2009 H1N1 Infection in Pregnant Women: CDC’s Maternal Health Response

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The findings and conclusions in this report are those of the author and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Outline

• Background
• Timeline of outbreak
• Characteristics of H1N1 virus
• Early response efforts
• Partnerships
• Surveillance and epidemiology
• Communication efforts

Background

Why are pregnant women considered an at-risk population?
• Changes in immune, respiratory and cardiovascular system during pregnancy result in increased risk for certain infections, including influenza
• In seasonal influenza, viremia is believed to occur infrequently and placental transmission appears to be rare – may differ with novel influenza strains
• Hyperthermia is a risk factor for some types of birth defects and other adverse outcomes

Influenza Infection in Pregnant Women

• Increased morbidity and mortality from influenza during previous pandemics and epidemics
• Increased risk of complications related to seasonal influenza

Previous Research on Pregnant Women and Influenza

Risk of Hospital Admission for Respiratory Illness during Influenza Season by Pregnancy Status* among Women with No Comorbidity, Nova Scotia, 1990-2002

*Compared to year before pregnancy

Dodd et al., CMAJ 176:463-8, 2007
Timeline of 2009 H1N1 Outbreak

4/15/09 CDC identifies novel H1N1 virus in patient 1
4/25/09 WHO declares public health emergency
4/26/09 U.S. declares public health emergency
6/11/09 WHO raises global pandemic alert to Phase 6

Characteristics of 2009 H1N1 Influenza Virus

• Triple reassortment of influenza virus strains of pig, human, and bird origin
• Not “enough” mutation to reclassify virus as a new subtype
• Enough genetic variation and adaptation occurred to designate it as a “novel” strain

Characteristics of Novel H1N1 Virus

• Susceptible to oseltamivir (Tamiflu®) and zanamivir (Relenza®)
• Resistant to amantadine and rimantadine
• Most infections characterized as a self-limited, uncomplicated, febrile respiratory infection
### Presenting Manifestations in Pregnant Women with Pandemic (H1N1) 2009 Influenza

**United States, April 15 to May 18, 2009**

<table>
<thead>
<tr>
<th>Presenting manifestations</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>33 (97%)</td>
</tr>
<tr>
<td>Cough</td>
<td>32 (94%)</td>
</tr>
<tr>
<td>Rhinorrhea</td>
<td>20 (59%)</td>
</tr>
<tr>
<td>Sore throat</td>
<td>17 (50%)</td>
</tr>
<tr>
<td>Headache</td>
<td>16 (47%)</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>14 (41%)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>6 (18%)</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>4 (12%)</td>
</tr>
</tbody>
</table>

*Jamieson DJ et al., Lancet 374:451-8, 2009*

### Early Response Efforts

**Pandemic Influenza: Special Considerations for Pregnant Women**

Convened in 2008 to obtain input from experts and key partners on the clinical management and related health actions during pandemic influenza.

### Pandemic Influenza: Special Considerations for Pregnant Women

- April 2008, CDC, AMCHP, and MoD convened a meeting of national experts on pandemic influenza and pregnancy.
- Topics discussed: antiviral medication, vaccines, non-pharmaceutical interventions, communications.
- Several gaps in knowledge in the context of seasonal and pandemic influenza were identified.
Interim guidelines development influenced by expert meeting findings

Current Guidelines, Resources, and Information at CDC

- http://www.cdc.gov/h1n1flu/
- http://www.flu.gov/
- http://www.cdc.gov/flu/
Importance of Partners in H1N1 Response Related to Pregnant Women

- Discussion from experts/partners extensively relied upon in response
- Partner connections used to gather input on emerging issues
- Partners coordinated and mobilized their professional associations
- Partners assisted with dissemination of interim guidance and key messages

Surveillance & Epidemiology

2009 Pandemic H1N1 Influenza

- 34 confirmed or probable cases of pandemic (H1N1) 2009 influenza in pregnant women (April 15-May 18, 2009) in US (34/5469 or 0.62% of total)
- 11 women (32%) were admitted to hospital
- 6 deaths among pregnant woman with pandemic (H1N1) 2009 influenza (April 15-June 16, 2009) (6/45 or 13% of total)

Jamieson DJ et al., Lancet 374:451-8, 2009
Trimester at Time Symptom Onset, United States, April 15-May 18, 2009

Admission Rates for Pregnant Women and General Population with Pandemic (H1N1) 2009 Influenza, United States, April 15 to May 18, 2009

<table>
<thead>
<tr>
<th>Population</th>
<th>Admission Rate per 100,000 (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnant women</td>
<td>0.32 (0.13-0.52)</td>
</tr>
<tr>
<td>General Population</td>
<td>0.076 (0.07-0.09)</td>
</tr>
</tbody>
</table>

