

HOW INFECTIOUS DISEASE PRIORITIES SPREAD:

**Global battles against polio, malaria and tuberculosis in
the post-World War Two era**

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April 7, 2001

Paper Summary

Medical and public health researchers have conducted hundreds of studies concerning how infectious diseases are transmitted. They have conducted hundreds more concerning how such transmission can be halted. A third transmission issue, by contrast, has received almost no attention in the medical and public health fields. This is the issue not of how diseases spread, but of how *priority for controlling diseases* spreads.

The answer is far from obvious. This paper examines the post-World War Two histories of global efforts to fight three infectious diseases - polio, malaria and tuberculosis - in order to shed light on this issue and to raise it as a matter requiring ongoing research. The paper draws from the policy studies literature to present three models of the infectious disease policy transmission process, and uses the case studies to evaluate the explanatory power of each. A rational model postulates a deliberate, linear and logical progression from discovery of biological cause of the disease to creation of intervention solutions to systematic diffusion of these solutions to cover affected populations. An incremental model postulates a much more drawn out and contested process, where health interventions reach affected populations only very slowly. A punctuated equilibrium model, drawn from Frank R. Baumgartner's and Bryan D. Jones' work on policy agenda-setting, suggests an even more complex pattern: long periods of dormancy where interventions are available only to small populations, punctuated by bursts of priority where such interventions spread across the globe in surprisingly rapid and concentrated periods of time.

The processes of polio, malaria and tuberculosis policy transmission in the post-World War Two era, while showing some elements of rationalism and incrementalism, exhibit distinctively burst-like patterns, offering evidence for a punctuated equilibrium model of the disease control priority process. The paper calls for further studies of the diffusion process in order to evaluate this new disease transmission issue in greater depth.

Introduction

The biological dimensions of polio transmission are well known to medical researchers. This debilitating disease, which occurs predominantly in infants and whose primary result is paralysis of the legs, is caused by the wild poliovirus. There are three types of this virus, all closely related to a group of RNA viruses that invade the central nervous system. Human beings are the sole mode of transmission, either through direct contact or through a fecal-oral route, there being no animal or insect reservoirs of the virus (WHO 1996a: 21).

In part because the biological dimensions of transmission are well known, so too are the means of interrupting transmission. With the development of the inactivated polio vaccine by Jonas Salk in 1955, and of the live oral polio vaccine by Albert Sabin six years later, the capacity now exists through vaccination to block the spread of all three types of the virus. Vaccination has the effect of multiplying antibodies in the blood, preventing spread of the virus to the central nervous system in the case of infection. Through a four-fold strategy focusing on infants and children of routine vaccinations, concentrated national immunization campaigns, surveillance for outbreaks of the disease and mop-up immunization operations in areas where transmission persists,¹ most countries have been able to eradicate the disease from their borders.

These are the basic facts concerning polio transmission and the means of interrupting transmission. Hundreds of studies have been published on both subjects for polio and for dozens of other infectious and communicable diseases. There is a third disease transmission issue, however, that has occupied considerably less research attention, and consequently is much less understood. In fact, in medical and public health literatures it hardly occupies a place as an issue of any kind, let alone a transmission

concern. This is the question not of how diseases spread, but of how *priority for fighting* diseases spreads. This paper is about this latter concern.

Models of the priority transmission process

Why should we be worried about such an issue? Once we understand the biological dimensions of transmission and the technical means of interrupting transmission, does priority not spread of its own accord? Presumably, when the medical technology becomes available, it diffuses across the globe through an internally generated dynamic, significantly reducing disease incidence, particularly if that technology is reasonably inexpensive. To be sure, there may be complexities to the process. Few public health and medical experts are naïve enough to believe that the world is ordered in such a way that just because a person is sick he or she will be treated; just because an intervention exists it will be available universally. Yet there may be a sense in which this rational model of disease control transmission accurately describes the underlying process, if not in the short-term, then in the long-term. That is, understanding of the biological cause leads to discovery of relevant interventions which in turn leads to cost-effective replication of the technology, and, ultimately containment or eradication of the disease.

Or is the process of disease priority transmission really so simple? There are other ways of conceptualizing the underlying dynamic. Rather than a rational move from discovery of biological cause to creation of intervention to spread of technology to containment of the disease, perhaps the process is more gradual. Theories of disease causation are proposed, researched, and contested. Eventually there is a degree of consensus within the medical community about causation. Multiple intervention strategies are proposed, competing with one another for priority, resources and policy attention. Certain interventions, because they are most cost-effective, or easily

implemented, or politically palatable, win out. But they diffuse slowly, reaching certain segments of the population (the richer; the ethnically privileged; the favorably gendered) first. Eventually these interventions do reach the poor, the ethnically disadvantaged, the peoples of peripheral nation-states, but this process may take years, decades, even centuries. In other words, the transmission process for fighting a disease is rational only in a very loose sense of the term, if at all. More accurately described, it is incremental and contested.

Or the process may be even more complex yet. There may be long periods of dormancy, where effective interventions sit discovered but in wait, known only to the medically-savvy, available only to the privileged few. At certain junctures, for reasons hidden to most of the world's population, they burst suddenly onto the scene, taking the world by storm, surprising political and medical elites alike at the pace with which they spread across the globe. Their movement is not like a glacier, as an incrementalist might understand the process, but like a tidal wave, born in a moment, diffused in a flash.

These are three vastly different models of the process of transmission of disease priority: a rational model that presumes a deliberate and logical progression from discovery of cause to creation of solution to widespread availability of the solution; an incremental model that postulates a process infused with contestation and that involves the uneven and gradual spread of a solution; and a punctuated model that assumes long periods of dormancy followed by surprising bursts of attention and priority. The question is which pattern, if any, most accurately describes the disease priority transmission process.²

In this paper, we examine the post-World War Two history of efforts to fight three infectious diseases - polio, malaria and tuberculosis (TB) - in order to investigate patterns of disease priority transmission. These three diseases make interesting case studies, since each has a long history of global control and eradication efforts involving a multiplicity of actors, and since each has been both on and off the global policy agenda at

various junctures. We do not aim to draw definitive propositions concerning the most accurate model. Further research, both quantitative and qualitative and involving multiple cases, will be necessary to draw such conclusions. We do, however, aim to explore and highlight this neglected public health issue concerning how priority for fighting diseases spreads, and to open up this issue as a matter for ongoing inquiry.

