

Great Diseases Lesson 1.2

Plagues of the past changed lives and shaped history



Figure 1.2.1: Medieval wood cut of the Antonine plague.

The Antonine Plague in 165 -180 B.C. killed about one-third of the population and weakened the expansion of the Roman empire

The plague was either smallpox or measles. It led to a dramatic decrease in the population of Rome, weakening the army and slowing the expansion of the empire. We might all be speaking Latin today if Rome had not been weakened by this epidemic! It was brought back to the Roman Empire by troops returning from campaigns in the Near East, claimed the lives of two Roman emperors — Lucius Verus, and Marcus Aurelius Antoninus, and decimated the Roman army. It caused up to 2,000 deaths a day at Rome, one quarter of those infected. Total deaths have been estimated at five million, as much as one-third of

the population in some areas. The Romans' defense of the eastern territories was hampered when large numbers of troops succumbed to the disease. Many towns and villages in the Italian peninsula and the European provinces lost all their inhabitants. As the disease swept north to the Rhine, it also infected Germanic and Gallic peoples outside the Empire's borders. For a number of years, these northern groups had pressed south in search of more lands to sustain their growing populations. With their ranks thinned by the epidemic, Roman armies were now unable to push the tribes back. The plague caused drastic effects throughout the Roman Empire, particularly on literature and art. The ancient world never recovered .

One of the deadliest plagues: The Black Death killed 30-60% of Europe's population.

One of the deadliest pandemics the world had ever experienced is the Black Death. This [bubonic plague](#) outbreak started in Central Asia and reached [Crimea in 1346](#). The Black Death is estimated to have killed **30% to 60% of Europe's population, reducing the world's population from an estimated 450 million to between 350 and 375 million in 1400**. The Black Death returned every generation with varying [virulence](#) and mortalities until the 1700s. During this period, more than 100 plague epidemics swept across Europe. People knew that the Black Death was transmitted by rats, but they couldn't do anything about it because they didn't understand that rats aren't the actual cause or infectious agent. The disease is actually transmitted by a bacterium (***Yersinia pestis***) that infects the fleas the rats carry. In fact the common belief at the time was that the plague was spread by birds. Birds' beak-shaped face-masks like the one you see on the left top of the page were worn by Plague Doctors during the Black Death and acted like a primitive gas mask. It was also thought that the mask would draw the disease away from the sufferer. Along the same lines the red glass eye pieces were thought to help protect the plague doctor from evil influences. The beak usually contained strongly aromatic herbs and spices to combat the terrible stench of unburied corpses and fluids from ill plague patients.

Plagues in the Americas played an important role in overthrowing the Native Americans

Have you ever wondered how the Native Americans were overthrown by settlers that were far from home? Yes, technologies like guns certainly helped, but so did losing your population to infectious disease. Before the Europeans arrived, the Americas had been largely isolated from the infectious disease epidemics that spread throughout Europe. The first large-scale contacts between Europeans and native people of the American continents brought overwhelming pandemics of measles and smallpox, as well as other Eurasian diseases. These diseases from Europe spread rapidly among native peoples and led to a drastic drop in population and the collapse of indigenous American cultures.

It is important to note that diseases were passed in both directions. Syphilis was carried back from the Americas and swept through the European population, decimating large numbers there. Both are examples of how populations that haven't encountered a 'foreign' infectious disease may be particularly susceptible to it at first.

Plagues were used as agents of biological warfare

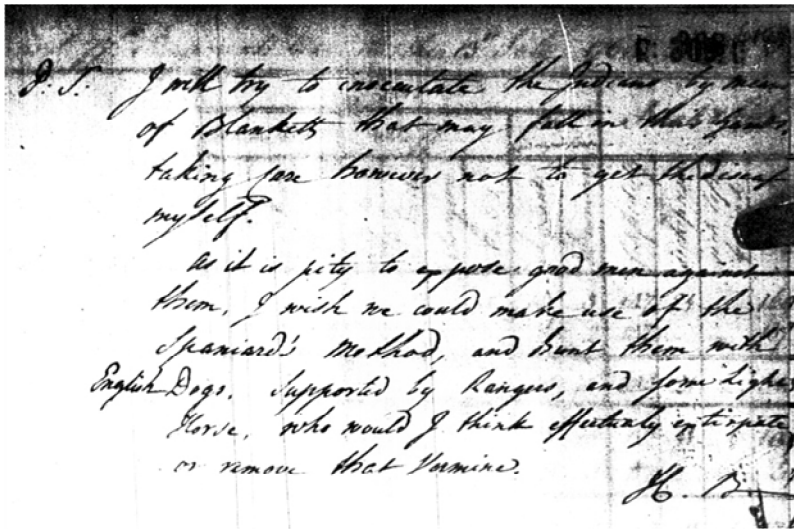


Figure 1.2.2: Did the British knowingly give infected blankets to the Native Americans?

