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Pandemic Influenza, Connecticut, 2009-2010

On Thursday and Friday, April 23 & 24, 2009 the United States Centers for Disease Control and Prevention (CDC) sent a series of urgent dispatches to all state health departments advising them of cases of febrile respiratory illness in California, Texas, and Mexico associated with influenza A (H1N1) virus infection. The virus contained a unique genetic combination that had not been previously reported (1). The CDC, in collaboration with state and municipal health departments, extended and expanded surveillance to monitor the spread of the influenza A/ California/7/2009 (H1N1) virus (or "2009 H1N1 influenza"). The Department of Public Health (DPH) conducted enhanced influenza surveillance using multiple systems from April 2009 through May 2010.

Surveillance Methods

Laboratory Surveillance: Positive influenza tests are laboratory reportable in Connecticut. The DPH tracked the number of persons with positive influenza tests to determine what types, subtypes, and strains were circulating during the pandemic. Test results also provided information useful to understand the occurrence and spread of influenza throughout the state, and the populations at risk.

Sentinel Provider Surveillance System: Reporting of influenza-like illness (ILI) was conducted through a statewide network of volunteer outpatient providers known as (ILINet). The proportion of patients exhibiting ILI was reported to the DPH on a weekly basis. ILI is defined as a cough or sore throat in the absence of a known cause, and the presence of a fever $\geq$ 100° F.

Syndromic Surveillance: The Hospital Admissions Syndromic Surveillance (HASS) System, received daily electronic reports from all 32 acute care hospitals on unscheduled admissions that included those for pneumonia. The Hospital Emergency Department Syndromic Surveillance (HEDSS) System received daily electronic reports on ED visits from 19 (59%) acute care hospitals.

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Influenza-associated Hospitalizations: Influenza-associated hospitalization was added to the list of reportable diseases (2). This allowed for a more complete assessment of the severity and risk factors for acquiring more serious disease caused by circulating influenza.

Influenza-associated Deaths: Pneumonia and influenza-associated deaths were reported weekly to the CDC by 4 Connecticut cities. Since January 2005, the DPH required reporting of influenza-associated deaths in children less than 18 years of age. In October 2009, the requirement was expanded to include persons of all ages (2).

Results of Surveillance

From April 19, 2009 - May 29, 2010, the DPH received 12,467 laboratory confirmed influenza reports. Of these, 10,971 (88%) were influenza type A viruses, 59 (0.5%) were influenza type B viruses, and 1,437 (11.5%) were unknown type. Of the influenza A viruses, 5,622 (51%) were subtyped; 5,489 (98%) were 2009 H1N1 influenza, 112 (2%) were seasonal influenza A (H3N2), and 21 (0.4%) were seasonal influenza A (H1N1) (Table 1, pg. 32).

Laboratory-confirmed influenza was found in persons aged < 1 year to 100 years; median age was 14 years. Nearly half (49%) were aged 5-18 years. Persons aged $\geq$ 65 years accounted for only 2% of positive laboratory reports (Table 1, pg. 32).

Of case-patients with laboratory-confirmed influenza, 976 (8%) required hospitalization, and 36 (0.3%) died including two children. Of the 976 hospitalized persons, 755 (77%) were confirmed with 2009 H1N1 infections and 35 died (4.6%). During a single week, November 1-7, 192 hospitalized influenza case-patients were reported. Overall during the pandemic, the rate of hospitalization among state residents was 21.9 per 100,000 population. The statewide rate was 4.2 hospitalizations per 100,000 population during the first wave and 17.7/100,000 during the second. The

highest county rates during the first wave were reported in New Haven (9.8/100,000) and Hartford (3.5/100,000) counties followed by Fairfield (2.8/100,000) and New London (1.5/100,000) counties. During the second wave the highest rates continued to be reported from New Haven (31/100,000) and Hartford (20.2/100,000) counties followed by Windham (16.3/100,000) and New London (15.1/100,000) counties.

In part, relative county rates of hospitalizations reflected the increased rates reported in some urban areas compared to the statewide rate. These included New Haven (101.1/100,000), Hartford (60.5/100,000), Waterbury (44.8/100/000), Stamford (22.6/100,000) and Bridgeport (19.1/100/000). Overall the relative risk of hospitalization among residents of these cities (populations over 100,000) compared to residents in the rest of Connecticut during the pandemic was 3.14 (95% Confidence Interval = 2.71, 3.63).

Blacks had a higher hospitalization rate (44 cases per 100,000 population) than whites (17/100,000) or Asians (17/100,000), and Hispanic/Latinos had a higher rate (66/100,000) than non-Hispanic/Latinos (9/100,000). The majority of the hospitalized case-patients reported at least one significant underlying medical condition including asthma (23.9%), diabetes (14.1%), and obesity (11.8%).