We begin with an examination of the case of polio. We then move on to the case of malaria. Finally, we turn to global efforts to fight tuberculosis. In the concluding section we examine regularities across all three cases in order to draw some tentative propositions concerning patterns of transmission for disease control.

The case of polio

Vaccines for polio were discovered in 1955 (Jonas Salk's killed vaccine) and in 1961 (Albert Sabin's live vaccine). Rapidly following these discoveries several hundred million children in industrialized states were immunized against the disease, and polio incidence plummeted.³ Approximately 500,000 deaths and five million cases of paralytic polio in industrialized countries were averted due to administration of the live vaccine alone.⁴

It was not until 1969, however, that fighting the disease received priority in developing countries. In that year, recognizing the worldwide prevalence of polio, the World Health Assembly placed the disease under international surveillance, asking that member states report any outbreaks (WHO 1972: 293). In 1971 the World Health Organization (WHO) produced *A Technical Guide for a System of Poliomyelitis Surveillance* to assist member countries with the surveillance process (WHO 1972: 293). In 1972, the WHO launched the expanded program on immunization (EPI) to combat a number of vaccine-preventable diseases that affected children. The WHO included polio

in this program, and through the 1970s global vaccination rates slowly but steadily increased.

The next major international development took place in 1983, when around 400 polio experts from over 50 countries attended the International Symposium on Poliomyelitis Control, held in Washington, DC and organized by the Pan American Health Organization (PAHO), the Americas branch of the WHO (WHO 1983: 349). There they debated the issue of control versus eradication, and whether it was possible to eradicate polio in the 20th century. Delegates expressed considerable doubt about the possibility at the time, noting a lack of political will and technical problems in detecting the presence of wild poliovirus (WHO 1983: 349).

By 1985 that perspective had begun to change. In that year the member countries of PAHO committed themselves to eradicating the disease from the Americas region by the year 1990 (Daniel and Robbins 1997: 19; WHO 1985: 394), a goal they achieved only one year behind target. In an April 1987 meeting PAHO delegates laid down a series of guidelines on procedures for polio reporting, surveillance and the conduct of national immunization days (WHO 1988b: 17-18), setting precedents for countries in other regions that would later undertake these activities. In a November 1987 international WHO meeting PAHO's efforts were praised, and it was announced that global poliomyelitis eradication could now be envisioned (WHO 1988a: 10). WHO leaders requested each of the organization's six regions to review before the next meeting the potential for regional eradication within the next decade, so that they could determine a feasible date for global eradication (WHO 1988a: 10).

Launch of global polio eradication initiative

In 1988, at the 41st meeting of the World Health Assembly, the World Health Organization made a commitment to the global eradication of polio by the year 2000, citing this as a gift from the twentieth to the twenty-first century (WHO 1988c: 161). Between 1988 and 2000, as a direct consequence of this commitment, the world witnessed a remarkable acceleration in polio control efforts. As part of the 1988 commitment, the World Health Assembly urged member states to intensify immunization efforts and to enhance surveillance capacity for the poliovirus. The Assembly also requested the WHO director-general to strengthen the technical capacity of the organization to respond to member government requests for planning, training and supervision in national immunization programs, and to undertake evaluations to facilitate corrective actions for countries with polio-3 (three doses per child) coverage of less than 70% (WHO 1988c: 162).

In May 1989, the 42nd World Health Assembly endorsed a plan of action to operationalize the effort, asking, among other things, that countries ensure that 80% polio immunization coverage be achieved in each district for infants under the age of one (WHO 1989: 273-274). This effort received an enormous boost when Rotary International also adopted the global eradication goal and committed itself to an international fund-raising effort in support of the initiative. Originally setting a goal of collecting US\$120 million, the organization had raised \$230 million as of 1990 (Rotary International 1990: 9) and \$378 million by 2000.⁵ In 1992 a revised global plan of action was endorsed, recognizing that eradication would not be achieved in most countries through routine immunization, and advocating supplementary immunization strategies including the use of national immunization days (NIDs) - concentrated campaigns to vaccinate infants and children in short periods of time (WHO 1993: 225). By 1995 the WHO had settled on a four point strategy for eradication: maintaining high routine

coverage, conducting supplementary immunization campaigns such as NIDs, implementing effective surveillance, and carrying out mopping-up immunization in high-risk areas (WHO 1995b: 97).

Eradication efforts accelerated in the mid-1990s. In 1995, 19 countries in the Middle East, the Caucasus and Central Asia held coordinated national polio immunization days (WHO 1998b). In 1996 they did so again, this time joined by Russia (WHO 1998b). In December 1996, approximately 181 million children were immunized against polio in the same week in South Asia when Bangladesh, Bhutan, India, Myanmar, Nepal, Pakistan and Thailand held national immunization days simultaneously in an effort to rid the region of the wild poliovirus (WHO 1998b). In a single day in January 1997 India was able to immunize 127 million children (WHO 1998b), after having immunized 117.4 million in a prior NID (WHO 1997b: 190). China also held NIDs and the number of polio cases reported in the country declined from 5,000 in 1990 to 0 in 1997 (WHO 1998b). In 1997 33 countries in Africa conducted polio campaigns targeting 90 million children (WHO 1998b). During 1995 more than half of the world's children under the age of 5 – around 300 million - were immunized against polio in NIDs (WHO 1998b). In 1996 the figure was 420 million and in 1997 450 million (WHO 1998b). By the end of the year of 1997 111 countries had held national immunization days (see figure 1). As of April 1998, all but four of the world's polio-endemic countries had held NIDs (WHO 1998a).

