that the response may require both “pull” incentives (creating markets for drugs where they are absent) and “push” incentives (providing incentives to conduct research and development). Kremer indicates that a

particularly effective and efficient pull mechanism to encourage vaccine development would be the establishment by governments or private foundations of legally binding commitments to purchase needed vaccines if and when they are developed (box 1).

According to estimates by the Commission on Macroeconomics and Health (2001), about \$3 billion a year would be required by 2007 to support research and development oriented toward neglected diseases. Of this, half should go to a new global health research fund devoted to supporting basic research and half to supporting targeted research and development for drugs, vaccines, diagnostics, and other medical technologies, through the support of existing initiatives such as those described in box 1. In addition, there should be a clear understanding that if specified products were developed in the future, part of this \$1.5 billion in annual spending could be used to purchase them, as discussed in box 1.

BOX 1

A PURCHASE COMMITMENT FOR VACCINES

BY MICHAEL KREMER

Vaccines provide the best hope for a long-run sustainable solution for AIDS and the other infectious diseases devastating poor countries: they are typically easier to deliver than drugs, since they require no diagnosis and physicians are not needed to administer them. But because pharmaceutical firms see little chance of recouping their risk-adjusted research and development costs, little private research is being conducted on vaccines for malaria, tuberculosis, and African strains of HIV.

An extremely cost-effective way for international organizations, industrial nations, or private foundations to stimulate research on such vaccines is to commit to purchasing effective vaccines once they have been developed. Such a purchase commitment not only would provide the incentive for vaccine development, but also would ensure that price is not a barrier to people using the vaccines.

Efforts to encourage vaccine development can be divided into two broad categories: “push” programs subsidize research inputs—for example, through research and development tax credits or grants to researchers—while “pull” programs reward the development of a vaccine. Both approaches have important roles, but current policy underutilizes pull programs.

Push programs are well suited for financing basic research, while pull programs (such as a purchase commitment) have several attractive features for encouraging more applied work, such as the later stages of vaccine development. Importantly, the public pays nothing unless a viable vaccine emerges. Pull programs encourage researchers to select projects with a reasonable chance of yielding a viable product rather than overselling their research prospects to research

BOX 1 CONTINUED

administrators and the public. They allow politicians and the public to be confident that they are paying for an actual product rather than supporting a development effort that might not be scientifically warranted. Pull programs also provide strong financial incentives for researchers to focus on developing a marketable product rather than pursuing other goals, such as publishing journal articles.

Finally, appropriately designed pull programs can help ensure that if new products are developed, they will reach those who need them. For example, industrial countries or private foundations could commit to purchasing a malaria vaccine for \$5 per immunized person and making it available to developing countries for free or in return for a modest copayment.

For such pull programs to be effective, potential developers must believe that sponsors will not renege on their purchase commitments. In fact, courts have held that similar public commitments to reward contest winners or to purchase specified goods constitute legally binding contracts and that decisions made by independent parties to adjudicate such programs are binding. Clear eligibility and pricing rules can enhance a program's credibility. For example, it could be stipulated that candidate products must be cleared by a regulatory agency such as the U.S. Food and Drug Administration or European Medicines Evaluation Agency. This would ensure that funds are spent on bona fide vaccines.

A candidate product could also be subjected to a market test: nations wishing to purchase the product would need to provide a modest copayment in proportion to their per capita income. Such copayments would give countries an incentive to carefully investigate whether candidate products are appropriate for local conditions and provide a useful test of countries' commitment to a program. If a country is willing to pay, it is also more likely to be prepared to take the steps necessary to ensure that the vaccine is delivered to the people who need it.

The market promised by a program should be large enough to induce substantial effort by vaccine developers, but less than the social value of the vaccine. Several researchers have concluded that a real annual market of \$250–500 million would be needed to motivate substantial research. Over 10 years a commitment at this level could save about 1.9 billion discounted disability-adjusted life years—equivalent to saving the lives of 63 million 30-year-olds. The average cost per year of life saved would be \$4.

