

mind•full: a brainsnack for future leaders with ethical appetites

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emerging infectious diseases

Outbreaks of emerging infectious diseases occur at an alarming rate and present challenging dilemmas to the global community. People come in contact with these diseases in various ways, as the environment and behavior patterns of both people and germs change. Hospitals, crowded cities, and war zones are breeding grounds for disease. And with international travel, a local outbreak on one side of the world can lead to a pandemic—an epidemic without borders.

Epidemics of infectious diseases, such as bubonic plague, smallpox, and yellow fever, have been described in national records, history books, and folklore. Yet researchers are still unsure where they come from or exactly how they work. Some disease-causing microbes lurk in isolated regions; others evolve through natural mutations or in response to changed environments. Vaccines for polio and other viruses and antibiotics to alleviate diseases like pneumonia give humans a chance to fight back, but there are no wonder drugs.

Today's emerging infectious diseases are diverse: exotic viruses like ebola and hantavirus; relative newcomers, such as human immunodeficiency virus (HIV); and old scourges like tuberculosis and malaria, which are sometimes unaffected by drugs that once stopped them. Most experts agree that containment of disease outbreaks can be accomplished through increased priority on treatment for infected individuals, research funding for emerging infectious agents, international cooperation, and systematic vigilance. Government leaders may agree, but point to limited resources and competing priorities as cause for restraint in their national budgets.

The mission of Student Pugwash USA is to promote the socially responsible application of science and technology in the 21st century. As a student organization, Student Pugwash USA encourages young people to examine the ethical, social, and global implications of science and technology, and to make these concerns a guiding focus of their academic and professional endeavors.

The **mind•full** series encourages readers to explore crucial ethical dilemmas associated with the application of science and technology.

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go figure!

Emerging (and re-emerging) infectious diseases have the potential to wreak havoc in every corner of the globe. Statistics show their effects are most devastating in developing countries and in the poorest regions of developed countries.

Developing countries lack both sufficient health care facilities and adequate medical supplies, such as diagnostic equipment, sterile syringes, and clean bedding. This has often resulted in the hospital being the most dangerous place to be in time of outbreak. In industrialized countries, including the United States, there are people living in poverty who have inadequate access to health care or who are incapable of managing their illnesses.

- Malaria kills about **1 million** children a year.

- In the developing world, **1 in 2** deaths is caused by communicable disease, whereas in the developed world **3 out of 4** deaths are due to non-communicable diseases, many of which are lifestyle related, such as cancer or heart disease.

- More than **7,000** adults die each day from tuberculosis and there are over **1,000** new cases every hour of every day.

- Snail fever affects **200 million** people in 74 countries. The cost of treatment—although only 30 cents per patient—is too expensive for widespread use in many of the most-affected countries.

- Malaria, directly or in association with acute respiratory infections and anemia, causes around **2 million** deaths a year and some **400 million** cases annually. Globally, more than 2 billion people are threatened.*

- In Africa, where **9 out of 10** malaria deaths occur, the social and economic costs of the disease have reached US\$2 billion each year.

what's a million?

Figures become abstract quickly. Think of this to help you out. If we called out the names of one million people, taking two seconds to say each name, it would take us 24 days to finish the list. If we called out one billion names, it would take us 64 years!

- It is estimated that by the year 2000, over **5 million** children will be infected by HIV and another **5-10 million** orphaned by the HIV/AIDS pandemic.

- Of the world's **51 million** deaths last year, 40% were caused by communicable diseases.

- River blindness, a parasitic disease, infects **18 million** people in 34 countries in Africa and Latin America.

- In the next 5 years, AIDS will have killed more than **8 million** people, most of them young adults, with women an increasing proportion of the total.

- Over **13 million** adults, mostly heterosexual men and women, are infected with HIV. Up to 60 % of infections in females are believed to occur by age of 20. Some **6,000** people become infected each day and by the year 2000, the cumulative total of HIV infections worldwide could reach **30 to 40 million**.

- Hepatitis B kills about **1 million** people each year, but it is preventable by vaccine.

1,000,000

Sources: Statistics quoted directly from "Fifty Facts from the World Health Report 1995," World Health Organization—<http://www.who.ch/programmes/whr/facts.htm>. *Quoted from "World Health Report 1995-Executive Summary," World Health Organization—http://www.who.ch/programmes/whr/xsum_e.htm. "What's a million," based on Stephen Schwartz's calculations, The Bulletin of the Atomic Scientists, November/December 1995, p. 34.

in control or out of it ?

An international surveillance network designed to detect outbreaks brings together government agencies, hospitals, research facilities, and non-governmental organizations. International health regulations require countries to report cases of the most deadly infectious diseases to the World Health Organization (WHO) within 24 hours of disease diagnosis. These reports prompt a mobilization of laboratories around the world that rapidly respond to assist in treatment and to collect and analyze data. This network also coordinates an assessment of public health threats, educates health care workers, maintains communication with the international infectious disease infrastructure, and develops guidelines for reporting and responding to an outbreak.

