April 2, 2010 MMWR Articles

- CDC/RAND/Knowledge Networks panel
  October 2009 survey of HCP
- State-specific monovalent (‘H1N1’) vaccination
  - Methods of estimating coverage
    - Kaplan-Meier survival estimates of vaccinations through January using interview data collected through February
    - Combined BRFSS and NHFS state-level estimates
April 30, 2010 MMWR Article

- State-specific trivalent (‘seasonal’) vaccination
- Same methods as April 2 monovalent article
  - Kaplan-Meier survival estimates of vaccinations through January using interview data collected through February
  - Combine BRFSS and NHFS state-level estimates
Swine Flu Fears Push Seasonal Shots to Record High

CDC: Record number of Americans got seasonal flu shots; fear of swine flu contributed

The Associated Press

By MIKE STOBBE AP Medical Writer

ATLANTA April 29, 2010 (AP)
2009-10 Trivalent Vaccination Coverage as of January 31, 2010, BRFSS and NHFS
n=79,154 children/adolescents plus 183,263 adults

<table>
<thead>
<tr>
<th>Group</th>
<th>% Vaccinated</th>
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<tbody>
<tr>
<td>&gt;6 mos</td>
<td>39.7</td>
</tr>
<tr>
<td>6mos - 17yrs</td>
<td>40.0</td>
</tr>
<tr>
<td>&gt;18 yrs</td>
<td>39.6</td>
</tr>
<tr>
<td>HR 18-49 yrs</td>
<td>36.2</td>
</tr>
<tr>
<td>non-HR 18-49 yrs</td>
<td>27.6</td>
</tr>
<tr>
<td>50-64 yrs</td>
<td>45.0</td>
</tr>
<tr>
<td>65+ yrs</td>
<td>68.0</td>
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</tbody>
</table>

Source: MMWR 2010;59:478-484

H1N1 Vaccination Coverage as of end of January 2010, BRFSS and NHFS

<table>
<thead>
<tr>
<th>Group</th>
<th>% Vaccinated</th>
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<tr>
<td>&gt;6 mo</td>
<td>22.3</td>
</tr>
<tr>
<td>6mo - 17yrs</td>
<td>35.1</td>
</tr>
<tr>
<td>&gt;18 yrs</td>
<td>18.2</td>
</tr>
<tr>
<td>Initial Target</td>
<td>30.8</td>
</tr>
<tr>
<td>HR 25-64 yrs</td>
<td>22.7</td>
</tr>
<tr>
<td>Other 25-64 yrs</td>
<td>13.2</td>
</tr>
<tr>
<td>65+ yrs</td>
<td>21.7</td>
</tr>
</tbody>
</table>

Source: MMWR 2010;59:363-8
**National 2009 H1N1 Flu Survey (NHFS)**

- Conducted October 2009 – June 2010 by National Opinion Research Center (NORC)
- Random-digit-dialed telephone survey of 6,000 households / month
  - 18% from households that are cell phone-only or mainly
- Additional children from NIS sample frame
  - ~8,000 per month
- Weekly national H1N1 & seasonal estimates
- Coverage, intent, reasons, opinions, place of vaccination

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**Behavioral Risk Factor Surveillance System (BRFSS)**

- Conducted October 2009 – June 2010
- State-based random-digit-dialed telephone survey of >29,000 households per month
  - Landline only for influenza-related questions
- Children: 46 states, DC, PR, USVI
- Adults: 49 states, DC, PR, USVI
- Monthly H1N1 & seasonal coverage
  - Primary source of state-level data
  - Aggregate “national” estimates
Five Other Sources

- **SDI Health**
  - CLAIMS of vaccinations administered in provider offices

- **RAND/Knowledge Networks Internet Panel Surveys of Health-care Personnel (HCP)**
  - Monthly national estimates of H1N1 and seasonal coverage and behavioral factors

- **Harvard School of Public Health Flu Polls**
  - Eight national polls conducted April 2009 – January 2010

- **Pregnancy Risk Assessment Monitoring System (PRAMS)**
  - ~30,000 women with live births to be surveyed in 31 states

- **National Health Interview Survey (NHIS)**
  - National in-person survey

---

RDD Databases:
New Analytic Approaches – 1 Improving Precision
Kaplan-Meier survival estimates

<table>
<thead>
<tr>
<th>Interview Month</th>
<th>November</th>
<th>December</th>
<th>January</th>
<th>February</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccination Month</td>
<td>October</td>
<td>November</td>
<td>December</td>
<td>January</td>
</tr>
</tbody>
</table>
New Analytic Approaches – 2
Improving Precision, Filling Gaps

