



Defense Intelligence Agency

Defense Intelligence Assessment

(U) Worldwide: 2009-H1N1 Virus Might Have Substantially Higher Health Impact Than Typical Seasonal Influenza

10 June 2009
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The following sections have been updated since this assessment was last posted:

Relative Impact of H1N1 Versus Seasonal Influenza Is Applicable Worldwide on 03 Jun 2009

Potential Impact of Other Public Health Interventions on 03 Jun 2009

(U) Scope Note

(U) This analysis is intended to provide policymakers and planners with approximate projections of the potential health impact of the new 2009-H1N1 virus during the upcoming influenza seasons in the Southern and Northern Hemispheres. Potential impact (measured in rates of illness, hospitalization, and death) is estimated relative to the baseline of seasonal influenza, which varies widely between temperate and tropical areas and between developing and developed countries. NCMI will update this analysis as new public health data are obtained over the coming weeks and months.

(U) Key Judgments

(U) NCMI projects the following with medium confidence, unless stated otherwise:

- (U) The 2009-H1N1 influenza illness rate will be two to five times higher than that seen with annual seasonal influenza in areas where no countermeasures are applied. In these areas, approximately 50 percent of the total population could become ill.
- (U) NCMI assesses with high confidence most cases of 2009-H1N1 are likely to resemble typical seasonal influenza, experiencing a 5- to 7-day febrile respiratory illness. A very small percentage of cases will require hospitalization, and the fatality rate will be very low in persons younger than 65 years, similar to seasonal influenza. However, the substantially higher overall number of cases (potentially two to five times higher) will result in a proportionately higher number of hospitalizations and deaths from 2009-H1N1 as compared with typical seasonal influenza.
- (U) The greatest increase in illness rates, hospitalizations, and deaths in comparison to seasonal influenza will occur among persons aged 15 to 50 years.
- (U) The projected additional impact of 2009-H1N1 compared to typical seasonal influenza will hold true for most of the world, including developed and developing countries located in temperate and tropical areas. However, baseline rates of seasonal influenza are unknown for most countries worldwide due to lack of surveillance.

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- (U) A vaccine can be developed for 2009-H1N1 that provides protection comparable to those used for seasonal influenza prevention. Areas with widespread use of such a vaccine could reduce the number of 2009-H1N1 illnesses, hospitalizations, and deaths to levels comparable to or slightly greater than those seen with typical seasonal influenza.
- (U) Other public health measures, including social distancing, school or event closures, isolating probable cases, prophylactic treatment with antiviral drugs, and strict infection control, could decrease the magnitude and intensity of 2009-H1N1 outbreaks. However, these measures are unlikely to halt transmission; they are more likely to delay exposure, essentially redistributing 2009-H1N1 infections more evenly over time. The impact of these measures in significantly reducing the total number of infections is unclear.

(U) These projections are subject to the caveats below.

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(U) Caveats and Critical Assumptions

(U) Because 2009-H1N1 is a newly emerging virus, significant unknowns remain, rendering precise predictions premature, particularly for areas outside the United States where data are very sparse for seasonal influenza and 2009-H1N1. Genetic changes in the virus, which are certain to occur but whose nature and significance are impossible to predict, also could affect predictions. Therefore, this analysis has a limited life span and NCMI will update it as new public health data are obtained over the coming weeks and months.

(U) H1N1 Might Cause Substantially Higher Illness Rates Than Typical Seasonal Influenza

(U) NCMI assesses with medium confidence 2009-H1N1 influenza illness rates two to five times higher than those caused by typical seasonal influenza are possible in areas where vaccination and other countermeasures are not applied. Illness rates from H1N1 over the upcoming influenza season could reach 50 percent of the total population, compared to typical seasonal influenza rates of 10 percent to 20 percent in the United States (see Table 1 for data on typical attack rates for seasonal influenza in the United States). NCMI assesses this increase will be due primarily to a near total absence of prior immunity to 2009-H1N1 among those younger than 65 years.