The WHO coordinates programs to strengthen global surveillance and support local disease monitoring and treatment of infections. One of the most prominent laboratories involved in the effort is the Centers for Disease Control and Prevention (CDC) in the United States (Atlanta, Georgia). In addition to its international role, the CDC works with an alphabet soup of national government agencies to monitor numerous diseases through voluntary cooperation of hospitals, physicians, and laboratories in the United States.

In dealing with outbreaks over the years, the system has shown its weaknesses. At many levels, funding for basic research laboratories, crisis relief efforts, and development of drugs or vaccines has not always been a priority and has often suffered at the hands of other pressing budget items. Analysts point out that a physician's lack of familiarity with the symptoms of diseases, especially those emerging or re-emerging after a generation of low level infections, may delay diagnosis and prompt reporting. Critics also cite confusion and lack of accountability among agencies responding to outbreaks.

To avoid or contain disease, some countries have placed restrictions on travel and immigration. HIV tests are required in many countries for a person staying longer than three months; others require tests if permanent residency is sought. A few countries have stricter regulations, such as Colombia, which admits no one suspected of being HIV positive; Iraq and Kazakhstan require proof from all visitors; and Singapore, requires tests for workers earning less than \$945 per month.

geek speak

emerging infectious disease

—caused by a virus, bacterium or other infectious agent that turns up in a new species or in a new geographical location*;

disease—refers to a situation in which infection has elicited signs and symptoms in the infected individual;

epidemic—the condition in which a disease spreads rapidly through a community in which that disease is normally not present or is present at a low level;

pandemic—an epidemic that occurs worldwide;

re-emerging infectious disease

—reappearance of a known disease after a decline in incidence.

* Definition taken from Judith A. Johnson, "Infectious Diseases: Emerging and Reemerging Threats to Public Health in the United States," CRS Report for Congress, 95-534 SPR, Congressional Research Service, 1995.

All other definitions are taken from *Emerging Infections: Microbial Threats to Health in the United States*, Institute of Medicine, Washington: National Academy Press, 1992.

pandemics of yesterday, today, and tomorrow?

smallpox

The campaign against smallpox resulted in a unique victory—eradication. The last known case of smallpox was diagnosed in 1977, just 10 years after a reported yearly death toll of 2 million people worldwide. In 1979, the World Health Organization certified that the world was free of the smallpox virus. This accomplishment required a global effort—a vaccine that could be delivered easily and inexpensively, an international treaty requiring that smallpox be reported, an eradication program coordinated by the World Health Organization, national surveillance programs, and cooperative physicians in countries around the world.

Controversy erupted in recent years with the plan to destroy the last remaining smallpox viruses that are housed in Russia and the US. While of little scientific value, many believe that the virus should be preserved. The WHO has recommended that the remaining stocks of the virus be destroyed by June 30, 1999.

aids/hiv

In 1981, acquired immunodeficiency syndrome (AIDS) was recognized in countries around the world. In 1987, the World Health Organization declared AIDS a global emergency and formulated a plan to coordinate research, policy making, and public outreach. There have been social and biological obstacles encountered in combatting HIV, the virus that causes AIDS. Among the populations first diagnosed were those with little political power and a lifestyle that went against social norms, such as homosexual men, intravenous drug users, and prostitutes. Since those early days, AIDS has reached around the globe.

As is the case with many viruses, the origin of AIDS is unknown. Biologically, HIV is challenging because of its variations. So far, two distinct strains have been isolated, HIV-1 (globally predominant) and HIV-2 (primarily West African), each of which contain subtypes. This genetic variability has led to difficulties in developing a “universal” AIDS vaccine or other medication, in testing for HIV antibodies in patients and blood supplies, and in reporting cases to the global surveillance system. Because HIV attacks the immune system, it has been associated with opportunistic infections and cancers including tuberculosis, pneumonia, and Kaposi’s sarcoma.

malaria

Some “emerging” infectious agents are actually variants of older microbes that have adapted and are no longer sensitive to drugs designed to combat them. Resistance to drugs is a major threat to public health, as there are no other means of defense against these diseases. Two microbes that are of great concern are tuberculosis (TB) and malaria.

TB has been in decline in developed countries over the last 30 years, but has continued to be a threat in developing countries. TB is a highly contagious disease passed through coughing. Although TB is treatable with a multiple drug therapy, strains resistant to these drugs have appeared in countries around the world since the mid-1980s.