Combining Surveys

*Fill in with NHFS for states missing BRFSS data*

*Improve precision for state-level child estimates*

\[ W_c \times (0.5 \times \text{BRFSS child state A} + 0.5 \times \text{NHFS child state A}) + W_a \times (0.8 \times \text{BRFSS adult state A} + 0.2 \times \text{NHFS adult state A}) \]

\[ W_c \times (\text{NHFS child state B}) + W_a \times (0.9 \times \text{BRFSS adult state B} + 0.1 \times \text{NHFS adult state B}) \]

Percent of Children and Adults Vaccinated with Trivalent, Monovalent or Both Vaccines by mid-March, NHFS, February 28 – March 27 2010

<table>
<thead>
<tr>
<th></th>
<th>Children</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seasonal only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both H1N1 and Seasonal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1N1 only</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

% vaccinated by mid-March

40%

90%

80%

70%

60%

50%

40%

30%

20%

10%

0

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention

SUPER HEALTHIER PEOPLE
Weekly uptake of tri- and monovalent influenza vaccines through April 10, 2010, SDI Health

Cumulative doses administered in physician offices for tri- and monovalent vaccine through April 10, 2010, SDI
Projected 2009-10 Influenza Vaccination
Cumulative Uptake of Either Vaccine (tri- or monovalent) through April 17
Compared to Previous Season, SDI

Cumulative Doses Seasonal and Pandemic Vaccines for 2009/2010 vs.
Cumulative Doses of 2008/2009 Seasonal Vaccines in Physician Offices

*This uptake line shows all flu vaccinations (H1N1 or seasonal) billed in physician offices
NOTE: Combining tri- and monovalent vaccinations, influenza vaccination uptake in 2009-10 is 27% higher than for the 2008-09 season.

Seasonal Vaccination Coverage
Pregnant Women, BRFSS

% vaccinated by mid-month

Nov  Dec  Jan  Feb
Tri- vs. Monovalent Vaccination Coverage
Pregnant Women, BRFSS

Sample sizes for seasonal were 221, 163, 144 and 199 of currently pregnant women in Nov, Dec, Jan and Feb, respectively. For H1N1, sample sizes were 218, 161, 136, and 185 currently pregnant women in Nov, Dec, Jan and Feb, respectively. States not included: VT in Nov and Dec; AZ, CT, RI, UT, VT in Jan; DC, VT in Feb.

Second H1N1 Dose Receipt, Children 6m – 9y
NHFS, February 28 – March 27 2010

- 40% (95% CI 35-44) received ≥1 dose
- 20% (95% CI 17-23) received ≥2 doses
- Among children receiving at least one dose, 50% received a second dose
## Racial/Ethnic Disparities in Seasonal and H1N1 Vaccination Coverage by mid-March, NHFS, February 28 – March 27, 2010

<table>
<thead>
<tr>
<th></th>
<th>Difference in coverage Black – White</th>
<th>Difference in coverage Hispanic – White</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Seasonal</td>
<td>H1N1</td>
</tr>
<tr>
<td><strong>Children</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-5.6</td>
<td>-4.2</td>
</tr>
<tr>
<td><strong>Adults</strong></td>
<td>-16.5*</td>
<td>-9.8*</td>
</tr>
<tr>
<td><strong>All</strong></td>
<td>-13.7*</td>
<td>-7.6*</td>
</tr>
</tbody>
</table>

* Coverage difference statistically significant, p<0.05

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## NHFS – Place of Vaccination

![NHFS Place of Vaccination Chart](chart.png)

- **Place of Vaccination for Adults versus Children**
  - **NHFS, Interviews Conducted January 2010**
  - **Seasonal Adult** 59%, **Seasonal Child** 83%
  - **H1N1 Adult** 58%, **H1N1 Child** 59%

- **Medical Location**
  - Seasonal Adult 59%, Seasonal Child 83%, H1N1 Adult 58%, H1N1 Child 59%

- **Non-medical Location**
  - Seasonal Adult 38%, Seasonal Child 15%, H1N1 Adult 38%, H1N1 Child 41%
State-specific Influenza Vaccination Coverage Estimates Shared with States

- Estimates using December data sent mid-January
- Estimates using January data sent mid-February
- Detailed tables by age and target group
- 2009-10 H1N1 and seasonal reported levels
- 2007-08 seasonal for comparison
- Regional and national estimates
- Child BRFSS and NHFS estimates combined to provide child data in all states and improve precision

2009-10 Trivalent Influenza Coverage Top and Bottom 5 states

Children/Adolescents Aged 6 mos to 17 yrs
### 2009-10 Trivalent Influenza Coverage Top and Bottom 5 states

Persons Aged $\geq 18$ years

#### Median
- Median Trivalent Influenza Coverage
- Median Trivalent Influenza Vaccination Coverage

#### All States Combined
- Trivalent Influenza Coverage: 39.6% (± 0.6)
- Trivalent Influenza Vaccination Coverage:
  - All: 39.7%
  - Children: 40.9%
  - Adults: 40.0%
  - 18 to 49 y: 36.5%
  - 50 to 64 y: 45.5%
  - $\geq 65$ yrs: 68.0%