(Figure 1 about here: Number of countries holding national immunization days for polio)

While eradication had not been achieved by the end of year 2000, the world was well on its way to doing so, and in that year WHO director-general Gro Harlem Brundtland announced a five-year strategic plan in order to ensure that the world would be certified as polio free by the year 2005 (WHO and UNICEF 2000a and 2000b). Meanwhile, Rotary International maintained its financial commitment and private

philanthropists joined the cause, with the Bill and Melinda Gates Foundation pledging \$50 million and the R.E. (Ted) Turner United Nations Foundation an additional \$28 million.⁶

Figures one and two on global immunization rates and disease incidence across time indicate just how powerful an impact the global campaign has had. By 1990 the percentage of infants under five globally who had received all three recommended doses of oral polio vaccine was well over 80%. Corresponding to this rise in immunization rates was a decline in reported disease incidence: In 1976, there were 44,390 cases reported globally; by 1999, only 7,094 cases.⁷

(Figure 2 about here: Global polio immunization rates)

(Figure 3 about here: Number of cases of polio reported globally)

If we review the history of priority for fighting polio in order to evaluate the three models of the priority transmission process, we see distinctive patterns both of incremental change and punctuated bursts. In the late 1950s and early 1960s, after the discovery of vaccines, a huge immunization wave swept across the industrialized world, nearly eliminating the disease in rich countries. From 1969, the year the WHO placed polio under international surveillance, through the late 1980s, priority for fighting the disease rose only slowly in developing countries, taking the form of routine immunization programs through national health systems. In 1988, nearly a full quarter century after discovery of the Salk vaccine, there was a sudden acceleration, as the World Health Assembly committed itself to eradicating the disease from the globe by the end of the second millennium. From that point on priority swept across the globe like a tidal wave as country after country adopted the WHO's four-point eradication strategy, with the national immunization day as centerpiece. Only in the most limited sense of the term did the process of priority transmission follow the steady logic of rationalism.

The case of malaria

Malaria was regarded as a major public health problem and a serious obstacle to socioeconomic development even before World War Two, but it was not until the discovery of dichlorodiphenyl dichloromethane (DDT) during the war that the first major global efforts to eradicate the disease emerged. The strategy was simple: spray malaria-endemic areas extensively with DDT to reduce the number of infected mosquitoes below the critical level of density, and the malaria parasite will no longer be transmitted, so it was believed.

The 1950s wave to eradicate malaria

Established in 1947 and a key body in shaping global malaria policy, the Expert Committee on Malaria from the beginning adopted a cautious attitude toward the use of DDT. Its members were concerned about ecological consequences, feasibility and cost (Najera 1989). However, the success of some countries in achieving DDT-based malaria eradication gave momentum to the idea of elimination of the disease (Najera, Liese, and Hammer 1993). In 1954, the 14th Pan American Sanitary Conference adopted a continental plan for the eradication of malaria from the Americas and in the same year, the Second Asian Malaria Conference recommended that the ultimate goal of nationwide malaria control programs should be eradication. In 1955, the WHO Executive Board recommended the policy of malaria eradication to the Eighth World Health Assembly, which adopted the policy, marking the launch of the first major WHO initiative in fighting the disease.

The idea of mere 'control' of the disease lost sway in this environment of optimism surrounding the possibility of eradication. Soon after the official announcement of malaria eradication policy, most countries of the Americas, Europe, North Africa, Asia, and the Pacific officially declared that their anti-malaria programs

held eradication as the goal (Najera, Liese, and Hammer 1993). Almost every infected country in America, Asia, and Europe joined in the first global anti-malaria campaign.⁸ By September 1973, malaria eradication programs covered 99.93 percent and 84.05 percent, respectively, of malarious populations in America and Southeast Asia (data from WHO 1974).

Financial support from donors, including USAID and its predecessor agencies, was a major spark to eradication efforts. Between 1957 and 1969, USAID and its predecessor agencies provided \$407 million in grants and loans for 44 programs in 37 countries (Conahan and US General Accounting Office 1982). The contribution from the U.S. government covered 40 percent of the budgets of WHO and UNICEF on anti-malaria in this period (Shuler and USAID 1985). Following WHO's policy statement of worldwide malaria eradication, the U.S. International Development Advisory Board recommended that all new as well as existing U.S. supported malaria control programs be converted to eradication programs. According to this policy, USAID was to support only anti-malaria programs that undertook eradication as a goal. As a result, many countries changed the objective of their program from control to eradication (USAID 1976).⁹

It should be pointed out that this first mass campaign achieved much progress in some areas, and spectacular reductions in malaria incidence and malaria-related mortality were achieved, especially in India and Sri Lanka (WHO 1999b). However, such efforts were far from uniformly successful. Resurgences of malaria endemicity occurred increasingly frequently, particularly in Central Africa and Southeast Asia (Najera, Liese, and Hammer 1993). Reasons for failure of eradication projects included resistance to DDT, inadequate epidemiological knowledge, insufficient administrative capacity, and weak health care systems in poor countries.

The shift away from a malaria eradication strategy

These problems and failures forced a re-examination of the global strategy of malaria eradication. Reports from the World Health Assembly in 1968, and subsequent meetings of the Expert Committee on Malaria, made it clear that each country would have to design malaria programs with careful consideration of local epidemiological conditions that, in many circumstances, made short-term eradication impossible (Shuler and USAID 1985).

It took some time before a number of program administrators abandoned this faith in short-term eradication, however. One reason was that the concept of malaria control (rather than eradication), and a feasible global strategy remained undefined, even though the Expert Committee provided technical guidelines. Health authorities – even malariologists – were reluctant to introduce the necessary changes in the programs (Najera, Liese, and Hammer 1993). The reason related to the vested interest in maintaining their organization and autonomy. Moreover, most countries considered that the only way of consolidating gains so far achieved was to maintain as much of the current routine activities as they could afford (Najera 1989). They could afford less and less, however, as donor enthusiasm for eradication dwindled. Between 1970 and 1981, only 12 new projects in 9 countries were approved, representing only \$150.5 million in assistance (Conahan and US General Accounting Office 1982), to be contrasted with the \$407 provided between 1957 and 1969.

The 1970s and 1980s represented low points in global attention to malaria, in large measure due to disappointments surrounding eradication initiatives. However, in the 1990s there was a surprising resurgence of priority as donors and governments 'rediscovered' the disease as a problem. In the early 1990s the WHO organized several high level meetings on malaria. In October 1991 the organization arranged an interregional conference in Brazzaville on malaria, and in October 1992, a meeting of

ministers of health in Amsterdam, at which time participants ratified a global malaria control strategy. In March 1993 the first meeting of a regional working group on malaria control for the WHO African Region was convened at the WHO Regional Office for Africa in Brazzaville. It adopted a regional plan of action for 1994-1997 on malaria disease management and prevention. Subsequently, a majority of African countries undertook an initial evaluation of their malaria situations, while the WHO engaged in technical cooperation with over thirty African countries to strengthen their malaria control programs. By the end of 1994, the majority of endemic countries in the African region had completed national plans of action in line with the global malaria control strategy (WHO 1997a).