- (U) The World Health Organization (WHO) estimates H1N1 has a secondary (household) attack rate in the range of 22 percent to 33 percent, based on early data from Mexico, compared with a range of approximately 13 percent to 50 percent for seasonal influenza.
- (U) The U.S. Centers for Disease Control and Prevention (CDC) has stated that the relatively high levels of H1N1 influenza transmission that have occurred in the United States "off-season" or outside typical months for seasonal influenza indicate this strain may be transmitted even more efficiently during the upcoming winter influenza season, because colder conditions are thought to be more favorable to influenza spread.
- (U) The level of H1N1 transmission in locations outside Mexico, including in the United States, remains uncertain, but one senior CDC influenza expert described off-season H1N1 attack rates in the United States as comparable to what is seen for seasonal influenza during the winter.

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- (U) One study relying on preliminary data from a Mexican town estimated a community H1N1 attack rate of 61 percent in children younger than 15 years and 29 percent in persons 15 years and older.
- (U) Scientific studies report that past pandemic influenza viruses had population attack rates of 50 percent in the United States and elsewhere due to very low levels of pre-existing immunity among the majority of the population.
- (U) According to reports from the CDC and the Mexican Ministry of Health (MOH), the distribution of cases, although not definitive, suggests those older than 65 years have lower infection rates for 2009-H1N1 than younger individuals. It is believed those older than 65 might have acquired cross-protective immunity from exposure to strains with similarities to 2009-H1N1 that circulated 40 to 60 years ago. Younger individuals lack such immunity (see the tone box below entitled "Age, Exposure, and Influenza Immunity"). During past pandemics in which a novel virus circulated, older people also were less susceptible to infection, reflecting a possible role of immunity acquired decades earlier.

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(U) Age, Exposure, and Influenza Immunity

(U) Over the course of a lifetime, people are generally exposed to a wide variety of influenza viruses, many of which share similar genetic features. As a result, cross-protective immunity to different strains builds up over time. This buildup of immunity is partially responsible for a progressive decrease in seasonal influenza attack rates in older age groups (see Table 1).

(U) New influenza viruses such as 2009-H1N1 have unique genetic features not shared with typical seasonal influenza viruses, so a high proportion of the population likely will have no immunity. In essence, the entire population born since a similar virus last circulated is as immunologically vulnerable to the new virus as a young child. In such situations, attack rates in adults will be closer to those typically seen in children.

(U) Influenza is much more likely to be fatal among those over age 65 than among younger individuals (see Table 2). This reflects the immune system's decreased ability to fight off infection after age 65, which becomes progressively worse for people in their 70s, 80s, and 90s.

(U) Table 1. Age-specific Attack Rates for Seasonal Influenza in the United States

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Age Group (Years)	Seasonal Influenza Attack Rates (%)
<5	20-50
5-14	10-40
15-49	6-15
50-64	6-15
65 and over	1-10
All age groups	10-20

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(U) Terms Used in This Analysis to Describe the Impact of H1N1

(U) *Illness Rate (Attack Rate)* -- the proportion of the population that becomes ill from influenza over an entire influenza season (or year), expressed as the number of cases of illness divided by the total population.

(U) *Secondary Household Attack Rate* -- the percentage of close contacts who become infected through exposure to a known case in the household.

(U) *Hospitalization Rate* -- the number of hospitalizations divided by the total population.

(U) *Fatality Rate* -- the number of fatalities divided by the total population.

(U) *Age-specific Rate* -- the proportion of a specific age group affected by an event (e.g., illness, hospitalization, fatalities), divided by the total number of people within that age group in the population.

(U) Thus Far, H1N1's Severity Is Similar to That of Seasonal Influenza

(U) NCMI assesses with high confidence most cases of 2009-H1N1 are likely to resemble typical seasonal influenza, experiencing self-limited febrile respiratory illness for 5 to 7 days. As seen for seasonal influenza, a very small percentage of patients younger than 65 years will require hospitalization for 2009-H1N1 (see Table 2); however, the higher overall number of 2009-H1N1 cases in this age group likely will result in a proportionately higher number of hospitalizations and deaths. The 2009-H1N1 virus does not currently share the highly lethal characteristics of the 1918 H1N1 influenza virus or the H5N1 avian influenza virus in humans.