#### Top 5 Trivalent Influenza Coverage States
- MN, HI, SD, MA, NE

#### Bottom 5 Trivalent Influenza Coverage States
- AK, HI

#### Top 5 Trivalent Influenza Vaccination Coverage States
- MN, HI, SD, MA, NE

#### Bottom 5 Trivalent Influenza Vaccination Coverage States
- AK, HI

---

### 2009-10 Estimated Trivalent Influenza Vaccination Coverage Top Highest States

#### IN A TOP 5

<table>
<thead>
<tr>
<th>State</th>
<th>All $\geq6$ mos</th>
<th>Children 6 m to 17 y</th>
<th>Adults $\geq18$ y</th>
<th>18 to 49 y at high risk</th>
<th>18 to 49 y not at high risk</th>
<th>50 to 64 y</th>
<th>$\geq65$ yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>MN</td>
<td>4,638</td>
<td>HI</td>
<td>HI</td>
<td>HI</td>
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<tr>
<td>SD</td>
<td>4,016</td>
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<td>MA</td>
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<tr>
<td>RI</td>
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<td>ME</td>
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</tr>
</tbody>
</table>

**Median**
- All: 40.6%
- Children: 41.2%
- Adults: 40.6%
- 18 to 49 y: 38.3%
- 50 to 64 y: 45.5%
- $\geq65$ yrs: 69.3%

**All states combined**
- All: 39.7%
- Children: 40.0%
- Adults: 39.6%
- 18 to 49 y: 36.2%
- 50 to 64 y: 27.6%
- $\geq65$ yrs: 45.0%
### 2009-10 Estimated Seasonal Influenza Vaccination Coverage
#### Bottom Lowest States

<table>
<thead>
<tr>
<th></th>
<th>All ≥6 m</th>
<th>Children 6 m to 17 y</th>
<th>ADULTS ≥18 yrs</th>
<th>18-49 y High risk</th>
<th>18-49 y Not high risk</th>
<th>50-64 y</th>
<th>≥65 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>In a Bottom 5</td>
<td>n</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>OK</td>
<td>3,976</td>
<td>LO</td>
<td></td>
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<tr>
<td>MI</td>
<td>5,371</td>
<td>LO</td>
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</tr>
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<td>CA</td>
<td>7,225</td>
<td>LO</td>
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<tr>
<td>NJ</td>
<td>5,683</td>
<td>LO</td>
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<tr>
<td>FL</td>
<td>10,721</td>
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<td>LO</td>
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</tr>
<tr>
<td>Median All states combined</td>
<td>4,670</td>
<td>40.6</td>
<td>41.2</td>
<td>40.6</td>
<td>38.3</td>
<td>28.8</td>
<td>45.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Children: H1N1 vs Seasonal, 2009-10</th>
<th>Adults: H1N1 vs. Seasonal, 2009-10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image1" alt="Scatter plot" /></td>
<td><img src="image2" alt="Scatter plot" /></td>
</tr>
<tr>
<td></td>
<td>$r=0.72$</td>
<td>$r=0.72$</td>
</tr>
</tbody>
</table>
Is H1N1 coverage by state correlated with past seasonal coverage?

Summary: Seasonal Vaccine Coverage – 1

- Seasonal vaccination started in August and peaked in October; Seasonal vaccination in September was higher than any past season.
- An estimated 29 million children and 90 million adults vaccinated for Seasonal flu during August 2009-January 2010
- This is the first full season to implement the universal child recommendation
- A 67% relative increase of seasonal vaccination among children and a 30% relative increase among healthy young adults compared to 2008-9 season.
- Seasonal coverage for recommended adults (18-49 HR, >50-64, ≥ 65) were similar compared to 2008-09 season
- State specific child and adult coverage correlated positively (r=0.68) with wider range among children than adults
Summary of Seasonal Vaccine Coverage – 2

- Seasonal state coverage correlated positively with 2009 H1N1 coverage among both children (r=0.72) and adults (r=0.72)
- An estimated 62% of health care workers vaccinated for seasonal flu by January 2010 (from MMWR-Rand estimates)
- An estimated 38% of pregnant women vaccinated for seasonal flu by the end of January (BRFSS KM estimates)
- Seasonal vaccine coverage in adults was significantly higher in whites than blacks or Hispanics,
- Seasonal coverage in children was higher in whites than blacks, but similar to Hispanics.