The emergence of a roll-back malaria campaign

Through the second half of the 1990s priority for fighting malaria continued to rise. As a response to the concerns of many African countries, the Economic and Social Council of the United Nations initiated a review of the global malaria situation in 1993, which led to endorsement of the Global Strategy in the Forty-Ninth Session of the United Nations General Assembly in December 1994. In March 1996, malaria was identified as a priority component of the United Nations system-wide Special Initiative on Africa. In 1997, African leaders, at the annual meeting of the Organization of African Unity, explicitly called for action to control malaria. In December 1997 African health ministers promoted this concern at the annual onchocerciasis meetings in the United Kingdom, prompting the British government to bring up the malaria issue at the G8 summit in Birmingham, United Kingdom in 1998. There the members of the Group of Eight recognized the importance of the cause, while the British Government pledged £60 million toward the fight (WHO 2000).

This wave of attention culminated in an official WHO-led global campaign to fight malaria, launched in May 1998 and known as 'Roll Back Malaria,' an initiative that followed the selection of a new, activist Director-General of the WHO, Dr. Gro Harlem Brundtland. Substantial pledges of financial resources came from G8 countries, the European Commission, and development banks and other organizations (Nabarro and Mendis 2000).

The roll-back malaria movement began with great momentum, as regional meetings were held throughout Asia, Africa and Central Europe to build consensus for implementation. In the year 2000, alone, at least 45 regional and international meetings were convened on malaria (see appendix table 1). WHO distributed guidelines for country-level implementation of Roll Back Malaria. Forty-one African governments expressed an intention to participate in the campaign, as well as all seven of the ten countries in the WHO's Southeast Asian region where malaria was endemic (Bangladesh, India, Indonesia, Myanmar, Nepal, Sri Lanka, and Thailand).¹⁰

As we look across time, the pattern of priority for fighting malaria can hardly be called rational: It did not follow global disease incidence in any clear way, nor progress logically from discovery of biological cause, to creation of solution, to widespread adoption of solution. At times it was incremental, rising steadily, for instance, through the 1990s to reach the global agenda. Above all else it displayed a punctuated pattern, lying dormant at certain stages, bursting on to the scene at others. And the sources of waxing and waning were multiple and complex. Waxing was associated with the discovery of an intervention (DDT spraying) and excessive enthusiasm about its possibilities, the availability of donor funding (that in turn may have been based on the geopolitical and economic interests of certain advanced industrial nations), sudden 'rediscoveries' of malaria as a problem by G8 governments, African leaders and international organizations, and the emergence of vibrant political leadership at the world's major health organization. Waning was associated with disillusionment with

treatment strategies and the loss of interest by advanced industrial states in fighting the disease. In sum, we see punctuated patterns in priority for global malaria control, with elements of both policy stability and rapid change.

The case of tuberculosis

In 1944 doctors for the first time successfully used antibiotics to cure a TB patient.¹¹ This intervention triggered the disappearance of hundreds of open-air resorts that until that time had been the dominant mode of treatment, and sparked a radical change in the focus of national tuberculosis control programs across the globe. Resource-rich countries settled into TB case management based on hospital beds and chemotherapy, supplemented by the decades-old BCG vaccine. These interventions initiated a steady decline in TB incidence and mortality rates in the developed world that would last nearly three decades (Murray, Styblo and Rouillon 1993). Meanwhile, researchers and public health administrators in resource-poor nations faced a paucity of funds for the construction and maintenance of expensive institutions and the training of specialized personnel (Bayer and Wilkinson 1995). Consequently, health policy makers and practitioners in developing countries looked in the 1950s and 1960s toward ambulatory care - treatment outside costly medical institutions - as a potential answer to the accelerating prevalence of TB among the poor. They placed hope in a series of studies conducted by researchers in India that ambulatory care and passive case detection - the latter a tactic that avoided expensive massive screenings of whole populations - could reduce TB incidence in the developing world.¹² As a consequence of these research findings and treatment discoveries, countries in the developed and developing world alike reduced the number of hospital beds dedicated to TB efforts.

TB moves off the global agenda

TB rates in advanced industrialized nations plummeted in the 1970s. Simultaneously coverage of TB in Western media evaporated and policy makers considered the problem of TB well under control. The *International Union Against Tuberculosis* added '*and Lung Disease*' to its title and expanded its focus as research on tuberculosis alone could no longer fill the pages of its publications. Medical journalist Chris Holme (1998) recounts that, "[tuberculosis] disappeared from medical school curriculums as quickly as it did from the research programmes of pharmaceutical companies and the political agenda." In 1986, Margaret Thatcher disbanded the Medical Research Council, which had been founded in response to the public clamor over tuberculosis, and the prevalence of TB coverage in the World Health Organization's own publications dwindled to almost nothing by the late 1980s. By the end of the decade, the WHO's entire staff for TB monitoring and control consisted of one person (Holme 1998). In short, the priority placed on TB control in the public health arena had diminished from the global level it had reached by mid-century to an issue of concern only for developing countries.¹³

This lull in the attention of industrialized countries to the problem of TB had a severe effect on international resources available to developing countries to fight the disease. However, it did not mean that administrators and scholars in developing countries became complacent. As early as 1957, the International Union Against Tuberculosis and Lung Disease (IUATLD) - a century-old international non-governmental collection of TB organizations and experts - had been advocating the creation of voluntary TB organizations in low-income countries. Officially named The Mutual Assistance Program in 1961, the program primarily provided technical and managerial consulting and planning support for national TB programs. The 1970s and 1980s were characterized by many small-scale successful pilot-projects in developing

countries, conducted mainly through the technical support of the IUATLD. It was through the Mutual Assistance Program in the mid-1970s that the Scientific Director of the IUATLD, Dr. Karel Styblo, undertook research in Tanzania to develop affordable, effective TB control based on general health services (WHO 1995a). In 1977, Styblo garnered the support of the Ministry of Health in Tanzania for a TB pilot project, the bulk of financial support for which came from Norway's Ministry of Foreign Affairs and the Swiss Development Cooperation. (Enarson 2000). He employed a short-course of drug therapy and used the already-existing health services structure (or management unit) in order to monopolize an readily available staff and resources for diagnosis, treatment, and record keeping. Directly observed treatment of a short course drug regimen through existing health service units, combined with strict but simple recording and reporting methods developed by Styblo and the IUATLD in Tanzania, is recognized by the WHO as the source of its current Directly Observed Treatment Short-course (DOTS) strategy, now the predominant global intervention (WHO 1999a).¹⁴

While these advances made in TB management may have influenced control programs in a handful of developing countries, there is little evidence that the insights gained in Tanzania and elsewhere received more than limited attention as industrialized countries largely ignored the disease while poor countries struggled due to resource constraints. It would take much larger forces to garner the level of resources required to make successful national TB control strategies available to developing countries.