- (U) Most confirmed cases of 2009-H1N1 have been characterized by a mild respiratory illness similar to seasonal influenza, without complications resulting in hospitalization. The WHO has reported the H1N1 virus tends to cause only mild illness in otherwise healthy people. According to a Canadian newspaper report, Canada's chief public health officer characterized the severity of symptoms in the over 700 confirmed H1N1 cases seen through 20 May in that country as "typical of seasonal flu."
- (U) According to a news article in a scientific journal, one prominent U.S. virologist who has studied H1N1 said that it does not contain variations in a key protein associated with the high virulence seen in the 1918 and H5N1 influenza viruses.

(U) Greatest Relative Increase in Illness, Hospitalization, and Death Likely To Be Seen in 15- to 50-Year-Olds

(U) NCMI assesses with medium confidence healthy 15- to 50-year-olds are likely to experience the greatest relative increase in rates of illness, hospitalization, and death from 2009-H1N1 as compared to typical seasonal influenza. NCMI judges this age group, which (unlike young children) normally has partial immunity to seasonal influenza, will have essentially no immunity to 2009-H1N1 (see the tone box entitled "Age, Exposure, and Influenza Immunity").

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- (U) Seasonal influenza attack rates for 15- to 50-year-olds are typically less than half those seen for younger individuals (see Table 1).
- (U) Hospitalization and fatality rates for seasonal influenza are also typically lowest in 15- to 50-year-olds. The overall percentages of total hospitalizations and deaths from seasonal influenza also are very low in this age group (see Table 2).
- (U) As compared to those for seasonal influenza, the age-specific hospitalization rates for H1N1 thus far in the United States and Mexico suggest a higher proportion of hospitalizations in persons between the ages of 30 and 44 years.
- (U) According to statistics released by the MOH, 76 percent of confirmed and suspected deaths in Mexico from 2009-H1N1 occurred in persons between the ages of 20 and 55 years. In addition, the MOH also reported that in April 2009, the percentage of deaths from 2009-H1N1 was one to two times higher for those between the ages of 5 and 17 and three to four times higher for those between the ages of 18 and 49, compared to the number of deaths in those age groups due to seasonal influenza in April 2008, April 2007, and April 2006.

(U) Table 2. Hospitalization and Fatality Rates for Seasonal Influenza in the United States

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Age Group (Years)	Hospitalization Rates (%)	Proportion of Total Hospitalizations (%)	Fatality Rates (per 100,000)	Proportion of Total Deaths (%)
<5	0.11-0.25	9.1	0.3-5	0.2
5-14	0.014-0.045	39.5	0.3-5	0.2
15-49	0.011- 0.028	7.2	0.3-5	1.7
50-64	0.053-0.11	8.0	6.3-9	3.8
65 and over	0.25-0.61	36.2	88-100	94.3
All ages	0.05-0.12		12-17	

(U) Relative Impact of H1N1 Versus Seasonal Influenza Is Applicable Worldwide

(U) NCMI assesses with medium confidence the comparison of the relative impact of 2009-H1N1 with typical seasonal influenza is applicable worldwide. NCMI judges 2009-H1N1 will continue to spread via international travel and eventually will reach all but the most isolated populations. H1N1 transmission is likely to be influenced by the same local conditions that affect seasonal influenza, such as temperature, crowding, and population mixing (see [\(U\) "Flu Season" Begins in Southern Hemisphere; New 2009-H1N1 Influenza Virus May Spread](#), DI-1812-1545-09). The same absence of immunity to 2009-H1N1 in people younger than 65 years likely exists worldwide, with similar implications for substantially higher attack rates in this age group everywhere. However, a severe lack of baseline data on seasonal influenza transmission, especially in developing countries, makes projections of specific numbers or rates of illness, hospitalizations, and deaths in particular areas difficult. If levels of immunity in developing countries differ substantially from those indicated by data

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from the United States, Mexico, and the United Kingdom, then it is possible attack rates will vary from projections.