Risk Ratio 4.3, 95% CI 2.3-7.8

Pandemic (H1N1) Influenza in California, April –August 2009

- Surveillance for pregnant or postpartum (up to 2 weeks) women who were hospitalized with or died from 2009 H1N1 influenza in CA
  - 94 pregnant women
  - 8 postpartum women
- 89/94 (95%) of pregnant women were in 2nd/3rd trimester
- 32/93 (34%) had established risk factors for influenza complications other than pregnancy

Pregnant & Postpartum Women with Influenza in California, April – Aug. 2009

- 22/102 (22%) required ICU care
- 8/102 (8%) died
- 6 deliveries occurred in ICU, including 4 emergency cesarean deliveries
- Pregnant and postpartum women with prompt antiviral treatment (within 2 days of symptom onset) were less likely to be admitted to ICU or die than those with later treatment


Updated Information on Deaths among Pregnant Women

- ~ 6% of deaths in US from pandemic (H1N1) 2009 Influenza are among pregnant women (based on 484 H1N1 deaths reported to CDC by Aug. 21, 28 of whom were pregnant)
- Pregnant women ~1% of the general population

Surveillance Goals

- Improve understanding of influenza infection and treatment on fetal outcomes
- Determine effects of antiviral medications on maternal and fetal/infant outcomes when used during pregnancy
- Quantify impact of seasonal and H1N1 influenza immunization on pregnancy outcomes
CDC Pregnancy Flu Line

- Flu Line "LIVE" beginning October 19, 2009
- 5-page case report requested for every case
- Case definition
  - August 21st or after onset of illness
  - Pregnant or up to 6 weeks Post-Partum
  - Severe illness (ICU admissions and deaths)
  - Lab confirmed influenza diagnosed by a) a positive rapid test, or b) rRT-PCR positive for influenza, or 3) DFA/IFA, or 4) viral culture to CDC

Variables Collected

- Maternal demographics
- Underlying conditions
- Testing results
- Treatment summary (including antivirals and ventilation)
- Delivery method and any complications
- Infant outcome

CDC Pregnancy Flu Line

Mechanisms for Surveillance

- Flu Line Phone – 24 hours/7 days per week
  - Handles flu line reporting questions
  - Provides consultation with SMEs for caregivers of severely ill pregnant women
  - As of January 28, have not received any case reports over Flu Line phone
- Flu Line secure fax
- Flu Line secure e-mail
CDC Flu Line Coordination With Existing Surveillance

- Emerging Infections Program (EIP)
- Council of State and Territorial Epidemiologists
  - Initial invitation to states to participate in flu line came from CSTE
  - Flu Team staff participates in weekly CSTE calls
- Other CDC Flu Surveillance
  - H1N1 Hospitalization Case Series
  - Pediatric Deaths

CDC Pregnancy Flu Line Reports

Future Directions

- Submitted proposal for funding to continue Pregnancy Flu Line for the 2010/2011 influenza season
  - Allow comparability between seasons
  - Gather improved data on the maternal and fetal/infant outcomes associated with influenza and its treatment
- Better data could likely be obtained if pregnancy/postpartum deaths and ICU admits were reportable
Other Epidemiology and Surveillance Activities

- Pregnancy Influenza Project
  - Prospective study examining maternal health and fetal/infant outcomes
- PRAMS
  - Data collection on H1N1 and seasonal vaccine uptake
- ACOG survey
  - Survey of obstetricians’ practices related to H1N1 flu
- AI/AN surveillance project

H1N1 Communications for Pregnant Women

Maternal Health Desk Communication Functions
**Background**

- April 2008 CDC, AMCHP, and MoD convened a meeting of national experts on Pandemic Influenza and Pregnancy
- Topics discussed: antiviral medication, vaccines, non-pharmaceutical interventions, communications
- Communications committee identified several unique gaps in the context of seasonal and pandemic influenza

**Background cont.**

- Launched formative research project with pregnant women and health care providers
- Amidst project planning (swine flu outbreak, spring 2009)
- Project refocused on seasonal and 2009 H1N1 influenza

**Formative Research:**

**Overarching Goals**

- To better understand the knowledge, attitudes, risk perception, barriers and behaviors of pregnant women or recently pregnant women and their healthcare providers regarding seasonal and 2009 H1N1 flu
- To identify misinformation, information needs and gaps
- To inform flu emergency response strategies and tactics
  - Maternal Health Team
  - Joint Information Center (JIC)
Preliminary Findings

Demographics
All Women’s Groups (n=18)