All surveillance systems showed two distinct waves of 2009 H1N1 influenza during the same periods; one peak in the spring and another larger peak in the fall (Figures 1-3, pg. 31). There were 1,969 laboratory confirmed cases during the first pandemic wave from April 19-August 29, 2009 and 3,520 during the second wave from August 30, 2009-May 29, 2010. High levels of flu activity were seen through December, returning to low levels in January 2010. A sharp but brief increase in the proportion of outpatient visits attributed to ILI was seen in February 2010 and indicated a third smaller peak within the second wave (Figure 1, pg. 31). Influenza in Connecticut gradually returned to sporadic activity by the last week of March.

During the second pandemic wave, the proportion of ILINet reports reached 12.9% and similarly the proportion of fever/flu ED visits reported through HEDSS reached 16%. A total of 18,347 statewide pneumonia admissions were reported to the HASS system during the 2009 pandemic, a 7% increase compared to a similar period in 2008-09, and a 5% increase compared to a similar period in 2007-08.

Proportion of emergency department visits attributed to a “fever/flu” syndrome was greatest in southwestern Connecticut and remained constant during the second wave, while the proportion in all other regions increased significantly and surpassed the southwestern region (Figure 3, pg. 31).

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Editorial Note

In Connecticut, the 2009 H1N1 influenza pandemic began in April 2009 and bridged two influenza seasons. Activity started and was most intense in southwestern and central Connecticut, and was later followed by increases in the eastern part of the state. Due to influenza cases occurring throughout the summer months, the 2009 H1N1 influenza season lasted longer than usual. The duration and intensity of disease transmission, uncertainty regarding disease severity, and the need for prevention guidance required an ongoing public health response that included maintenance of multiple influenza monitoring systems.

Illness associated with the novel strain was milder than initially thought based on reports from the first cases in Mexico and the United States. Younger populations were more susceptible to infection by the 2009 H1N1 influenza virus. This differs from a typical influenza A (H3N2) season in which older persons generally become infected and develop serious illness. HASS pneumonia admissions, city pneumonia and influenza deaths, and influenza-associated pediatric deaths suggested that a slight increase in severe adverse outcomes overall occurred during the 2009 pandemic as compared with the 2008-09 influenza season.

Blacks and Hispanic/Latinos were more frequently hospitalized than non-Hispanic whites. Higher hospitalization rates among these groups may be due in part to the prevalence of underlying diseases such as asthma and obesity, and residence in the state’s largest urban areas where hospitalization rates were 3 times greater than in less densely populated areas.

In a recent analysis of pediatric influenza-associated hospitalizations in New Haven County, poverty and crowding were each found to be independent positive predictors of influenza-related hospitalization (3). The incidence of pediatric influenza-related hospitalization in the highest

Figure 1. ILINet % influenza-like illness (ILI) visits vs. HEDSS System % "Flu/Fever" visits, Connecticut, April 2009-May 2010.

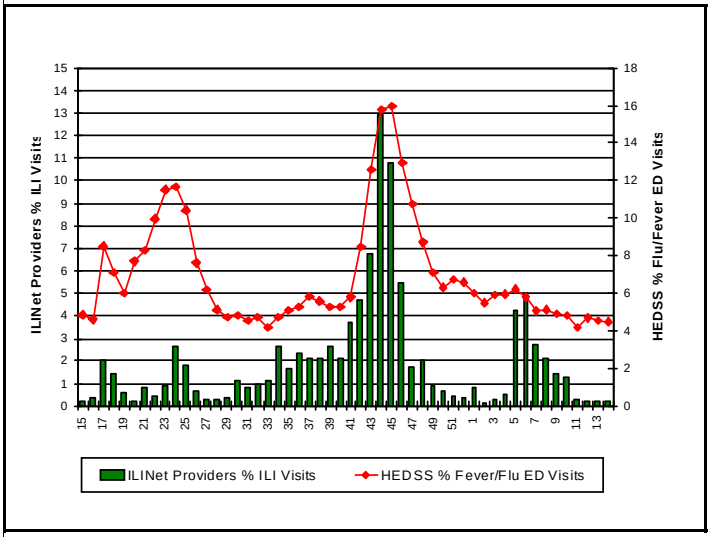


Figure 2. Influenza-associated hospitalizations by HASS System weekly pneumonia admissions, Connecticut, April 2009-April 2010