The British are thought to have had the first idea to use smallpox as a bioterrorism agent by giving smallpox infected blankets to the indigenous population. On at least one occasion a high-ranking European considered infecting the Indians with smallpox as a tactic of war. Lord Jeffrey Amherst, commander of British forces in North America during the French and Indian War (1756-'63) discussed sending infected blankets to hostile tribes.

According to historian Francis Parkman, Amherst first raised the possibility of giving the Indians infected blankets in this letter to Colonel Henry Bouquet, who would lead reinforcements to Fort Pitt. We don't know if Bouquet actually put the plan into effect. We do know that a supply of smallpox-infected blankets was available, since the disease had broken out at Fort Pitt some weeks previously. We also know that the following spring smallpox was reported among the Indians in the vicinity. The smallpox epidemic between 1775 and 1782 raged across much of North America, killing more than 130,000 people. Tens of thousands of people died throughout Mexico from smallpox beginning in 1779. Smallpox then swept through the Pueblos of New Mexico beginning in 1780. It caused loss of Aztec and Inca populations and death of military and social leaders, contributing to the downfall of both empires and the subjugation of American peoples to Europeans.

<http://sites.tufts.edu/greatdiseases/student/infectious-disease/id-unit1/1-2/p3/>

Plagues still impact our lives and shape history

Now we will turn our attention to infectious diseases that greatly impact societies today. Keep in mind that even with modern medicine and infrastructures like clean water and toilets it is hard to control many pathogens. And areas with endemic infectious diseases are often crippled by the burden of illness.

HIV causes crippling mortality and morbidity.

The largest recent pandemic is due to HIV (Human Immunodeficiency Virus). Over 30 million people worldwide are living with HIV/AIDS (Acquired Immune Deficiency Syndrome). The number of AIDS cases in the United States and Europe rose steadily through the mid-1990s and then plateaued as a result of increasingly effective efforts at prevention and drug treatments. In the developing world the disease has continued to spread. Africa has just over 12% of the world's population but more than 60% of the AIDS cases worldwide.

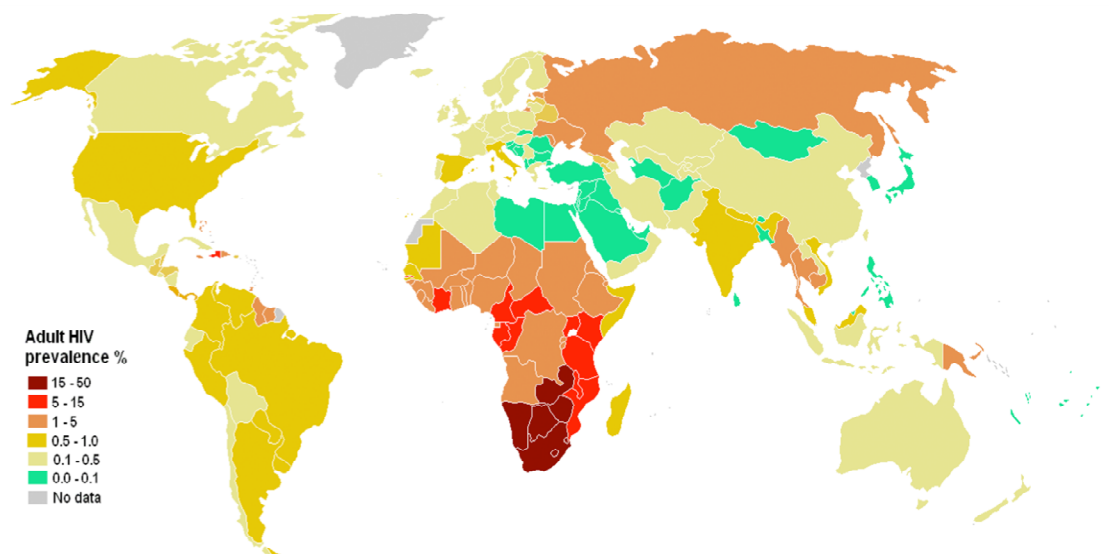


Figure 1.2.3: Most recent update of HIV prevalence world-wide (2008).

From its discovery in 1981 to 2006, AIDS has killed more than 25 million people. AIDS is caused by HIV, which is a [retrovirus](#). HIV infects about 0.6% of the world's population. In 2009, an estimated 2.6 million people were newly infected and AIDS claimed an estimated 1.8 million lives, down from a global peak of 2.1 million in 2004. Approximately 260,000 of those were children. The disproportionate number of AIDS deaths occurring in Sub-Saharan Africa retards economic growth and exacerbates the burden of poverty. A 2005 study that estimated 90 million HIV infections in Africa also estimated a minimum of 18 million of orphans. The WHO considers HIV infection to be a global pandemic.