The resurgence of priority for TB control

In 1986 in the United States, the Center for Disease Control noted a startling reversal in the thirty-year downward trend of TB incidence, a reflection of a decade of neglect of infectious TB patients, as well as an increase in HIV prevalence. The Advisory Council for the Elimination of Tuberculosis (ACET) of the Department of Health and Human Services reported that from 1953 to 1985, the number of TB cases reported annually in the United States dropped 74% but that from 1985 to 1992, the trend reversed (1999). Consequently, ACET requested funding to reinvest in what it perceived as a re-emerging problem. It was refused by the U.S. Congress, whose members had passed resolutions resulting in widespread cuts in public health services in general, and who considered TB to be a disease of low priority.

In 1989 the CDC and ACET issued a document entitled *A Strategic Plan for the Elimination of Tuberculosis in the United States*. The report identified AIDS patients, immigrants, refugees, migrant workers from high-prevalence countries and minority populations of low socio-economic status as the primary pockets of infection. The impetus for the report seemed to be that the demography of TB would shift to other populations if it were not controlled in these 'high-risk' groups. Media attention and public concern about those failing to complete their treatment grew, as Bayer and Wilkinson put it (1995), "...as a result of the fear that what had been a treatable disease might become an untreatable danger to middle-class populations that had in recent years been spared the threat of tuberculosis." In response, Congress increased funding for the CDC's TB control efforts to \$25 million in 1991, and raised it again to \$104 million for 1993 (Bayer and Wilkinson 1995).¹⁵

The significance for the global health agenda of this new attention to TB in the United States and of a similar alarm in Europe (see Raviglione et al. 1992 and Rieder 1992) is immeasurable. An ACET report stated that (1993):

A close relationship exists between the global TB problem and the impact of the disease in the United States. TB cases among foreign-born persons residing in the United States could soon outnumber cases among U.S.-born persons. Thus, TB elimination in the United States will not be possible without a substantial reduction in the global TB burden.

A 1992 expansion of the United States' 1989 Strategic Plan for TB control highlighted the government's response to the startling degree of global infection: "To decrease the likelihood of introduction of MDR-TB [multi-drug resistant tuberculosis] to the United States, [we must] evaluate the feasibility of establishing DOT programs in four or five of the countries from which a high volume of immigration originates and which have a high incidence of TB" (U.S. Department of Health and Human Services 1992).

Action by international organizations mirrored the new TB alarm in developed countries. WHO documents set at 1990 the beginning of the organization's advocacy of the IUATLD-developed strategy of passive case-finding, DOTS, a regular supply of drugs, and intensive monitoring of progress (Pio et al. 1997). The organization began the decade with only \$16 million earmarked for TB in 1990 - far less than other disease control programs (Kochi 1994). However, it started a series of TB program reviews in the early 1990s in cooperation with the World Bank (Pio et al. 1997). In 1991 the World Health Assembly declared a global TB reduction target, and the WHO announced a general TB strategy grounded in the past work of the IUATLD. In 1993 the World Bank, via its World Development Report, argued that TB services were among the most cost-efficient of health care interventions and that, "governments that spend money on TB services can expect a positive return on this investment" (Enarson 2000). Shortly thereafter, the WHO declared TB a global emergency and began intensive marketing to developing nations of a fine-tuned version of the IUATLD plan designated as WHO-DOTS. The plan included training manuals, standardized chemotherapy plans, record-keeping and reporting workbooks. The IUATLD and WHO launched workshops and courses for health care providers and administrators in every WHO region. World Bank loans for health sector reform became tied to the implementation of WHO DOTS. With

the global big-hitters behind this particular plan against TB, even those resource-poor countries that had TB control programs in place for decades, such as India, subscribed to the WHO plan, thereby securing necessary funding.¹⁶ Within five years of the WHO's declaration of the WHO-DOTS plan, 120 countries had adopted DOTS, including all 22 high-burden countries.

In November 1998 new director-general of the WHO, Dr. Gro Harlem Brundtland, launched the Stop TB Initiative.¹⁷ The campaign is an attempt to coordinate the efforts of all the organizations, institutions, and researchers involved in combating TB. The scope of partners is unprecedented, including all major international and many national TB, lung health, and tropical disease organizations, several major pharmaceutical companies, charitable foundations, doctors associations, a number of development agencies, and the high-burden countries, as well as individual scientists, researchers, and practitioners of TB treatment programs. Working groups have formed to address particular challenges, including DOTS expansion, new TB drug development and containment of MDR-TB emergencies.¹⁸

In March of 2000, ministerial representatives from high-burden countries gathered on World TB Day and issued the Amsterdam Declaration to Stop TB, affirming the WHO-DOTS strategy and the Stop TB Initiative and requesting continued commitment from international organizations and developed nations, with a concerted effort to make MDR-TB drugs accessible and affordable. The G8 responded to this massive organization of forces at their July 23, 2000 meeting in Okinawa, naming TB a priority disease that affects economic development and prosperity. The G8 meeting communiqué declared:

[We] commit ourselves to working in strengthened partnerships with governments, the WHO and other international organizations, industry (notably pharmaceutical companies), academic institutions, NGOs and other relevant actors in civil society to...reduce TB deaths and prevalence of the disease by 50% by 2010.

TB priority has thus burst back onto the international scene in less than a decade, linking major international actors in a network that extends around the globe. One cannot help but notice the punctuated nature of the process. A priority in the 1940s and 1950s for international organizations and governments of the developed world, TB attention receded into dormancy in the 1960s, 1970s and 1980s as rates in industrialized countries plummeted, only to burst again on to the scene in the 1990s. The disease, measured in terms of number of cases globally, did not become more widespread in the early 1990s. What changed was that it threatened once again to penetrate the ranks of the middle-class in industrialized nations, a powerful fear that seems to have underpinned the burst.