Any of several organizations—including national governments, the World Bank, and private foundations—have the ability to create a credible purchase commitment to stimulate vaccine research. If a commitment to purchase new vaccines fails to induce their development, it will have cost nothing. If it succeeds, it will save millions of lives at a few dollars each.

Note: For more information, see Kremer (2001a, 2001b).

The governance of health research has been debated for more than a decade (see Global Forum for Health Research 2002, especially chapter 3). One option to manage the new global research fund would be through a system of governance akin to the one used by the U.S. National Institutes of Health or the U.K. Medical Research Council (as also proposed by Kaul and Faust 2001), in which funding to research is based on a scientific peer-review process. An important objective of the fund would be to help build long-term scientific capacity in developing countries. So, funding could be made available for research groups in developing countries, which would submit proposals individually or together with other research groups from industrial or developing countries.

Another initiative that could enhance global incentives for research and development would be extending national orphan drug legislation to global diseases, a measure also proposed by the Commission on Macroeconomics and Health (2001). Orphan drug legislation provides pull and push incentives (for example, by easing terms for regulatory approval and providing public funds for research and development) to develop drugs for diseases that, in the current national context, affect a small number of people (and so a limited market) and thus fail to elicit a response from the private sector. Extending the scope to the international market could generate interest in neglected diseases.

Deploying rapid response task forces

Though important and relevant, the above suggestions are oriented toward long-term results. The current global health situation is a crisis—especially in the case of HIV/AIDS—calling for immediate action. Solutions are needed that allow more rapid action than is often possible with the slow pace of international health cooperation. Ill health means that people's security is at risk. Just as efforts are being made to upgrade the international community's capacity to respond to international military crises, consideration should be given to developing capacity for rapid responses to health emergencies. This could involve, for example, dispatching international health teams to help countries control spreading diseases as quickly as possible. Building national capacity is the only sustainable solution, but doing so is a long-term effort. Disease-stricken countries cannot wait for new vaccines and drugs to be developed or for national capacity to mature. The current crisis calls for an emergency response that supports the enhanced publicness of the other responses.

APPENDIX: BIOMEDICAL RESEARCH AND DEVELOPMENT TO TREAT POOR PEOPLE'S DISEASES

Around the world about \$70 billion a year is spent on biomedical research and development, but very little is devoted to the diseases of poor people. The oldest international initiative addressing the diseases of poor people is the Special

Programme for Research and Training in Tropical Diseases, a collaborative effort between the United Nations Development Programme (UNDP), World Health Organization (WHO), and World Bank. For more than 25 years this program has focused on orphan diseases. Malaria has long been among the diseases addressed by the program; tuberculosis was recently added.

The Global Forum for Health Research, a private foundation, was created in 1998 to help correct the 10/90 gap—the fact that just 10 percent of world spending on health research addresses 90 percent of the world's health problems. The forum works as a network of networks and as a catalyst to narrow the 10/90 gap.

An important new organizational arrangement has been the establishment of public-private partnerships. Such partnerships have been created in part because global health problems are so complex that no single agent (firm, government, or nonprofit) is likely to tackle them successfully. Some public-private partnerships are devoted to comprehensive responses to a disease, such as the Roll Back Malaria global partnership. But many have been created to support and conduct research and development for neglected diseases (see table).

The international initiatives listed in table have approximately \$100 million in total annual funds, considerably less than the requirements suggested by the Commission on Macroeconomics and Health. But this amount excludes private and national spending on neglected diseases. While private spending is difficult to estimate, it is thought to be rather low. In terms of national spending, the U.S. National Institutes of Health is a particularly strong player. Its annual budget for AIDS research is about \$2.5 billion (with proposed funding for 2002 of \$357 million for research on an AIDS vaccine), while that for tuberculosis research is more than \$80 million and for malaria research about \$70 million (<http://www.nih.gov>).

