# Influenza-Related Hospitalizations in San Francisco, 2009-2010

**San Francisco Communicable Disease Control and Prevention Section**

**www.sfcdcp.org**

## Introduction

During the 2009-2010 H1N1 Swine Flu Pandemic a number of surveillance systems were in place to monitor influenza activity in San Francisco. The California Emerging Infections Program (CEIP) conducted active laboratory-based surveillance for all laboratory confirmed influenza cases hospitalized in their three county catchment areas (Alameda, Contra Costa, and San Francisco counties). Only results for the San Francisco residents are summarized in this report. This report provides a snapshot of the local impact of H1N1 Swine Flu and is not a comprehensive overview of the pandemic.

## Methods

Sources of data included local hospitals, laboratories and local health departments. Data were obtained by reviewing laboratory reports, hospital medical records and health department records. For this report, a case was defined as a San Francisco resident with influenza-like illness who was admitted to the hospital in the three-county catchment area from April 22, 2009, through April 30, 2010, and who had a positive influenza test of any type 14 days before or 3 days after admission.

### Influenza Lab Testing

Prior to January 2010, SFDPH Public Health Laboratory (PHL) only had the capacity to subtype the previously circulating influenza A viruses, seasonal H1 and seasonal H3. Influenza A viruses that could not be subtyped as seasonal were classified as "unsubtypable" and presumed to be influenza A H1N1 swine, the dominant circulating strain. Some of the "unsubtypable" specimens were tested by the California Department of Public Health reference laboratory and were confirmed to be influenza A H1N1 swine. From January-April 2010, the SFDPH PHL performed laboratory confirmation for influenza A H1N1 swine. Cases of influenza A in which no subtyping was performed were categorized as subtype unknown. Analyses focus on all cases of influenza A, including Influenza A H1N1 Swine, unsubtypable and subtype unknown.

## Results

208 hospitalized influenza cases were identified.

### Influenza Subtypes

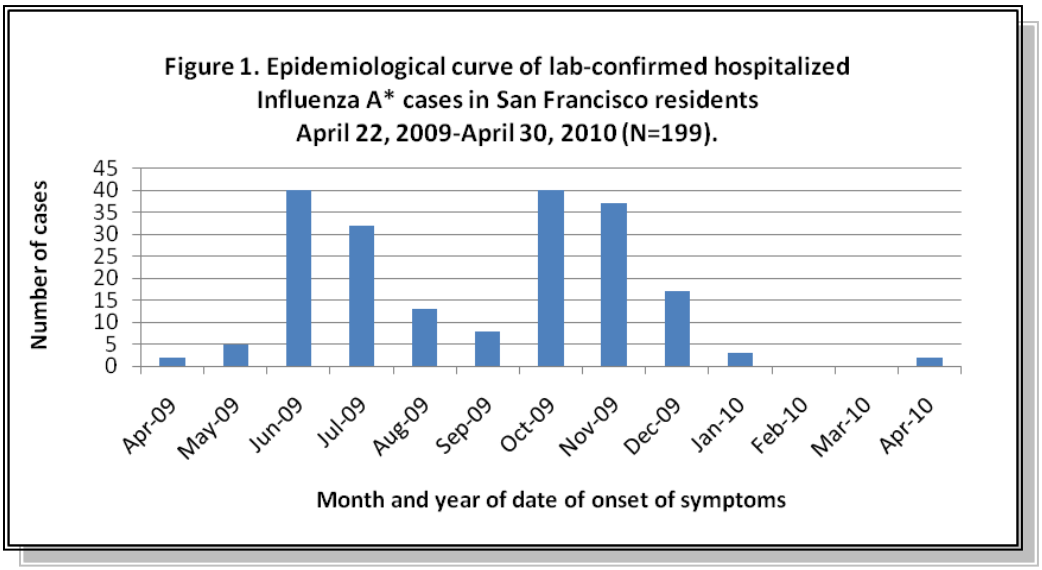
Over half the cases (122/208 or 59%) were influenza A H1N1 Swine Flu and 77 were influenza A of unknown subtype (Table 1).

**Table 1. Influenza cases by subtype, April 22, 2009-April 30, 2010, N=208**

| Influenza Subtype | Number of cases |
|---|---|
| Influenza A H1N1 Swine | 91 |
| Influenza A unsubtypable, Presumed H1N1 Swine | 31 |
| Influenza A, subtype unknown | 77 |
| Influenza A/B | 2 |
| Influenza B | 4 |
| Unknown influenza type | 3 |

## Disease Activity

Two peaks of disease occurred in June 2009 and October 2009 (Figure 1).




*Includes all cases of influenza A, regardless of subtype; does not include influenza A/B

## Demographics

Cases occurred approximately equally among men and women (Table 2). However, a larger proportion of the 60 ICU and/or fatal cases occurred among men (60%) than women (40%). Of the 92 women hospitalized, 41 of them were of childbearing age (15 -45 years old), and of these, almost half (19 of 41) were pregnant. The average age of cases was 41 (median: 45; range: 0-95). Twenty-five percent of cases were White, 31% were Asian/Pacific Islanders, 20% were Hispanic and 18% were Black (Table 2).