Conclusion: Punctuated equilibria and the spread of infectious disease priorities

Between the years 1988 and 1991 global attention for fighting polio, malaria and tuberculosis burst on to the scene in ways that no observer a decade earlier, trying to envision disease priority trends of the 1980s and 1990s, could ever have imagined. In 1988 the World Health Organization launched a global initiative to eradicate polio - a disease that for the entirety of human history has crippled children. Nearly every polio-endemic country on the earth joined in the campaign, as did dozens of industrialized nations, international organizations and corporations, and by the end of the millenium eradication had nearly been achieved. In the early 1990s, pushed by African leaders, the governments of advanced industrial states and international organizations significantly heightened their attention to malaria control, and then convened a series of major meetings through the decade to develop strategies to attack the disease. In 1998 the World Health Organization launched a global 'roll-back malaria' campaign, and in the year 2000 alone, at least 45 high-level meetings were held in dozens of countries in order to organize and implement the initiative, putting malaria near the top of the global disease agenda. In the 1990s a powerful international network of actors formed to fight

tuberculosis, encompassing all the world's major health players including the World Health Organization, the World Bank, the G8 countries and dozens of developing world ministries of health. The World Health Organization's recommended DOTS strategy to fight tuberculosis became the dominant treatment, practiced in over 100 nations, and both the WHO and the World Bank made tuberculosis control one of their major priorities.

These surges of attention and the erratic post-World War Two histories of priority for fighting polio, malaria and tuberculosis raise questions about the rationalist and incremental frameworks, taken individually, as models of the disease priority transmission process. Elements of each model do capture *portions* of the process. Discoveries of biological causes did lead to treatment solutions and the diffusion of these solutions in a manner predicted by rationalism. Treatments did spread to encompass much of the world's affected population, but, as predicted by incrementalism, in very slow fashion. However, both rationalism and incrementalism miss the ebbs and flows of policy attention, and have nothing to say about the surprising bursts of priority that have infused the histories of polio, malaria and tuberculosis control.

The three case studies indicate that diseases rise on to global policy agendas as a result of a complex array of forces. The number of victims of the disease is one among numerous factors, and possibly one of the least critical. At least as important are factors such as the discovery of and the development of consensus surrounding simple treatment solutions; the creation of workable strategies to implement these solutions; the rise of capable public health entrepreneurs to push the causes; and possibly most critically, the emergence of a perception among political elites in industrialized countries that the disease is in some way (rightly or wrongly) a threat to their own populations. Much further research is required to sort out the full array of factors, their interactions, and their relative power, but these factors do seem to be part of the causal equation.

It simply cannot be predicted when easily administered treatments will be invented, effective implementation strategies discovered, public health entrepreneurs

inspired, or alarm among rich countries heightened. Randomness and uncertainty are inherent parts of the process. Therefore, shocks to equilibria inevitably shape disease priority transmission patterns. The framework that captures this dynamic best is the punctuated equilibrium model, since it encompasses both the observation that periods of stability exist, and that these points of equilibrium will be interrupted by unpredictable occurrences. This unpredictability, ironically, offers hope for the future. Not all change is incremental. For those widespread diseases that have been ignored for decades yet continue to cause suffering among peoples of resource-poor countries, a treatment discovery in Delhi, an implementation solution in Lima, a committed leader in Brazzaville or an outbreak among upper-middle class society in Chicago may lift a disease in a flash from a position of dormancy to one of active attention on the global agenda.

Acknowledgements

Support is gratefully acknowledged from the Pacific Basin Research Center of the Soka University of America, whose funding helped make research for this paper possible.

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Appendix

Table 1: Partial list of meetings in 2000 to organize Roll Back Malaria campaign

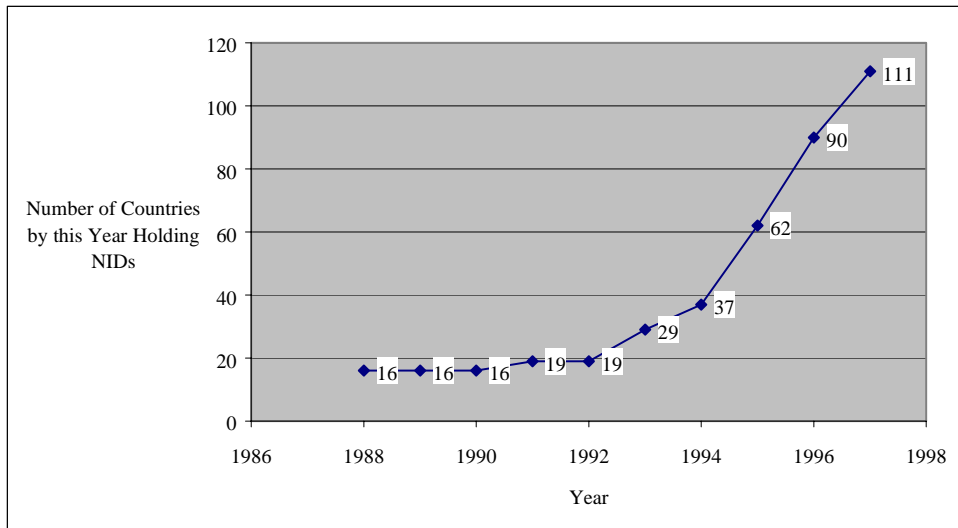
Month	Country	Title
January	Tanzania	RBM Inception meeting
February	Ethiopia	RBM National Inception Meeting
February	Zimbabwe	RBM Consultants Workshop
February	Afghanistan	RBM Meeting
February	Nepal	RBM Advocacy Meeting
February	Nigeria	RBM Consensus Building Meeting
February	Yemen	WHO/RBM Joint Mission
February	Kenya	Meeting of the National Malaria Coordinating Committee
February	Kenya	Ministerial Launch of RBM
February	Zambia	Consensus meeting on RBM draft strategy
March	Ghana	Roundtable meeting of RBM partners
March	Namibia	Stakeholders meeting
March	Zambia	Stakeholders meeting on RBM
March	Germany	POPs, Intergovernmental Negotiating Committee Fourth Session
March	Zambia	JICA meets and hands over commodity support materials
April	Philippines	RBM Meeting
April	Papua New Guinea	National Supervisors Meeting
April	Nigeria	African Summit on RBM
May	Switzerland	CDS Coordinators Strategy Meeting
May	Laos	Meeting on RBM
May	Indonesia	Meeting of Mekong RBM partners
May	Azerbaijan	2nd Inter-regional Malaria Coordination Meeting
June	Switzerland	RBM Technical Briefing Session
July	USA	Malaria Control for African Prosperity and Roll Back Malaria
August	Columbia	Symposia on RBM at XVth Congress on Tropical Medicine
October	Switzerland	Updating Antimalaria Treatment Guidelines
November	Oman	5th National Malaria Conference
November	Philippines	WPRO RBM review Meeting
November	South Africa	POPs, Intergovernmental Negotiating Committee Fifth Session
November	Burkina Faso	Health and Environment Workshop
December	Switzerland	WHO/UNICEF/UNFPA Coordinating Meeting on Health

