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COMMUNICABLE DISEASES 2002

Global defence against the infectious disease threat

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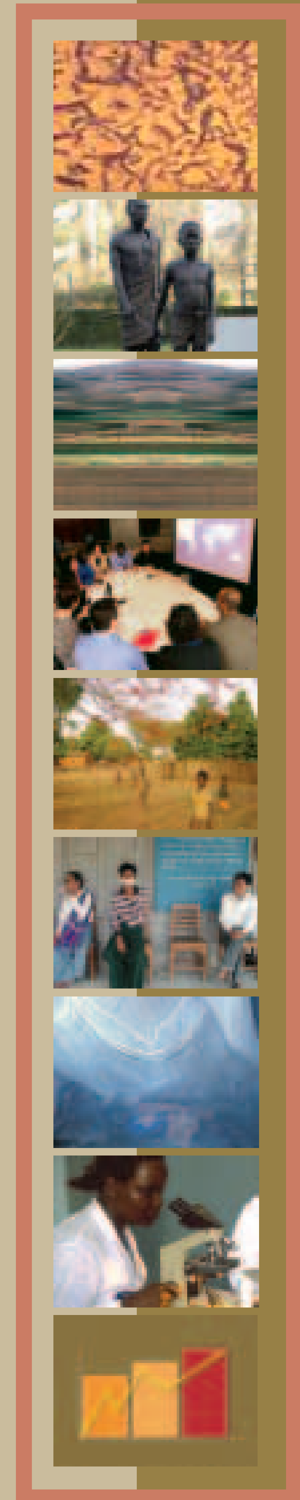

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Newsletter (Action against infection)	http://www.who.int/infectious-disease-news
Report on infectious diseases	http://www.who.int/infectious-disease-report/
Weekly epidemiological record	http://www.who.int/wer/
WHO Mediterranean Centre, Tunis	http://wmc.who.int/
Buruli ulcer	http://www.who.int/gtb-buruli
Filariasis Global Alliance	http://www.filariasis.org
Leprosy	http://www.who.int/lep/
Intestinal parasites	http://www.who.int/ctd/intpara
WHO Pesticides programme	http://www.who.int/ctd/whopes
Surveillance and Response	http://www.who.int/emc/
Outbreaks – infectious diseases	http://www.who.int/disease-outbreak-news
CSR document collection	http://www.who.int/emc-documents
Rabies network (RABNET)	http://www.who.int/rabnet
Antimicrobial resistance information bank	http://oms2.b3e.jussieu.fr/arinfobank/
Dengue information bank	http://oms2.b3e.jussieu.fr/DengueNet/
Influenza network (FluNet)	http://oms.b3e.jussieu.fr/flunet
CSR collaborating centre database	http://oms2.b3e.jussieu.fr/WHOCC_Net/
Roll Back Malaria (RBM)	http://www.rbm.who.int
Tuberculosis	http://www.who.int/gtb/
Tuberculosis Partnership	http://www.stoptb.org
Tropical Disease Research (TDR)	http://www.who.int/tdr/
TDR image library	http://www-nt.who.int/tropical_diseases/databases/imagelib.pl
TDR video library	http://terrance.who.int/mediacentre/tdr