**Table 2. Demographic characteristics of hospitalized influenza A* cases in San Francisco residents, April 22, 2009 - April 30, 2010**

| Demographic Characteristics | Total (N=199) | | Survivors not requiring ICU (N=139) | | ICU and/or Fatal (N=60) | |
|---|---|---|---|---|---|---|
| | *N* | *%* | *N* | *%* | *N* | *%* |
| **Sex** | | | | | | |
| **Male** | 107 | 53.8 | 71 | 51.1 | 36 | 60.0 |
| **Female** | 92 | 46.2 | 68 | 48.9 | 24 | 38.1 |
| **Pregnant** | 19 | 9.5 | 13 | 9.3 | 6 | 10 |
| **Age** | | | | | | |
| **Average** | 41.1 | N/A | 41.2 | N/A | 40.6 | N/A |
| **Race/Ethnicity** | | | | | | |
| **Hispanic** | 41 | 20.6 | 26 | 18.7 | 15 | 25.0 |
| **Non-Hispanic** | 158 | 79.4 | 113 | 81.3 | 45 | 75.0 |
| ***White*** | 50 | 25.1 | 35 | 25.2 | 15 | 25.0 |
| ***Asian/Pacific Islander*** | 62 | 31.2 | 45 | 32.4 | 17 | 28.3 |
| ***Black*** | 35 | 17.6 | 26 | 18.7 | 9 | 15.0 |
| ***American Indian/Alaskan Native*** | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| ***Unknown*** | 11 | 5.5 | 7 | 5.0 | 4 | 6.7 |

*Includes all cases of influenza A, regardless of subtype; does not include influenza A/B

## Hospitalization Rates by Age Group

The highest number of hospitalizations occurred in the 18-49 year old age group (Table 3); however, the highest rate of hospitalization, 37.3 per 100,000 population, occurred among those 50-64 years of age. Rates of hospitalization are not included for the pediatric age groups (0-17 years old) because the small number of cases made the rate estimates unreliable.

**Table 3. Number and rate of hospitalized adult influenza A cases in San Francisco residents by age group, April 22, 2009 - April 30, 2010**

| Age Groups | N | Rate per 100,000 population | Approximate 95% Confidence Interval |
|---|---|---|---|
| **18-49 years** | 83 | 18.9 | (14.8, 23.0) |
| **50-64 years** | 53 | 37.3 | (27.3, 47.4) |
| **65 years and older** | 27 | 23.7 | (14.7, 32.6) |
| **Total** | 199 | 24.4* | (21.0, 27.8) |

*Rate for the total is a crude rate and has not been age adjusted

## Antiviral Treatment

Eighty-two percent of all non-fatal cases received antiviral treatment, but only 35% received treatment within 48 hours of symptom onset. In fatal cases, 11 out of 13 patients were treated with antiviral agents but only 2 of the 13 were treated within 48 hours of symptom onset (Table 4). If treated, the very young (aged 0 – 4 years) and very old (aged 65 years and older) were more likely to receive early treatment.

**Table 4. Antiviral Use in influenza A cases in San Francisco residents, April 22, 2009 - April 30, 2010***

| Antiviral Use | Non Fatal (N=186) | Fatal (N=13) | Total (N=199) |
|---|---|---|---|
| **Any antiviral treatment** | 152 | 11 | 163 |
| **Received oseltamivir or zanamivir ≤ 48 h after symptom onset** | 67 | 2 | 69 |

* Cases could be included in both antiviral use categories

## Comorbidities

136 of 199 influenza A cases for which data was available had a comorbid condition (Table 5). The top comorbidities in survivors not requiring ICU care were asthma (n=39), immunosuppressive conditions (n=31) and chronic metabolic disease (n=25). In ICU and/or fatal cases chronic metabolic disease (n=21) and asthma (n=14) were the most frequent comorbid conditions.

**Table 5: Comorbid conditions of hospitalized cases of Influenza A in San Francisco residents, April 22, 2009 - April 30, 2010**

| Chronic comorbid illness associated with severe influenza | Total (N=199) | Survivors not requiring ICU(N=139) | ICU and/or Fatal (N=60) |
|---|---|---|---|
| **Chronic lung disease*** | 28 | 17 | 11 |
| **Asthma** | 53 | 39 | 14 |
| **Chronic cardiac disease** | 30 | 19 | 11 |
| **Chronic metabolic disease** | 46 | 25 | 21 |
| **Diabetes mellitus**** | 14 | 9 | 5 |
| **Renal disease** | 22 | 19 | 3 |
| **Immunosuppressive conditions** | 38 | 31 | 7 |
| **Neuromuscular disorder** | 5 | 2 | 3 |

***Of the 53 persons recorded as having asthma, only 7 are recorded as having chronic lung disease.**
****Includes Diabetes Mellitus, Gestational Diabetes, and Diabetes Mellitus II; persons listed with 'Diabetes' are not included.**

## Discussion

Influenza hospitalization data for San Francisco residents during the year from April 2009-April 2010 showed that H1N1 Swine Flu caused the majority of influenza hospitalizations. Two waves of pandemic disease occurred, one peaking in June, and a second in October of 2009. Disease occurred much earlier in the year compared to typical influenza seasons in Northern California; influenza activity usually peaks in the winter months.

The local demographic characteristics of the H1N1 Swine Flu pandemic were similar to those seen in California. Both nationally and in California, H1N1 Swine Flu affected a population younger than the population typically affected by seasonal influenza. The average age of cases in San Francisco was 41. Black and Hispanic persons were over-represented among hospitalized cases compared to the proportion of these groups in the general San Francisco population. In contrast, the proportion of hospitalized cases among white persons was lower relative to their proportion in San Francisco. The proportion of cases in Asian persons was consistent with their proportion in the population. Pregnant women, who make up only 1% of the general population nationally, accounted for 10% of San Francisco hospitalized cases, comparable to state and national figures. The majority of patients who were hospitalized had a comorbid condition.

Previous pandemics had multiple waves spread over many seasons. CEIP will continue active surveillance for hospitalized, laboratory confirmed influenza patients and SFDPH will continue to monitor for signs of re-emergence of H1N1 swine flu.