Summary of Seasonal Vaccine Coverage – 3

- State coverage among children ranged from 23.6% (Nevada) to 67.2% (Hawaii)
- State coverage among adults ranged from 32.4% (Nevada) to 52.5% (Minnesota)
- For adults ≥65y, state coverage ranged from 59.3% (Idaho) to 81.6% (Alaska)
Caveats – 1

- Vaccination status and target group status based on self or parental report
- Respondents may have confused H1N1 and seasonal vaccinations
- Non-response bias may remain after weighting adjustments
- NHFS estimates > BRFSS estimates
- Survey estimates of coverage consistent with vaccination patterns observed with SDI data

Caveats – 2

- Survey respondents reported 119 million doses of seasonal vaccines administered to non institutionalized persons, however, of the 114-115 million distributed no more than about 105* were available to the surveyed population indicating a over-reporting bias of 10-15%.
  - Recommendation:
    - Private sector doses wasted/unused need to be measured to allow for validation of self-reported coverage levels

*115 minus 6 m wasted/unused; 2 m administered to LTCF; 2 m administered to members of the military
Intent for 2010-11 Influenza Vaccination
April 3-10, 2010, NHFS

Please think ahead to the upcoming flu season, that is, the flu season that will begin in the fall of 2010. How likely are you to get a flu vaccination during the upcoming flu season? Would you say you:

(1) will definitely get one
(2) will probably get one
(3) will probably not get one
(4) or, will definitely not get one
(77) DON’T KNOW
(99) REFUSED
Post-season Evaluation Using Survey Data

- Developing 2009-2010 season research agenda
- Provide information to improve planning and implementation of next flu season and future pandemics
- Implementation – what worked and what didn’t
  - Collect data from states on their program activities
  - Relate activities to vaccination coverage
    - Number and type of providers enrolled as H1N1 vaccinators
    - Proportion of vaccine given through public venues
    - School-located vaccination
  - Case studies based on states with high and low coverage
- Provide BRFSS data analysis assistance to states
  - Team of 8+ full time staff

Plans for 2010-2011 Season Influenza Vaccination Surveillance

- BRFSS adult data monthly
- Children from NIS sample frame
  - Sample size ~8,000 per month
  - National weekly estimates
  - State-level estimates after accumulate several months of data
- “Snapshot” surveys, n~1,400
  - National and in 10 selected metro areas
  - Mid-season and March snapshots
  - Vaccination, opinions, behaviors
- Special population surveys, mid-season & March
  - Health care personnel
  - Pregnant women
- PRAMS, SDI, College Health Database
Conclusions

- CDC established a comprehensive vaccine coverage monitoring system for 2009 H1N1
- Results from this system helped CDC and possibly states manage the campaign
- Further analysis of data aimed at providing useful information for future seasons
- Lessons learned from assessment this season already applied to plans for 2010-11
- States should consider use of BRFSS to collect additional influenza vaccination data
  - Children (got vaccinated, place of vaccination)
  - Adult health-care personnel
- Improved measurements of unused doses are needed to allow for assessment of the validity of coverage surveys

Acknowledgements

2009-10 Coverage Team

- CDC/NCIRD — Barbara Bardenheier, Carla Black, Daoling Bi, Leah Bryan, Helen Ding, Gary Euler, Carolyn Furlow, Amparo Gonzalez-Feliciano, Charles LeBaron, Pengjun Lu, Elizabeth Luman, Liz Monsell, Rachel Palzer, Tammy Santibanez, Rosana Setse, Jim Singleton, Phil Smith, Larry Wilkinson, Carla Winston, Karen Wooten, David Yankey, Surasak Youngpairoj, Fan Zhang, John Zhang, Zhen Zhao
- CDC/BRFSS -- Lena Balluz, Machell Town
- CDC/NCBDDD — C. J. Alverson
- CDC/NCCDPHP – Lawrence Barker
- CDC/NCHS – Marcie Cynamon, Kathleen O’Connor
- NORC – Ken Copeland, Nick Davis, Margrethe Montgomery, Kirk Wolter
- SDI Health -- Laurel Edelman, Joel Greenspan
US patterns of state-specific influenza pandemic H1N1 outbreak* onset and duration with cumulative vaccination coverage, 1 June 2009 through February 2010

September 5, 2009

September 12, 2009
Lessons learned from this map sequence

- States’ involvement in the pandemic to the level of recognized increases among children and adolescents in ED visits for MD diagnosed influenza started in CA and FL and skipped to NE early, then filled in states next to NE and the southern half of the country, moved into the Northwest and from there across to the northern midwestern states and finally into the northeastern or New England states.

- Vaccination levels remained lower in the southern coastal states where the pandemic started earlier indicating factors other than those within the state’s control may have been at least partially responsible for lower vaccination coverage.

- It may be true that increased demand for vaccination was at least in part driven by concurrent startup of state epidemics in early and mid October about the time of H1N1 vaccine’s initial availability.