Abbreviations and acronyms

AIDS	acquired immunodeficiency syndrome
APOC	African Programme for Onchocerciasis Control
BSE	bovine spongiform encephalopathy
CDC	Centers for Disease Control and Prevention
COMBI	Communication for Behavioural Impact
DALYs	disability-adjusted life years
DANIDA	Danish International Development Agency
DEC	diethylcarbamazine
EWARN	Early Warning and Response Network
FAO	Food and Agriculture Organization of the United Nations
GAVI	Global Alliance for Vaccines and Immunization
GCDPP	Global Collaboration for Development of Pesticides for Public Health
GOARN	Global Outbreak Alert and Response Network
GPHIN	Global Public Health Intelligence Network
HAART	highly active antiretroviral therapy
Hib	*Haemophilus influenzae* type b
HIV	human immunodeficiency virus
IAEA	International Atomic Energy Agency
ICG	International Coordinating Group on Vaccine Provision for Epidemic Meningitis
IPT	intermittent preventive treatment
IVR	WHO/UNAIDS Initiative for Vaccine Research
MDR-TB	multidrug-resistant tuberculosis
MMV	Medicines for Malaria Venture
MORHAN	Movimento de Reintegração das Pessoas Atingidas pela Hanseníase
NGO	nongovernmental organization
OAU	Organization of African Unity
OCP	Onchocerciasis Control Programme
PAAT	Programme Against African Trypanosomiasis
PAL	Practical Approach to Lung Health
PATH	Program for Appropriate Technology in Health
R&D	research and development
RBM	Roll Back Malaria
SP	sulfadoxine–pyrimethamine
TB	tuberculosis
TDR	UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases
TEPHINET	Training Programs in Epidemiology and Public Health Interventions Network
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHOPES	WHO Pesticide Evaluation Scheme

Introduction

Mortality figures give only a partial measure of the toll that infectious diseases continue to take.

Some that rarely kill cause severe and permanent disabilities in millions of people.

Others flare up in epidemics that wreak havoc on economies as well as health systems.

The global infectious disease situation: divergence and convergence

According to the latest WHO estimates, infectious diseases caused 14.7 million deaths in 2001, accounting for 26% of total global mortality. Existing drugs and vaccines could have prevented many of these deaths. Simple access to food and drinking water free of faecal contamination could have prevented almost 2 million more.

Three diseases – AIDS, tuberculosis (TB), and malaria – continue to account for a large share (39%) of deaths attributed to infectious diseases. Total deaths from these three diseases amounted to 5.6 million in 2001. When deaths from diarrhoeal disease and respiratory infections (5.8 million) are added, these five diseases alone are responsible for approximately 78% of the total infectious disease burden.

Mortality figures, however, give only a partial measure of the toll that infectious diseases continue to take. As documented in chapter five of this report, there is a second league table – of the so-called "neglected" diseases – where health impact is measured by severe and permanent disabilities and deformities in almost 1 billion people. These are the impaired childhood growth and cognitive development associated with schistosomiasis, the mental retardation seen in survivors of meningitis, and the blindness caused by onchocerciasis. These are the severely enlarged limbs of elephantiasis, the faces eroded by mucocutaneous leishmaniasis or leprosy, and the limbs of small children that were amputated to save their lives from aggressive Buruli ulcer infection. Neglected diseases are hidden diseases as they affect almost exclusively extremely poor populations living in remote areas beyond the reach of health services. Their low mortality despite high morbidity places them near the bottom of mortality tables and, in the past, they have received low priority.

There is a third group of infectious diseases whose incidence, when plotted, reflects the abrupt peaks and plateaus of an electrocardiogram. These are the emerging and epidemic-prone diseases – the headline diseases that flare up and wreak havoc, sometimes in predictable geographical areas or seasons, sometimes in ways that take the medical and public health professions completely by surprise. Since the events of September 2001, the possible deliberate use of biological agents to cause harm has been added to this group as yet another unpredictable epidemic threat.

Finally, evidence is linking a growing number of infectious agents to an increased risk of cancer, blurring the traditional distinctions between chronic and communicable diseases. The International Agency for Research on Cancer (IARC), the cancer research arm of WHO, has determined that infections with several specific viruses, bacteria, and parasites increase the risk of human cancers of the cervix, liver, urinary bladder, and stomach and can also cause acute leukaemia. Cancers attributed by IARC to an infectious agent are thought to account for 26% of all cancers in the developing world, and 8% of all cancers in the industrialized world.