List of captions for figures

Figure 1: Number of countries holding national immunization days for polio

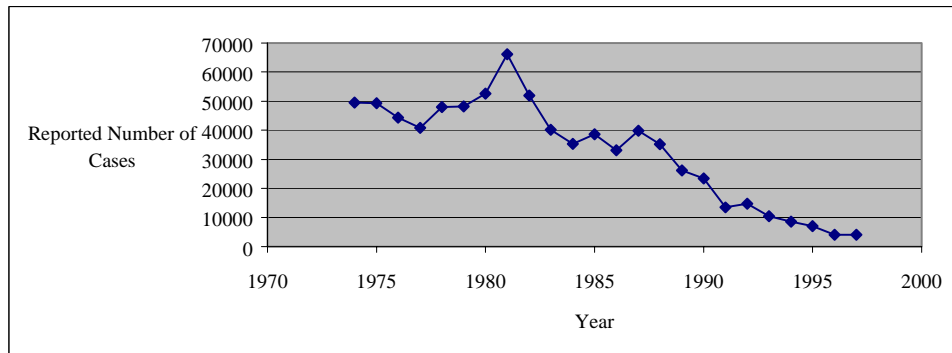
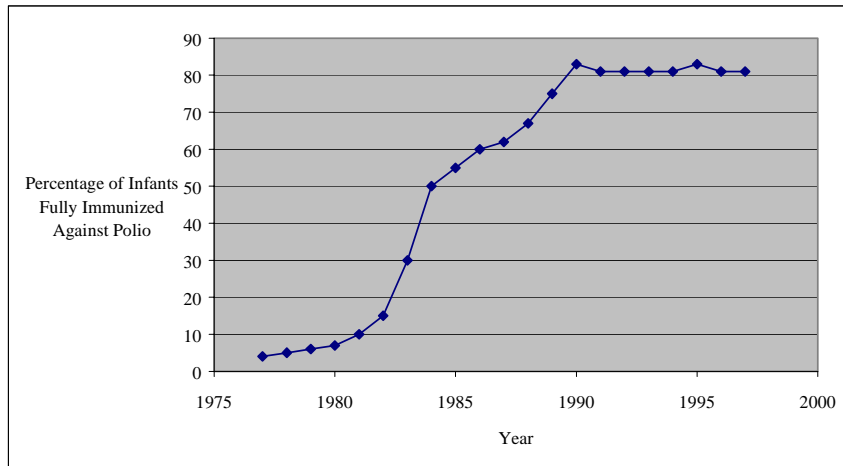
Figure 2: Global polio immunization rates

Figure 3: Number of cases of polio reported globally

Figures

Source: World Health Organizationⁱ

ⁱ For years 1988-1995 WHO 1996c, 190. For years 1997 – WHO 1998b.



Sources for figures 2 and 3: World Health Organizationⁱⁱ

ⁱⁱ Global Polio-3 immunization rates - 1977-1989 Kim-Farley 1992, 941 as estimated from graph chart. 1990 WHO 1998b, 1991 WHO 1994, 170 as estimated from graph. 1992-1994 WHO 1995b, 97. 1995-1996 WHO 1997b, 189. 1997 WHO 1998a. SEARO Polio-3 - 1977-1995 WHO 1996b, 10. Global Reported Cases - 1976-1994 WHO 1996b 38-139. 1995 WHO 1997c, 29. 1996 WHO 1998b. 1997 WHO 1998c.

Notes

¹ The official and globally practiced strategy of the World Health Organization.

² These models each have a tradition in the field of policy studies. See Kingdon (1984) for a clear explication of all three. Scholars concerned with the agenda-setting and implementation phases of the policy process have been the ones most involved in developing such models. In general, implementation scholars have tended to view the policy process in incremental terms while agenda-setting scholars have been most concerned with rapid change. Among the scholars who have attempted to integrate these two understandings are Frank Baumgartner and Bryan Jones (1993). Working from a tradition in political science agenda-setting research spurred by Schattschneider (1960), Walker (1974) and Kingdon (1984), they developed a punctuated equilibrium model of the agenda-setting process, one that challenges incrementalist policy models by showing that long periods of policy stability are punctuated by sudden shifts, making both stability and rapid change central elements in the policy process.

³ Information available at <http://www.sabin.org>.

⁴ See <http://www.sabin.org>.

⁵ World Health Organization, Press Release WHO/60, "A race of olympic proportions: Reaching the last child with polio vaccine," 27 September 2000.

⁶ World Health Organization, Press Release WHO/75, "Bill and Melinda Gates and Ted Turner donate US\$78 million to accelerate the campaign to eradicate polio by end of 2000," 7 December 1999.

⁷ World Health Organization, Press Release WHO/71, "Major milestone reached in global polio eradication: Western Pacific region is certified polio-free," 29 October 2000. This decline occurred as surveillance capacity has gone up markedly on a global basis. In the absence of actual change in polio incidence we would expect a sustained rise in cases reported.

⁸ Countries and regions that by 1962 had adopted programs were as follows: Argentina, Barbados, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominica, UAS, Grenada, Guadeloupe, Guatemala, Br. Guiana, Honduras, Br. Honduras, Jamaica, Martinique, Mexico, Nicaragua, Panama, Peru, Puerto Rico, St. Lucia, Surinam, Trinidad & Tobago, Venezuela, Afghanistan, Burma, North Borneo, Ceylon, Taiwan, Cyprus, Hong Kong, India, Iran, Iraq, Israel, Jordan, Lebanon, Philippines, Is. Sarawak, Singapore, Syria, Thailand, Turkey, South Africa, Cape Verde Islands, French Somaliland, Libya, Mauritius, United Arab Republic, Gaza Strip, Rhodesia & Nyasaland, Swaziland, Albania, Bulgaria, Spain, Greece, Italy, Portugal, Romania, the USSR and Yugoslavia. This list includes only those countries involved in consolidation and maintenance phases, which are based on success in prerequisite preparation and attack phases, so the number of countries taking part in malaria eradication is at least equal and probably larger than the number indicated in this list. This list is extracted from "The status of malaria eradication during the six month period ending 31 December 1962," *Weekly Epidemiological Record*, 14 June 1963.

