

Assessing the severity of an influenza pandemic

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The major determinant of the severity of an influenza pandemic, as measured by the number of cases of severe illness and deaths it causes, is the inherent virulence of the virus. However, many other factors influence the overall severity of a pandemic's impact.

Even a pandemic virus that initially causes mild symptoms in otherwise healthy people can be disruptive, especially under the conditions of today's highly mobile and closely interdependent societies. Moreover, the same virus that causes mild illness in one country can result in much higher morbidity and mortality in another. In addition, the inherent virulence of the virus can change over time as the pandemic goes through subsequent waves of national and international spread.

Properties of the virus

An influenza pandemic is caused by a virus that is either entirely new or has not circulated recently and widely in the human population. This creates an almost universal vulnerability to infection. While not all people ever become infected during a pandemic, nearly all people are susceptible to infection.

The occurrence of large numbers of people falling ill at or around the same time is one reason why pandemics are socially and economically disruptive, with a potential to temporarily overburden health services.

The contagiousness of the virus also influences the severity of a pandemic's impact, as it can increase the number of people falling ill and needing care within a short timeframe in a given geographical area. On the positive side, not all parts of the world, or all parts of a country, are affected at the same time.

The contagiousness of the virus will influence the speed of spread, both within countries and internationally. This, too, can influence severity, as very rapid spread can undermine the capacity of governments and health services to cope.

Pandemics usually have a concentrated adverse impact in specific age groups. Concentrated illnesses and deaths in a young, economically productive age group will be more disruptive to societies and economies than when the very young or very old are most severely affected, as seen during epidemics of seasonal influenza.

Population vulnerability

The overall vulnerability of the population can play a major role. For example, people with underlying chronic conditions, such as cardiovascular disease, hypertension, asthma, diabetes, rheumatoid arthritis, and several others, are more likely to experience severe or lethal infections. The prevalence of these conditions, combined with other factors such as nutritional status, can influence the severity of a pandemic in a significant way.

Subsequent waves of spread

The overall severity of a pandemic is further influenced by the tendency of pandemics to encircle the globe in at least two, sometimes three, waves. For many reasons, the severity of subsequent waves can differ dramatically in some or even most countries.

A distinctive feature of influenza viruses is that mutations occur frequently and unpredictably in the eight gene segments, and especially in the haemagglutinin gene. The emergence of an inherently more virulent virus during the course of a pandemic can never be ruled out.

Different patterns of spread can also influence the severity of subsequent waves. For example, if schoolchildren are mainly affected in the first wave, the elderly can bear the brunt of illness during the second wave, with higher mortality seen because of the greater vulnerability of elderly people.

During the previous century, the 1918 pandemic began mild and returned, within six months, in a much more lethal form. The pandemic that began in 1957 started mild, and returned in a somewhat more severe form, though significantly less devastating than seen in 1918. The 1968 pandemic began relatively mild, with sporadic cases prior to the first wave, and remained mild in its second wave in most, but not all, countries.

Capacity to respond

Finally, the quality of health services influences the impact of any pandemic. The same virus that causes only mild symptoms in

countries with strong health systems can be devastating in other countries where health systems are weak, supplies of medicines, including antibiotics, are limited or frequently interrupted, and hospitals are crowded, poorly equipped, and under-staffed.

Assessment of the current situation

To date, the following observations can be made, specifically about the H1N1 virus, and more generally about the vulnerability of the world population. Observations specific to H1N1 are preliminary, based on limited data in only a few countries.

The H1N1 virus strain causing the current outbreaks is a new virus that has not been seen previously in either humans or animals. Although firm conclusions cannot be reached at present, scientists anticipate that pre-existing immunity to the virus will be low or non-existent, or largely confined to older population groups.

H1N1 appears to be more contagious than seasonal influenza. The secondary attack rate of seasonal influenza ranges from 5% to 15%. Current estimates of the secondary attack rate of H1N1 range from 22% to 33%.

With the exception of the outbreak in Mexico, which is still not fully understood, the H1N1 virus tends to cause very mild illness in otherwise healthy people. Outside Mexico, nearly all cases of illness, and all deaths, have been detected in people with underlying chronic conditions.

In the two largest and best documented outbreaks to date, in Mexico and the United States of America, a younger age group has been affected than seen during seasonal epidemics of influenza. Though cases have been confirmed in all age groups, from infants to the elderly, the youth of patients with severe or lethal infections is a striking feature of these early outbreaks.

In terms of population vulnerability, the tendency of the H1N1 virus to cause more severe and lethal infections in people with underlying conditions is of particular concern.

For several reasons, the prevalence of chronic diseases has risen dramatically since 1968, when the last pandemic of the previous century occurred. The geographical distribution of these diseases, once considered the close companions of affluent societies, has likewise shifted dramatically. Today, WHO estimates that 85% of the burden of chronic diseases is now concentrated in low- and middle-income countries. In these countries, chronic diseases show an earlier average age of onset than seen in more affluent parts of the world.

In these early days of the outbreaks, some scientists speculate that the full clinical spectrum of disease caused by H1N1 will not become apparent until the virus is more widespread. This, too, could alter the current disease picture, which is overwhelmingly mild outside Mexico.

Apart from the intrinsic mutability of influenza viruses, other factors could alter the severity of current disease patterns, though in completely unknowable ways, if the virus continues to spread.

Scientists are concerned about possible changes that could take place as the virus spreads to the southern hemisphere and encounters currently circulating human viruses as the normal influenza season in that hemisphere begins.

The fact that the H5N1 avian influenza virus is firmly established in poultry in some parts of the world is another cause for concern. No one can predict how the H5N1 virus will behave under the pressure of a pandemic. At present, H5N1 is an animal virus that does not spread easily to humans and only very rarely transmits directly from one person to another.