This report, *Global defence against the infectious disease threat*, profiles trends in the incidence, prevalence, and control of all infectious disease groups – high mortality, neglected (disability-causing), and epidemic-prone – of major public health importance with the exception of AIDS and the vaccine-preventable diseases of childhood. These diseases are the responsibilities of other departments within WHO and the joint United Nations programme, UNAIDS, in which WHO is a partner. A report on the global AIDS situation is available from UNAIDS. Problems caused by the overlap of AIDS with other infectious diseases, both geographically and epidemiologically, are covered in the present report. Vaccine-preventable diseases of childhood are the subject of a recent report available from WHO.

The global infectious disease situation is being shaped by two broad sets of trends, one characterized by divergence and the other by convergence.

LEADING CAUSES OF MORTALITY FROM INFECTIOUS DISEASES, 2001 (IN MILLIONS)

Cause	Deaths (millions)
Respiratory infections	3.9
AIDS	2.9
Diarrhoeal diseases	1.9
Tuberculosis	1.6
Malaria	1.1

LEADING INFECTIOUS CAUSES OF CANCER, 2000

Infectious agent	Cancer site	Cases (number)	% due to infection
Human papilloma virus	cervix	471 000	100%
Hepatitis B virus	liver	306 800	55%
Hepatitis C virus	liver	175 600	31%
Helicobacter pylori	stomach	442 000	50%

A constantly diverging threat

Infectious disease agents take advantage of every opportunity to multiply, mutate, migrate, adapt to new hosts, and evolve to resist drugs.

As the chapters that follow indicate, the global infectious disease situation is being shaped by two broad sets of trends, one characterized by divergence and the other by convergence. In recent years, the infectious disease threat has diverged considerably from previous patterns of epidemiology, drug susceptibility, geographical distribution, and severity. Such divergence arises from the natural behaviour of the microbial world, which is complex and constantly evolving. Where infectious disease agents and vectors are concerned, nature not only takes its course, it also takes advantage of every opportunity to multiply, mutate, migrate, adapt to new hosts and habitats, and evolve to resist drugs and insecticides. The opportunities, as documented in this report, have been numerous, and a dramatic resurgence of the infectious disease threat has been the result.

The return of TB as a global threat has been accompanied by the emergence of multidrug-resistant forms costing up to 100 times more to treat. Malaria may soon be resistant worldwide to all currently available first-line drugs. Drug resistance to common bacterial infections is now so pervasive that it raises the spectre of a post-antibiotic era. The serious problem of HIV-TB co-infection has been joined by the especially deadly synergy of HIV-leishmaniasis co-infection, now reported in 34 countries.

Health workers display protective clothing during an Ebola epidemic. New diseases are now emerging at the rate of one per year.
Credit: WHO/GOARN

Cholera is in its seventh pandemic. Yellow fever is poised to cause massive urban epidemics. The 1998 epidemics of dengue and dengue haemorrhagic fever were unprecedented, and the epidemics of 2002 have broken the record again. A new strain of epidemic meningitis emerged in 2002, defying emergency preparedness in the form of stockpiled vaccines against conventional strains. New and more severe strains of common foodborne pathogens have made the profile of foodborne diseases distinctly more sinister. The invariably fatal variant Creutzfeldt-Jakob disease, first recognized in 1996, has added considerably to this concern. Year by year, the highly unstable influenza virus is a reminder of the ever-present threat of another lethal influenza pandemic.

Some insect vectors have developed resistance to virtually all major classes of insecticides. Others have re-emerged in areas where they had previously been well controlled. Still others, originally confined to tropical jungles, have adapted to breed in urban litter. Diseases have likewise spread to new continents or returned to former homes. West Nile fever is now firmly established in North America, as is Rift Valley fever on the Arabian peninsula. African sleeping sickness, almost eliminated in the 1960s, is once again ravaging parts of the African continent.

These are just a few of the many alarming trends documented in this report. They support a simple and straightforward conclusion. Infectious diseases and their vectors are remarkably resilient. The world must never relax its guard against a microscopic adversary that changes and adapts so rapidly and has the advantages of stealth

and surprise on its side. As explained in chapter four, a new global system for outbreak alert and response, formalized in April 2000, has greatly enhanced global capacity to detect and contain outbreaks with sufficient speed to prevent their international spread.