Selected international initiatives supporting biomedical research and development for neglected diseases

Initiative	Funding year	Funding amount (millions of U.S. dollars)	Funders	Focus
Special Programme for Research and Training in Tropical Diseases				
A global program of scientific collaboration established in 1975 to coordinate, support, and influence global efforts to combat a portfolio of major diseases of the poor and disadvantaged. Supports R&D, training, and capacity building.	2002–03	95	UNDP, WHO, World Bank, private foundations, country contributions	Malaria (42%); TB (21%; added in 2000); others (each less than 6%); R&D, training, and capacity building
Global Forum for Health Research				
A private foundation that monitors the 10/90 gap, develops priority setting methodologies, and acts as a catalyst and as a “network of networks.” Supports initiatives oriented toward reducing the gap, often providing seed money and administrative support.	2000 Endowment	2.3 1	Rockefeller Foundation, WHO, country contributions	Initiatives to reduce the 10/90 gap
International AIDS Vaccine Initiative				
A nonprofit scientific and charitable organization founded in 1996 to ensure the development of safe, effective, accessible HIV vaccines. Focuses on accelerating scientific progress, mobilizing public support through issue advocacy and education, encouraging industrial involvement in AIDS vaccine development, and working to ensure global access to a vaccine.	1999 2000 2001	3.9 11.5 ^a 19.4 ^a	Bill and Melinda Gates Foundation, Sloan Foundation, World Bank, country contributions, pharmaceutical industry	Development of an AIDS vaccine through support of R&D and enlargement of the number and scope of actors engaged in the effort

Medicines for Malaria Venture

A public-private partnership established in late 1999 to address the market failure reflected in the lack of incentives to develop medicines for malaria. Supports R&D projects with varying degrees of risk.

2001
2002

4.2
15^a

Private foundations,
country contributions,
World Bank, WHO, Global
Forum for Health Research,
pharmaceutical industry

R&D on malaria medicines
(6 R&D projects in 2001;
14 expected in 2002)

Malaria Vaccine Initiative

A public-private partnership created in 1999 to accelerate the development of a malaria vaccine. Works with national and international agencies and organizations, supporting laboratories, the coordination and management of pilot production, and the release of products for clinical trials.

1999

50^b

William H. Gates
Foundation

Vaccine for malaria

Multilateral Initiative on Malaria

Created in 1997 to strengthen and sustain, through collaborative research and training, the capacity of malaria-endemic countries in Africa to carry out research required to develop and improve tools for malaria control.

No data available

Country contributions,
U.S. National Institutes
of Health, Wellcome Trust
and other foundations,
pharmaceutical industry

Coordination and
mobilization of resources
for cooperative malaria
research

Global Alliance for TB Drug Development

A public-private partnership created in 2000 with the aim of accelerating the discovery and development of cost-effective drugs, by outsourcing drug R&D projects, and moving drug compounds along the development line to regulatory approval and the market at affordable prices for countries with the highest burden from TB.

2001–05

150^a

Rockefeller Foundation,
Bill and Melinda Gates
Foundation, country
contributions,
pharmaceutical industry

TB drug development,
from research to regulatory
approval and market
placement at affordable prices

Selected international initiatives supporting biomedical research and development for neglected diseases

Initiative	Funding year	Funding amount (millions of U.S. dollars)	Funders	Focus
Action TB An international coordinated research program set up by GlaxoSmithKline in 1993 with the aim of finding new targets for TB therapies, identifying novel vaccine candidates, and identifying surrogate markers for use in clinical trials. Involves more than 20 academic research groups in Canada, South Africa, the United Kingdom, and the United States and supports the work of more than 40 researchers.	1993–2003	30	GlaxoSmithKline	TB drug development

a. Projected or expected funding.

b. One-time grant.

Source: Authors compilation from relevant documentation.