Malaria, caused by a parasite that is carried by mosquitoes, has developed resistance to the most common and cheapest medications. Like AIDS, genetic variability in the parasites that cause malaria make it difficult to develop vaccines or drugs that will be effective on all forms of the disease. Efforts to stop malaria by controlling the mosquito population has resulted in pesticide-resistant mosquitoes.

tb (or not tb?)

(anything but a) conclusion

As governments around the world budget for the years ahead, scientists compete for research funds, and doctors confront the complexities of health care delivery, the people of the world face the growing threat of emerging infectious diseases. Popular books and films, such as Richard Preston's *The Hot Zone* and the movie *Outbreak*, have entertained millions of people and indicate the public's interest in and fear of microscopic pathogens. The battle against these microscopic beings will require governments to cooperate, people to work together, and human well-being to become the most important goal. Is the world ready?

How do **you** answer the **tough questions**

What global responsibilities do countries with greater resources, research capabilities, and advanced technologies have in fighting emerging infectious diseases? Is there a responsibility for these countries to study diseases that don't immediately threaten their domestic populations?

Developing countries tend to put more of their money for infectious diseases into providing treatment rather than into research. Do you agree with this priority? For example, should Zaire spend millions of dollars researching ebola, which has only surfaced occasionally and killed a relatively limited number of people, or should it spend its money on more immediate health care concerns? What are the dangers of this type of strategy, in your view?



Should someone who has AIDS, or another deadly disease, and knowingly infects someone else be charged with a crime?

There are various factors to consider when deciding which infectious diseases to combat, such as the number of people affected, the potential for widespread infection, the severity of the disease, and the ability of the virus or bacteria to mutate. Which do you think are the most important factors to take into consideration? Why?

Because of their ability to spread throughout the population, infectious diseases pose a tremendous potential threat to the general public. What emphasis should be placed on basic research, cures, and treatments of infectious disease as compared to that for non-communicable diseases, such as heart disease or cancer?



Public education about emerging infectious diseases often raises sensitive issues over religious beliefs and cultural norms. For example, some of these diseases are spread through sexual transmission and others are spread through burial rituals and other cultural traditions. In addition, some religious sects refuse treatment on religious grounds. Do you think that the general public's right to protection from diseases supersedes a community's right to maintain its religious and cultural norms? Do you think science is in conflict with religious and cultural traditions? If yes, are there ways to bridge the gaps?

Pharmaceutical companies play a significant role in responding to the need for vaccines and medications to combat emerging infectious diseases. Does a company have an ethical responsibility to develop a vaccine or drug that could save millions of lives? What role should profit play in the development and distribution of medication and vaccines? Should governments form partnerships with companies to downplay the profit motive?



We see that the poor are most severely affected by diseases. What role do you think poverty plays in spreading emerging infectious diseases?

How should we balance individual rights and freedoms with public health concerns? For example, what justifies placing a person in quarantine? Should people infected with a deadly disease be allowed to travel around the world? Should health care providers be required to report cases of infection to the government or other authorities? Should individuals be required to tell health care providers of their disease? Should health care providers be allowed to test a patient for a disease without first obtaining permission?

How should the press, the major source of information to the general public, respond to outbreaks of emerging infectious diseases? Do the people have a right to know when and where potential epidemics are surfacing, or do you think the government and the media should control the information? Why? In addition, do books like *The Hot Zone* and movies like *Outbreak* trivialize or sensationalize the threat, or do they help in public education?



Emerging infectious diseases spread rapidly under adverse living conditions. Environmental, economic, and social disruptions caused by war often devastate peoples' lives. Infectious diseases have ample opportunity to flourish in war-torn and refugee communities. Is this an acceptable side effect of war? Do you think people who die of infectious diseases as a result of such upheaval should be considered casualties of war? Do you believe this violates conventions protecting civilians in time of war?

(not so) easy to digest

- *The Andromeda Strain*, Michael Crichton—an oldie but goodie, available in book and movie formats. (Hardcover) New York: Random House, 1995. (Paperback) Ballantine, 1992.
- *Hot Zone*, Richard Preston—an easy (?) to read book, giving an in-depth examination of a recent ebola outbreak in the US. (Hardcover) New York: Random House, 1994. (Paperback) New York: Doubleday, 1995.
- *Outbreak*, the movie, starring Dustin Hoffman. Widely available at video stores. Fictionalized account of the recent ebola outbreak which threatened the US.
- *Outbreak*, Robin Cook—a thriller about an epidemiologist trying to solve the mystery of several ebola outbreaks across the US. (Paperback) Berkley Books, 1988.