A convergence of concern, commitment and first-rate tools

Despite some alarming trends, the infectious disease situation documented in this report is largely encouraging, sometimes in ways that suggest a fundamental change for the better in the landscape of public health. The world is on guard as never before. The threat posed by infectious diseases is now perceived to be universally relevant, as the speed and volume of international travel have made an outbreak or epidemic anywhere in the world a potential threat everywhere else. Moreover, the ability of infectious diseases to destabilize societies, so alarmingly demonstrated by AIDS, has brought home the message that local infectious disease problems can have global security implications.

The second set of trends profiled in this report is one of convergence – a coming together of concern, commitment, resources, scientific tools, and determined action, often with an urgency underscored by time-limited goals. TB and malaria – two of the most severe global infectious disease threats within WHO's mandate – are being tackled on multiple fronts by broad-based coalitions of partners. As documented in chapter six, the Stop TB partnership has now matured to the point that it is closing in on one after another of the opportunities that allowed this disease to resurge. The original DOTS strategy, aimed at improving treatment compliance, is now supported by strategies that insist on DOTS adherence throughout entire countries, ensure an uninterrupted supply of quality drugs, and make drugs for treating multidrug-resistant TB available at a fraction of their normal cost. Strategies for expanding DOTS coverage and accelerating case detection are engaging private practitioners, using communities and integrated service delivery, and providing incentives for HIV testing in areas where co-infection is prevalent. The newer Roll Back Malaria partnership, which is being modelled in part on Stop TB's success, has completed its first consolidating and support-building phase and is now ready for impact within countries. Achievements and future priorities are described in chapter seven.

The growing convergence of concern and commitment – and its impact on the global infectious disease situation – are most vividly expressed by two new trends. The first is the growth of public-private partnerships, often involving large and open-ended donations of drugs, that are aiming to put a permanent end to several neglected diseases. As explained in chapter two, alliances have now been formed to expedite the control of nine diseases. Many of these public-private partnerships take their impetus from the availability of safe and highly effective drugs suitable for single-

The second set of trends is one of convergence – a coming together of concern, commitment, resources, tools, and determined action.

A nurse distributes TB drugs. The Stop TB partnership is closing in on one after another of the opportunities that allowed this disease to resurge.

Credit: WHO/TBP/Davenport

Both of the new trends – public-private partnerships and strategic R&D – aim to ensure that drugs and other control tools being made available for diseases of the poor are the best the world can offer.

dose annual administration to all populations at risk. Apart from being free of charge, the drugs are quality-assured and often packaged in ways that encourage patient compliance. As explained in chapter five, health systems carved out for the delivery of one drug are being used to deliver interventions for other priority diseases, as partnerships build on each other's success.

Results are often spectacular. For example, the Global Alliance to Eliminate Lymphatic Filariasis, established in 2000, achieved an almost 10-fold increase in the targeted mass distribution of drugs within a year. The eradication of guinea worm disease, which is now in sight, will mark the first complete victory over a disease that has no vaccine to facilitate control and has relied instead on health education and behavioural change. The Global Alliance for Elimination of Leprosy renewed its commitment in January 2002 to intensify activities in order to find and cure a maximum of patients. Drugs are being donated, wherever and in whatever quantity needed, until the global elimination target is reached.

The second trend of convergence is represented by a new breed of research and development ventures, pioneered by the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR), that constitute a strategic response to an urgent health need, such as that arising from the rapid spread of resistance to first-line antimalarials. These ventures aim to bring badly needed yet unprofitable drugs and vaccines to market using the same complex technologies and quality standards that characterize industry-run discovery projects for commercially attractive diseases. Major diseases, notably TB and malaria, and lower profile diseases, including schistosomiasis, Chagas disease, African sleeping sickness, and epidemic meningitis, are now the beneficiaries of strategic product development.