⁹ For instance, in 1959, the government of Ethiopia accepted malaria eradication as a national objective, creating the Malaria Eradication Service to implement that objective. India's earliest anti-malaria efforts began in 1953 with a five-year National Malaria Control Program, followed in 1958 by a program to

eradicate malaria in India by 1965. In 1951, a malaria program was initiated in Indonesia. By 1959 the program was converted to the preparatory phase of a malaria eradication program. Nepal set up its malaria eradication program in 1958, which indicated that it would be feasible to eradicate malaria from the country by 1971. In 1958, WHO and the government of Pakistan began developing a program for the eradication of malaria. In 1960, they approved a 14-year plan for eradicating malaria in East and West Pakistan, initiating the program in 1961 (USAID 1976).

¹⁰ Information derived from website of the World Health Organization.

¹¹ New Jersey Medical School National Tuberculosis Center. "A Brief History of Tuberculosis." Available at <http://www.umdnj.edu/~ntbcweb/history.htm>.

¹² With a rich history of TB initiatives, associations, and programs led by both Indian and British researchers, India was in a position to foster research and development in tuberculosis even while most national TB programs in industrialized nations rested on their laurels, satisfied with a largely unregulated regimen of chemotherapy administered in hospitals. It was in the context of this need - to translate advances in chemotherapy into efficient treatment programs applicable in adverse conditions on a nationwide scale - that the Indian government elicited the aid of the United Kingdom Medical Research Council and the World Health Organization to create the Madras Tuberculosis Chemotherapy Centre. Though rarely acknowledged in contemporary publications about the history of tuberculosis treatment (much to the frustration of contemporary Indian TB treatment scholars and practitioners - see Banerji 1997), a series of studies in the 1950s and 1960s conducted through the Madras Centre and elsewhere in India would eventually revolutionize national TB control programs across the globe, particularly in countries that were unable to afford the treatment patterns followed in wealthier countries. Of particular import was a 1958 study (now recognized by TB experts as the classic "Madras Study") that demonstrated that treatment of TB patients in their home can be as effective as their treatment in sanatoria (Tuberculosis Chemotherapy Centre, Madras 1959).

A second pivotal research study in India took place at the National Tuberculosis Institute at Bangalore in 1962, and suggested that top priority should be given to sputum smear positive patients who were actively seeking treatment (Banerji and Anderson 1963). Until then, TB control efforts were based on "active detection," mass screening of suspect populations to detect pulmonary TB cases. The Bangalore study, followed by others in Africa and Asia, showed that patients with the symptoms of pulmonary TB almost always present themselves to a health care center at least once. In addition, active case finding proved too expensive for resource-poor countries. Sputum examination via microscope proved more reliable and less expensive than radiography. Finally, sputum smear positive cases are the most infectious, and consequently of first priority to public health officials seeking to limit the spread of TB.

¹³ The current Director of Scientific Activities at the IUATLD, Dr. Donald Enarson, recently offered an alternative, treatment-oriented explanation of the vanishing of TB from the global health agenda in the 1970s and 80s. Enarson recounts that his own critique of the WHO's Tuberculosis Control Program at a meeting of the Tuberculosis Surveillance Research Unit in the early 1970s, "showed the epidemiological harm of chemotherapy that prevented death while failing to cure infectious cases" (Enarson 2000).

¹⁴ While Styblo was advising TB program administrators of other nations through sponsorship by the IUATLD, other organizations in the developing world were experimenting with the most effective and efficient way to implement directly observed therapy (DOT) without the benefit of an extensive medical staff. In 1984, a large, local NGO called the Bangladesh Rural Advancement Committee initiated a DOTS-based TB control program that used community health workers for case detection and treatment in their own neighborhoods (Mushtaque 1997). Though the Bangladesh National Tuberculosis Control Program, as part of the movement that culminated at Alma Ata, had sought to integrate with primary health care since 1976, they had yet to successfully do so. The response from BRAC was to train women who were already involved in health services as volunteers to also collect sputum smears from agreeable community members with TB symptoms and to create a DOTS treatment plan together with the patient. The program

was successful enough that they were able to scale-up the project through a partnership with the National Tuberculosis Control Program.

¹⁵ Even as the United States stepped up its efforts, TB incidence and incidence of multidrug-resistant TB continued to rise. Unable to improve its treatment rates, the United States looked to the Tanzania projects begun by Styblo a decade earlier (Holme 1998). By 1993 ACET had at last recommended directly observed therapy (though not mandatory) on the level of federal policy, upon recognition of the “difficulty in predicting which patients will adhere to a prescribed regimen” (ACET 1993). The first decrease in new cases in the United States in a decade and a half occurred in 1993 and was attributed to directly observed treatment.

¹⁶ World Bank Press Release. “World Bank Release on Tuberculosis Control in India: World Bank project is largest intervention against TB.” January 31, 1997.

¹⁷ See <http://www.stoptb.org/home.html>.

¹⁸ By 1998, the year of the first WHO annual Global Tuberculosis Report, the problem first noticed in a neglected Bangalore study of 1962 had resurfaced full force. Multi-drug resistant TB, a symptom of inadequate attention to the complete treatment of sputum smear positive patients, arose on TB agendas around the globe following a WHO/IUATLD Global Report on Drug Resistance Surveillance (1997). The IUATLD and WHO convened meetings in the United States and Geneva in 1998 to assess two different treatment protocols for MDR-TB (Espinal 1998). This report and research by a Harvard group led to a realization that the cost of the drug regimen for combating MDR-TB was far out of reach for resource-poor nations. Consequently, 1999 and 2000 have seen a growing push from NGOs and developing nations for international organizations like the WHO and World Bank, developed nations, and pharmaceutical companies to provide second-line anti-TB drugs.