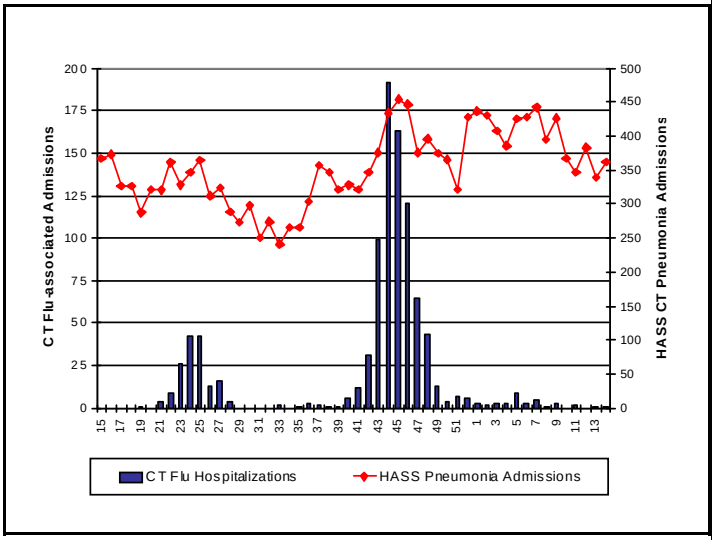
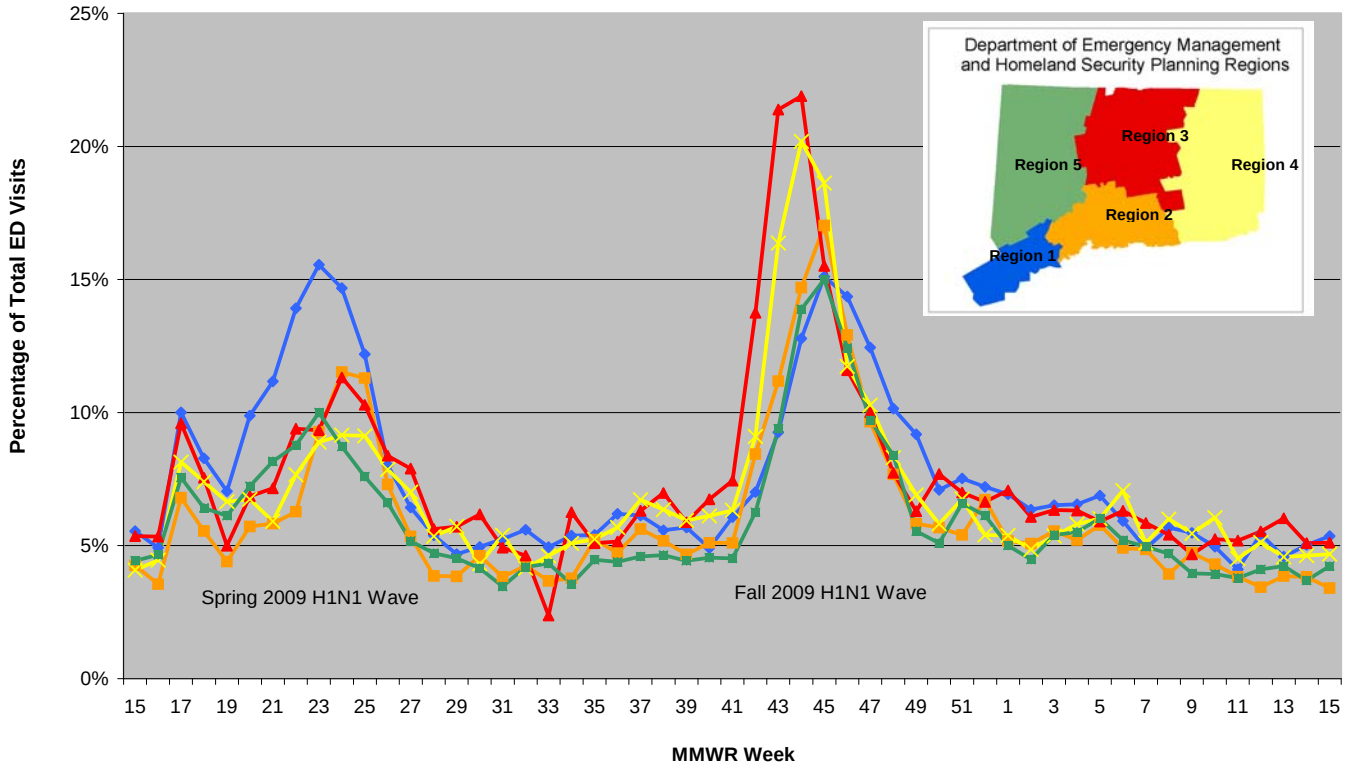


Figure 3. Temporal and Regional Trends during the Novel H1N1 Influenza Pandemic, Connecticut Hospital Emergency Department Syndromic Surveillance (HEDSS) System: Percentage of total ED visits for "fever/ flu" syndrome category, April 12 2009-April 24, 2010



poverty census tracts was 3.2 times greater than the incidence in the lowest poverty tracts ($p<0.0001$). Incidence in the census tracts with the highest level of household crowding was 3.0 times greater than that in the census tracts with the lowest household crowding ($p<0.0001$). When examined by influenza season, the same pattern was present for each influenza season during this time period, including the spring and fall 2009 pandemic H1N1 influenza waves.