in depth

- *The Coming Plague*, Laurie Garrett—a darn long (but good) historical and anecdotal account. Recommended for those not as interested in the techy side of the subject, but has references for those who are. New York: Farrar, Straus & Giroux, 1994.
- *Disease Control Priorities in Developing Countries*, World Bank, Oxford University Press, 1993. Can be ordered through World Bank Web page—<http://www.worldbank.org/> or World Bank Headquarters, 1818 H Street, NW, Washington, DC, 20433, USA. Tel: 202-477-1234.
- *Emerging Infections: Microbial Threats to Health in the United States*, Joshua Lederberg, Robert E. Shope, and Stanley C. Oaks, Jr. (editors)—provides technical information on the battle against infectious diseases, drugs, vaccines, and pesticides. Washington, DC: National Academy Press, 1992.
- *Emerging Infectious Diseases*—journal published by the National Center for Infectious Diseases, Center for Disease Control. Available on the Web: <http://www.cdc.gov/ncidod/EID/eid.htm> or Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Atlanta, GA 30333, USA.
- *Eurosurveillance: European Communicable Disease Bulletin*, Commission of the European Communities, European Union—<http://www.b3e.jussieu.fr/ceses/EuroSurv/E2.html>.
- *HIV/AIDS 1994 Year End Surveillance Report*, Centers for Disease Control—http://www.cdc.gov/nchstp/hiv_aids/statisti.htm or by contacting CDC National AIDS Clearinghouse, PO Box 6003, Rockville, MD 20849-6003, USA. Tel: 1-800-458-5231.
- *Journal of the American Medical Association*—special edition on emerging diseases for the particularly techy-minded, January 17, 1995.
- *Malaria: Obstacles and Opportunities*, Stanley C. Oaks, Jr., Violaine S. Mitchell, Greg W. Pearson, and Charles C. J. Carpenter (editors)—a source of information and guidance that includes biomedical aspects and scientific information. Washington, DC: National Academy Press, 1991.
- *Man and Microbes: Diseases and Plagues in History and Modern Times*, Arno Karlan—an interesting, accessible, historical overview of infectious diseases from the Stone Age through the 21st century. References are very useful. New York: G.P. Putnam's Sons, 1995.
- *World Development Report 1993: Investing in Health*—gives statistics on world health trends, with a focus on developing countries and examines economic issues. Order through World Bank—<http://www.worldbank.org/>. Published by the World Bank, Oxford University Press (English edition), 1993.

check it out !

Note: The Federation of American Scientists Program for Monitoring Emerging Diseases (ProMED) Web page is linked to over 30 journals worldwide that are documenting emerging diseases—<http://www.fas.org/pub/gen/fas/promed/>.

cyberspace

top picks

- Outbreak (an on-line information service addressing emerging diseases)—<http://www.objarts.com/outbreak-unreg/index.html>
- World Health Organization (provides statistics and updates on emerging infectious diseases, linked to other sites, including extensive list of non-governmental organizations)—<http://www.who.org/>

cybernavts beware!**best of the rest**

- Centers for Disease Control and Prevention—<http://www.cdc.gov/>
- CNN (search for transcripts or videos on a specific disease or country)—<http://www.cnn.com/SEARCH/search.html>
- Federation of American Scientists Program for Monitoring Emerging Diseases (ProMED)—<http://www.fas.org/pub/gen/fas/promed/>
- Global Health Network (award-winning site which includes information on emerging infectious diseases, fully linked to other organizations, information, governmental and international agencies)—<http://www.pitt.edu/HOME/GHNet/>
- The Nando Times (information on ebola and links to other sites)—<http://www.nando.net/newsroom/zairesources.html>
- National Institute of Allergy and Infectious Diseases, National Institutes of Health—<http://www.niaid.nih.gov/>
- Pan American Health Organization—<http://www.paho.org/>
- United Nations—<http://www.un.org/>
- Volunteers in Technical Assistance—<http://www.vita.org/>
- World Bank—<http://www.worldbank.org/>
- World Health Organization, Division of Emerging and Other Communicable Diseases—http://www.who.ch/programmes/emc/emc_home.htm

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but wait, there's more!

- **mind•full: a brainsnack for future leaders with ethical appetites.** International weapons trade issue available upon request. Upcoming issues in spring 1996 will address: the future of nuclear weapons, water quality and availability, alternative energy sources, access and the Internet, and public participation in scientific decision making.
- **Jobs You Can Live With: Working at the Crossroads of Science, Technology, and Society.** The fifth edition of the Student Pugwash USA internship directory. It highlights approximately 300 organizations that work to promote the ethical use of science and technology and provides suggestions on how to go about the internship and job search (available spring 1996).
- **The Global Issues Guidebook.** A 600 page student-authored discussion and classroom resource on science, technology, and society issues.
- **Pugwatch.** The chapter newsletter.
- **Chapter Organizing Guide.** Provides chapter members with an A to Z guide to getting a campus-based chapter up and running.
- **Tough Questions.** Student Pugwash USA's newsletter.

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