As explained in chapter two, both of these new trends are distinguished by an encouraging ambition: to ensure that drugs and other control tools being made available for the neglected diseases of the poor are the best the world can offer. The days when impoverished countries had to settle for second-rate health care may be slowly coming to an end.

Other important tools are also being brought to bear on the infectious disease problem. Sophisticated satellite imagery and earth-sensing technologies, developed for military purposes during the Cold War, have been adapted for public health use and are revolutionizing the approach to infectious disease control. In particular, they are providing major support to several of the new public-private partnerships that rely on mass drug administration to at-risk populations. As one example, explained in chapter three, the use of satellite imagery has made it possible to identify the geographical location of human populations at greatest risk of contracting African sleeping sickness. To identify, characterize, and map the patterns of tsetse fly habitats over an area in excess of 10 million square kilometres where nearly 50 million people are at risk would have been impossible before the advent of satellite imagery and geographical information systems.

Vector control, also described in chapter three, has been revitalized. Partnerships with industry have been formed to accelerate the development of new products suitable for use in developing countries. Once again, complex industrial technologies are being used to improve the long-term impact of insecticide-treated nets for reducing the transmission of malaria and other insect-borne diseases. In another ingenious solution, insecticide-treated tarpaulins and plastic sheeting have been developed for the construction of refugee shelters, effectively protecting populations against many diseases while also considerably reducing logistic demands during emergencies.

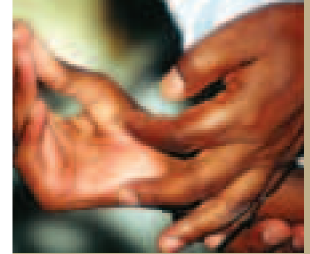
THE BURDEN OF NEGLECTED DISEASES IN DISABILITY-ADJUSTED LIFE YEARS (DALYs) IN MILLIONS			
Lymphatic filariasis*	5.6	Onchocerciasis*	1.0
Intestinal nematode infections	4.7	Dengue	0.7
Leishmaniasis	2.4	Chagas disease*	0.6
Schistosomiasis*	1.8	Leprosy*	0.2
Sleeping sickness*	1.6	Buruli ulcer	?

Because of the determination of the international community to eliminate several diseases, certain images that have been part of the world for centuries are now disappearing.

**targeted for elimination or control*

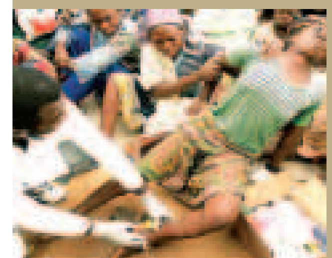
Disappearing images

While the world can never relax its vigilance over the constantly changing microbial world, some initiatives currently under way promise to bring permanent improvements for human health. Because of the determination of the international community to eliminate several diseases, certain images that have been part of the world for centuries are now disappearing: the shrouded figures ostracized by leprosy, the poles leading lines of people in their prime of life blinded by onchocerciasis, the sticks used to gradually and painfully wind out the guinea worm protruding from an ulcer in the foot or leg. Progress is also visible in other areas of daily life. The image of hospital beds filled with TB patients is being replaced by one of patients being treated – and cured – within communities. Antimalarials are moving closer to people's homes, and more children are sleeping protected by insecticidal nets.



Leprosy

Onchocerciasis



Guinea worm
Credit: Seattle Post-Intelligencer/M. Urban

Power is unleashed when multiple forces converge, and the infectious disease situation is clearly benefiting. Growing concern over the issue of global health security has resulted in heightened vigilance, better disease intelligence, and strengthened capacity to respond when outbreaks occur. While this trend can be seen as anchored in the enlightened self-interest of nations, the commitment and energy now focused on diseases of the poor are good evidence that humanitarian concerns are likewise shaping the infectious disease situation.

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