<table>
<thead>
<tr>
<th>Race</th>
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<tbody>
<tr>
<td>African American/Black:</td>
<td>28.1%</td>
</tr>
<tr>
<td>American Indian or Alaskan Native:</td>
<td>0.7%</td>
</tr>
<tr>
<td>Asian American:</td>
<td>1.4%</td>
</tr>
<tr>
<td>Caucasian/White:</td>
<td>65.5%</td>
</tr>
<tr>
<td>Multiracial:</td>
<td>4.3%</td>
</tr>
<tr>
<td>Hispanic:</td>
<td>8.5%</td>
</tr>
<tr>
<td>Non-Hispanic:</td>
<td>91.5%</td>
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<table>
<thead>
<tr>
<th>Age</th>
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<tbody>
<tr>
<td>18–24 years:</td>
<td>26.4%</td>
</tr>
<tr>
<td>25–34 years:</td>
<td>61.8%</td>
</tr>
<tr>
<td>35–44 years:</td>
<td>11.8%</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Pregnancy/Post Partum status</th>
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<tbody>
<tr>
<td>Currently pregnant:</td>
<td>43.8%</td>
</tr>
<tr>
<td>Had baby in past 6 months:</td>
<td>56.2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Medical Insurance</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Private insurance plan:</td>
<td>55.2%</td>
</tr>
<tr>
<td>Medicaid:</td>
<td>23.8%</td>
</tr>
<tr>
<td>SCHIP:</td>
<td>10.5%</td>
</tr>
<tr>
<td>Other public or military:</td>
<td>4.9%</td>
</tr>
<tr>
<td>Not applicable (uninsured):</td>
<td>5.6%</td>
</tr>
</tbody>
</table>

Attitudes and Behaviors
All Women’s Groups (n=18)

<table>
<thead>
<tr>
<th>Flu shot history</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Received flu shot in past 2 years:</td>
<td>39.9%</td>
</tr>
<tr>
<td>Did not receive flu shot in past 2 years:</td>
<td>60.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concerned about safety of vaccines</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Very concerned:</td>
<td>42.4%</td>
</tr>
<tr>
<td>Somewhat concerned:</td>
<td>34.7%</td>
</tr>
<tr>
<td>Not that concerned:</td>
<td>3.7%</td>
</tr>
<tr>
<td>Not at all concerned:</td>
<td>1.1%</td>
</tr>
<tr>
<td>Don’t know:</td>
<td>2.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level of worry</th>
<th>Catching regular flu</th>
<th>Catching H1N1 (“swine”) flu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all worried</td>
<td>23.8%</td>
<td>35.2%</td>
</tr>
<tr>
<td>Slightly worried</td>
<td>22.5%</td>
<td>22.5%</td>
</tr>
<tr>
<td>Somewhat worried</td>
<td>18.0%</td>
<td>18.0%</td>
</tr>
<tr>
<td>Moderately worried</td>
<td>22.5%</td>
<td>18.0%</td>
</tr>
<tr>
<td>Extremely worried</td>
<td>13.1%</td>
<td>17.3%</td>
</tr>
</tbody>
</table>
Key Findings for Communication Response Activities

- Pregnant and recently pregnant women are information seekers
  - Need to continue information dissemination
    - Multiple pathways
      - Trusted sources of information: doctors, mom, some internet sites
    - Factual (not hyped)
      - Messages might focus on benefits to the baby

Key Findings for Communication Response (cont’d)

- Good awareness of seasonal and H1N1 flu generally but…
  - Lots of misconceptions around key messages

<table>
<thead>
<tr>
<th>Flu Shots</th>
<th>Fever</th>
<th>Antiviral Medication</th>
<th>Breastfeeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;I don’t know you can do it while you are pregnant&quot; (seasonal)</td>
<td>&quot;I think fever serves a purpose, I think controlling it prematurely can do a disservice&quot; (H1N1)</td>
<td>&quot;— you just wait it out&quot;</td>
<td>&quot;[—] you just wait it out&quot;</td>
</tr>
<tr>
<td>&quot;am I at risk enough to make it worth it [H1N1]&quot;</td>
<td>Negative perceptions (i.e. bad for baby, cost, not a cure for flu)</td>
<td>Safety concerns (getting shots, taking antiviral medication)</td>
<td></td>
</tr>
</tbody>
</table>

Key Findings for Communication Response Activities (cont’d)

- Cost-benefit analysis
  - we need to tip the scale
- Some success
  - Everyday preventive measures (hand washing, cough etiquette, sanitizing)
    - Participants were doing or began doing with increased vigor
      - Within their locus of control
Application of Preliminary Formative Research Findings to Communication Response Strategies and Tactics

Application Formative Research Findings to Response Efforts—A snapshot

- Education and information dissemination
  - Web
    - Development of guidance materials for clinicians
    - Materials for lay audiences (pregnant women)
      - CDC pregnancy feature
      - Questions and answers
      - Social media (many elements under development)
        - Text messages
        - Tweets
        - Badges and buttons
        - E-cards

Information For Pregnant Women

[Image of a CDC web page with information about preventing flu during pregnancy]
Clinician Education

Partner Engagement

- Babycenter.com
- What to Expect Foundation
- Clinician Outreach and Communication Activity (COCA) calls
- Dear Partner/colleague Letter(s)
  - Fortune 500 employers
  - Pharmacists
Maternal Health Team and the Media

Traditional Campaign Materials
- TV and Radio PSAs
- Brochure
- Posters
- Tip sheets
- Toolkit

Additional Formative Research
- Harvard School of Public Health
  - Two on-line polls
    - pregnant women
    - women with children under 1 year of age
Thank you!

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