- (U) 2009-H1N1 has spread rapidly across the globe through international travel; as of 3 June 2009, confirmed cases had been documented in 66 countries.
- (U) The baseline level of seasonal influenza is unknown in most countries because of a lack of surveillance and prior public health studies and little existing diagnostic capability.
- (U) According to published scientific studies, conditions in warm, tropical countries tend to favor year-round transmission of the same influenza viruses referred to as "seasonal influenza" in temperate countries. Tropical countries experience relatively constant levels of influenza circulation throughout the year, rather than pronounced seasonal peaks associated with winter. Although monthly rates in tropical countries are lower than peak rates seen in temperate countries during the winter, the overall cumulative rate over the course of a year is likely to be similar in tropical and temperate countries.

(U) Potential Impact of Widespread Vaccination Against H1N1

(U) NCMI assesses with medium confidence a vaccine can be developed for 2009-H1N1 that provides protection comparable to that provided by vaccines used to prevent seasonal influenza. NCMI judges widespread use of such a vaccine across vulnerable age groups could dramatically limit the number of cases, hospitalizations, and deaths from 2009-H1N1 to roughly the level seen with typical seasonal influenza.

- (U) Previous seasonal influenza vaccines have had a well-established protective effect of 40 percent to 80 percent when the vaccine strains are well matched to circulating influenza viruses. Even when the match is suboptimal, vaccination still may provide a protective effect, in the range of approximately 10 percent to 30 percent.
- (U) Vaccinating a significant portion of the population also provides protection for those who have not received the vaccine because the level of circulation of the virus is reduced, lowering overall community exposure, an effect known as "herd immunity."

(U) NCMI assesses with high confidence a vaccine will not be available in Southern Hemisphere countries during their coming influenza season because a minimum of four to six months will be required to develop and manufacture a 2009-H1N1-specific vaccine once the decision is made that a vaccine is required and funding for the effort is committed.

- (U) Current pre-pandemic vaccine production relies primarily on egg-based manufacturing. In a December 2007 report, the U.S. Government Accountability Office noted that producing an influenza vaccine requires approximately 6 months

(U) Potential Impact of Other Public Health Interventions

(U) NCMI assesses with medium confidence other widespread public health measures, such as social distancing, school or event closures, heightened surveillance to identify and isolate probable cases, treatment with antiviral drugs, and strict infection control, could decrease the magnitude and intensity of 2009-H1N1 outbreaks. However, unlike vaccination, these measures principally reduce individuals'

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exposure to the virus, not their susceptibility to infection. NCMI assesses with medium confidence that these measures are likely to have a greater effect in delaying infection, resulting in more even distribution of cases over time. It is unclear what impact such measures would have in significantly reducing the total number of infections.

- (U) In Mexico, widespread school closings and other social distancing measures coincided with dramatic declines in the apparent rate of infection.
- (U) European countries have claimed their rapid, aggressive case identification efforts among travelers and their contacts have reduced the early impact of H1N1 in that region.
- (U) According to a peer-reviewed scientific study using data from the 1918 pandemic, cities in the United States that implemented aggressive public health measures effectively reduced the attack rate while measures were effectively implemented. Other model-based scientific studies also conclude that pandemic influenza attack rates can be significantly reduced using community-based interventions.

(U) H1N1 Will Circulate Simultaneously With Other Seasonal Influenza Viruses; Net Impact Likely Additive

(U) NCMI assesses with high confidence 2009-H1N1 will circulate simultaneously with other seasonal influenza viruses and is unlikely to completely displace them, but could become the predominant circulating strain over time. Therefore, NCMI judges the need for routine vaccination against known seasonal influenza viruses remains undiminished. To the extent other strains are circulating, the usual impact of seasonal influenza will be added to the impact of 2009-H1N1 and will be particularly apparent in those older than 65 years.

- (U) It is well-established in scientific literature that seasonal influenza usually causes the highest rates of hospitalization and death in persons older than 65 years.

(U) Administrative Notes

(U) This publication supersedes (U) Worldwide: 2009-H1N1 Virus Might Have Substantially Higher Health Impact Than Typical Seasonal Influenza, DI-1812-1553-09, dated 29 May 2009, which should be destroyed.

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