Infection with HIV causes the immune system to progressively fail. Once HIV virus has been transmitted it infects vital immune system cells such as [helper T cells](#) that normally protect the body against infection. HIV infection either kills the T cells directly, or targets them to be killed by other immune system cells that are surveying the body to eliminate infections. When helper T cell numbers decline below a critical level, they cannot protect the body against other infections allowing life-threatening opportunistic infections and cancers to thrive. This stage of infection is called AIDS.

Prevention and management

Most people infected with HIV-1 who are untreated eventually develop AIDS. They mostly die from infections or cancers that result from failure of the immune system. HIV progresses to AIDS at a variable rate that is affected by viral, host, and environmental factors. Most untreated HIV infections progress to AIDS within 10 years, but some will progress much sooner, and some will take much longer. Treatment with [antiretroviral drugs](#) increases the life expectancy of people infected with HIV and reduces both the mortality and the [morbidity](#) of HIV infection. As of 2005, the average survival time of someone with AIDS who receives antiretroviral therapy was estimated to be more than 5 years. Without antiretroviral therapy, someone who has AIDS typically dies within a year.

Although antiretroviral medication is still not available everywhere and does not actually cure the disease, expanded treatment programs have helped to turn the tide of new infections and AIDS deaths in many parts of the world. Intensified awareness and preventive measures, as well as the natural course of the epidemic, have also played a role. Nevertheless, complacency about HIV continues to contribute to risk for sexual transmission.

Tuberculosis infects about one-third of the world's population

Tuberculosis (TB) is another common, and in many cases lethal, infectious disease caused by the tubercle bacillus *M. tuberculosis*. Tuberculosis usually attacks the lungs but can also affect other parts of the body. It is spread through the air when people who have an active infection cough, sneeze, or otherwise transmit their saliva through the air. Most infections in humans result in an [asymptomatic, latent](#) infection, and in about one in ten latent infection eventually progresses to active disease, which, if left untreated, kills more than 50% of its victims. The classic symptoms are a chronic cough with blood-tinged [sputum](#), fever, night sweats, and weight loss (the last giving rise to the formerly prevalent colloquial term "consumption").

Roughly a third of the world's population has been infected with *M. tuberculosis*, and new infections occur at a rate of one per second. In 2007, an estimated 13.7 million people had active TB disease, with 9.3 million new cases and 1.8 million deaths; the annual incidence rate varied from 363 per 100,000 in Africa to 32 per 100,000 in the Americas. Tuberculosis is the world's greatest infectious killer of women of reproductive age and the leading cause of death among people with HIV/AIDS. The proportion of people who become sick with tuberculosis each year is stable or falling worldwide but, because of population growth, the absolute number of new cases is still increasing. In 2007 there were an estimated 13.7 million chronic active cases, 9.3 million new cases, and 1.8 million deaths, mostly in developing countries.

According to the latest World Health Organization statistics, the virus has killed more than 18,000 people since it appeared in April 2009, approximately 4% of the annual influenza deaths. Research released in September 2010 disclosed that children with the pandemic flu were less likely to develop complications than those sick with seasonal flu strains, contradicting early reports on the severity of the pandemic. Critics claimed the WHO had exaggerated the danger, spreading "fear and confusion" rather than "immediate information." The WHO has begun an investigation to determine whether it had "frightened people unnecessarily."

Malaria is arguably the highest impact infectious disease of our time

Malaria is a mosquito-borne infectious disease caused by a parasitic protozoan discovered in 1880 by Charles Louis Alphonse Laveran. While working in the military hospital in Constantine, Algeria, he observed the parasites in a blood smear taken from a patient who had just died of malaria. The disease results when the malaria parasites multiply within red blood cells causing them to burst. The classic symptom of malaria is a cycle in which sudden chills are followed by fever and sweating lasting four to six hours. The cycle repeats every two to three days as new red blood cells mature, become infected and then burst.

Malaria is widespread in tropical and subtropical regions, including much of Sub-Saharan Africa, Asia and the Americas. It is prevalent in these regions because the high rainfall and consistent high temperatures along with stagnant waters in which their larvae mature provide mosquitoes with the environment needed for continuous breeding.

Each year, there are more than 225 million cases of malaria, killing around 781,000 people according to the WHO's 2010 World Malaria Report, 2.23% of the total number of deaths worldwide. Malaria is commonly associated with poverty and can indeed be a cause of

poverty and a major hindrance to economic development. Ninety percent of malaria-related deaths occur in sub-Saharan Africa, the majority young children.

Malaria transmission can be reduced by preventing mosquito bites. Prevention can occur by using inexpensive (\$5) mosquito nets and insect repellents, or by mosquito-control measures such as spraying insecticide inside houses and draining standing water where mosquitoes lay their eggs. Malaria can be treated with multiple drugs, but the malaria protozoa have developed resistance to many of the historically effective antimalarials, most notably [Quinine](#), which was the most effective and popular drug for many years.

<https://sites.tufts.edu/greatdiseases/student/infectious-disease/id-unit1/1-2/p2/>