NOTES

1. Franklin D. Roosevelt, the U.S. president from the early 1930s through most of World War II, was a victim of polio.

2. Salk also thought that the vaccine should be made available to all. When asked who would control the new vaccine, Salk replied, "I'd say it belongs to everyone. I mean, could you patent the sun?" (Seavey, Smith, and Wagner 1998, p. 175).

3. To accelerate the eradication effort, in 1999 the Bill and Melinda Gates Foundation (<http://www.gatesfoundation.org>) provided \$50 million and the UN Foundation (<http://www.unfoundation.org>) provided \$28 million. The U.S. Centers for Disease Control and Prevention provides technical support, including genetic fingerprinting to identify the strains of poliovirus in an outbreak.

4. Although the continuing support of the U.S. Centers for Disease Control and Prevention to the eradication effort, as mentioned above, should not be understated.

5. It is not yet clear when and how immunization efforts would stop once the world is declared free of polioviruses. For an analysis of possible risks, see Dowdle and others (2002).

6. According to Cornes and Sandler (1986), eradication of diseases that spread indiscriminately around the world such as polio is a weakest link global public good: eradication cannot be achieved if one country stays out, so the global public good is provided only when the last country with the disease is certified as being free of it.

7. See UN (2000, 2001); the G-8 Okinawa Summit Declaration, 23 July 2000; and the Abuja Declaration and Framework for Action for the fight against HIV/AIDS, tuberculosis, and other infectious diseases in Africa, 27 April 2001 (<http://www.oau-oua.org/afrsummit/docs.htm>). U.S. public health policy is increasingly concerned with global health (Bunyavanich and Walkup 2001; <http://www.globalhealth.gov>); the United Kingdom has also shown concern for global health (UKPIU 2001).

8. Preston (1975) notes a negative relationship between per capita income and mortality. Abel-Smith and Leiserson (1978) examine health and economic development. Fogel (1994) shows the relationship between improvements in health and improvements in living standards for Europeans and North Americans. Strauss and Thomas (1998) provide an overview centered on developing countries.

9. Esty and others (1998, p. vii), analyzing the characteristics of states more likely to collapse, find that among hundreds of variables, high infant mortality is one of only three that consistently separate states that fail from others. In a critical assessment of this work, King and Zeng (2001, p. 650) question the validity of these conclusions—except in the case of infant mortality: "The infant mortality result is fairly striking: only states with governments that are sufficiently competent to keep infant mortality below the global median have comparatively low probabilities of state failure; other countries, even when they are alike in all other measured respects to the G7, have substantial probabilities of failure (as high as 0.25)."

10. For the multiple relationships between globalization and health, see Garrett (2000) and Lee, Buse, and Fustukian (2002). See also Dollar (2001), Cornia (2001),

and Woodward, Drager, and others (2001). Differing views on globalization and health are offered in Feachem (2001) and Lee (2002). Lee and Collin (2001) comprehensively summarize empirical research on globalization and health.

11. Notably South Africa, where a march organized by the Treatment Action Campaign (<http://www.tac.org.za>) contributed to the Global Treatment Access Campaign (<http://www.globaltreatmentaccess.org/>).

12. For example, the campaign for access to essential medicines by Médecins Sans Frontières (<http://www.accessmed-msf.org/index.asp>).

13. In the case of HIV/AIDS the response to the pandemic may have to be multifaceted, going beyond strengthening the health sector (UNDP 2002).

14. The tax credits could include credits for research performed in industrial countries on diseases affecting mainly developing countries and credits on sales to developing countries. See Attaran and others (2000) on the second proposal. See also *Vaccines for the New Millennium Act* of 2001 (U.S. Senate bill 895; U.S. House of Representatives bill 895) and UKPIU (2001), aimed at encouraging research to prevent and treat diseases primarily affecting developing countries.

15. There is also an indirect argument for increasing health spending in developing countries: national health systems become more efficient after a threshold level of health spending per capita has been achieved (Evans and others 2001). Thus increasing health spending in developing countries could help achieve this threshold, which would mean that further resources would be used more effectively.

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