

## **1. The 1918 pandemic (H1N1 virus)**

The 1918 influenza pandemic was the most severe pandemic in recent history. It was caused by an H1N1 virus with genes of avian origin. Although there is not universal consensus regarding where the virus originated, it spread worldwide during 1918-1919. In the United States, it was first identified in military personnel in spring 1918. It is estimated that about 500 million people or one-third of the world's population became infected with this virus. The number of deaths was estimated to be at least 50 million worldwide with about 675,000 occurring in the United States.

Mortality was high in people younger than 5 years old, 20-40 years old, and 65 years and older. The high mortality in healthy people, including those in the 20-40 year age group, was a unique feature of this pandemic. While the 1918 H1N1 virus has been synthesized and evaluated, the properties that made it so devastating are not well understood. With no vaccine to protect against influenza infection and no antibiotics to treat secondary bacterial infections that can be associated with influenza infections, control efforts worldwide were limited to non-pharmaceutical interventions such as isolation, quarantine, good personal hygiene, use of disinfectants, and limitations of public gatherings, which were applied unevenly.

## **2. 1957-1958 Pandemic (H2N2 virus)**

In February 1957, a new influenza A (H2N2) virus emerged in East Asia, triggering a pandemic ("Asian Flu"). This H2N2 virus was comprised of three different genes from an H2N2 virus that originated from an avian influenza A virus, including the H2 hemagglutinin and the N2 neuraminidase genes. It was first reported in Singapore in February 1957, Hong Kong in April 1957, and in coastal cities in the United States in summer 1957. The estimated number of deaths was 1.1 million worldwide and 116,000 in the United States.

## **3. 1968 Pandemic (H3N2 virus)**

The 1968 pandemic was caused by an influenza A (H3N2) virus comprised of two genes from an avian influenza A virus, including a new H3 hemagglutinin, but also contained the N2 neuraminidase from the 1957 H2N2 virus. It was first noted in the United States in September 1968. The estimated number of deaths was 1 million worldwide and about 100,000 in the United States. Most excess deaths were in people 65 years and older. The H3N2 virus continues to circulate worldwide as a seasonal influenza A virus. Seasonal H3N2 viruses, which are associated with severe illness in older people, undergo regular antigenic drift.

#### **4. 2009 H1N1 Pandemic (H1N1pdm09 virus)**

In the spring of 2009, a novel influenza A (H1N1) virus emerged. It was detected first in the United States and spread quickly across the United States and the world. This new H1N1 virus contained a unique combination of influenza genes not previously identified in animals or people. This virus was designated as influenza A (H1N1) pdm09 virus. Ten years later work continues to better understand influenza, prevent disease, and prepare for the next pandemic.

The (H1N1) pdm09 virus was very different from H1N1 viruses that were circulating at the time of the pandemic. Few young people had any existing immunity (as detected by antibody response) to the (H1N1) pdm09 virus, but nearly one-third of people over 60 years old had antibodies against this virus, likely from exposure to an older H1N1 virus earlier in their lives. Since the (H1N1) pdm09 virus was very different from circulating H1N1 viruses, vaccination with seasonal flu vaccines offered little cross-protection against (H1N1) pdm09 virus infection. While a monovalent (H1N1) pdm09 vaccine was produced, it was not available in large quantities until late November—after the peak of illness during the second wave had come and gone in the United States. From April 12, 2009 to April 10, 2010, CDC estimated there were 60.8 million cases (range: 43.3-89.3 million), 274,304 hospitalizations (range: 195,086-402,719), and 12,469 deaths (range: 8868-18,306) in the United States due to the (H1N1) pdm09 virus.

Additionally, CDC estimated that 151,700-575,400 people worldwide died from (H1N1) pdm09 virus infection during the first year the virus circulated Globally, 80 percent of (H1N1)pdm09 virus-related deaths were estimated to have occurred in people younger than 65 years of age. This differs greatly from typical seasonal influenza epidemics, during which about 70 percent to 90 percent of deaths are estimated to occur in people 65 years and older.

Though the 2009 flu pandemic primarily affected children and young and middle-aged adults, the impact of the (H1N1) pdm09 virus on the global population during the first year was less severe than that of previous pandemics. Estimates of pandemic influenza mortality ranged from 0.03 percent of the world's population during the 1968 H3N2 pandemic to 1 percent to 3 percent of the world's population during the 1918 H1N1 pandemic. It is estimated that 0.001 percent to 0.007 percent of the world's population died of respiratory complications associated with (H1N1) pdm09 virus infection during the first 12 months the virus circulated.