Special efforts to improve influenza vaccination rates within impoverished and crowded communities are necessary. Options to improve vaccination include school-based influenza vaccination clinics, mobile vaccine clinics, and retail clinic expansion into high poverty, high crowding communities. In addition, neighborhood-based outreach efforts are needed to increase individual and community-level participation in vaccination.

References:

1. CDC. Update: swine influenza A (H1N1) infections—California and Texas, April 2009. MMWR. 2009;58:435–7.
2. Connecticut Department of Public Health, Changes to the List of Reportable Diseases. Connecticut Epidemiologist. October 2009; 29(6)21. Available at: http://www.ct.gov/dph/lib/dph/infectious_diseases/ctepinews/vol29no6.pdf.
3. Connecticut Department of Public Health, Neighborhood Socioeconomic Status Among Children Hospitalized With Influenza: New Haven County, Connecticut, 2003-2010. Connecticut Epidemiologist. September 2010; 30(6)21. Available at http://www.ct.gov/dph/lib/dph/infectious_diseases/ctepinews/vol30no6.pdf .

Table 1: Summary of Laboratory Confirmed Influenza Cases, Connecticut April 19, 2009-May 29, 2010

Characteristic	2009 Type A (H1N1) (%)	Type A (H1N1) Seasonal (%)	Type A (H3N2) Seasonal (%)	Type A (Unspec.) (%)	Type A (Unsub.) (%)	Type B Seasonal (%)	Unknown Type (%)	Rate per 100,000	Total
Positive Reports	5,489 (44)	21 (0.2)	112 (0.9)	5,348 (42.9)	1 (0)	59 (0.5)	1,437 (11.5)		12,467
Age Groups									
<1	140 (3)	1 (5)	3 (3)	211 (4)	0	2 (3)	33 (2)	919	390 (3)
1-4	379 (7)	1 (5)	14 (12)	522 (10)	0	6 (10)	209 (14)	668	1,131 (9)
5-18	2,422 (44)	6 (29)	45 (40)	2,526 (47)	0	15 (25)	1,137 (79)	942	6,151 (49)
19-24	491 (9)	3 (14)	6 (5)	458 (9)	0	5 (8)	33 (2)	366	996 (8)
25-49	1,407 (26)	8 (38)	29 (26)	1,153 (22)	1 (100)	20 (34)	18 (1)	218	2,636 (21)
50-64	460 (8)	2 (10)	5 (4)	327 (6)	0	4 (7)	0	118	798 (6)
65+	123 (2)	0	10 (9)	117 (2)	0	7 (14)	6 (0.4)	55	263 (2)
Unknown	67 (1)	0	0	34 (1)	0	0	1 (.07)		102 (0.9)
Sex									
Male	2,458 (45)	14 (67)	46 (41)	2,517 (47)	1 (100)	25 (42)	723 (50)	339	5,784 (46)
Female	2,891 (53)	7 (33)	66 (59)	2,674 (50)	0	34 (58)	649 (45)	352	6,321 (51)
Unknown	140 (3)	0	0	157 (3)	0	0	65 (5)		362 (3)
Race									
White	460 (8.4)			620 (11.6)		6 (10.2)	607 (42.2)	57	1,693 (13.6)
Black/African Amer.	167 (3.0)			152 (2.8)		4 (6.8)	23 (1.6)	91	346 (2.8)
Asian/Pacific Islander	44 (0.8)			33 (0.6)			19 (1.3)	74	96 (0.8)
Amer. In/Alaska Nat.	0 (—)			2 (0)			0 (—)	13	2 (0)
Unknown	4,818 (87.8)	21 (100)	112 (100)	4,541 (84.9)	1 (100)	49 (83.0)	788 (54.8)		10,330 (82.9)
Ethnicity									
Hispanic/Latino	323 (5.9)	1 (4.8)	7 (6.3)	544 (10.2)		6 (10.2)	62 (4.3)	225	943 (7.6)
Non-Hispanic/Latino	326 (5.9)	2 (9.5)	5 (4.5)	329 (6.2)	1 (100)	12 (20.3)	461 (32.1)	37	1,136 (9.1)
Unknown	4,840 (88.2)	18 (85.7)	100 (89.3)	4,475 (83.7)		41 (69.5)	914 (63.6)		10,388 (83.3)
Hospitalized	765 (14)	0	2 (2)	198 (4)	1 (100)	7 (11)	3 (0.2)	28	976 (8)
Deaths	35 (0.6)	0	0	1 (.02)	0	0	0	1	36 (0.3)

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