Developing a mother-infant cohort in Sentinel’s PRISM Program as a resource to monitor the safety of vaccine use during pregnancy

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- The views expressed in this presentation are those of the authors and are not intended to convey official U.S. Food and Drug Administration (FDA) policy or guidance

- No relationships to disclose
Background

- Safety data on vaccine use during pregnancy for the mother and fetus are limited.

- Clinical trials do not typically include pregnant women.

- Limitations of passive surveillance systems and manufacturer-sponsored registries include lack of denominators or lack of formal comparators.
Background

- The FDA-funded Sentinel System monitors the safety of FDA-approved medical products.

- Electronic claims and/or health record data from 17 partners.

- Strengths include large population (>500,000 deliveries) and ability to conduct formal epidemiologic assessment.
Objective

- To develop capabilities to assess **infant outcomes** following **maternal vaccination** within Sentinel’s vaccine safety system
  - Post-licensure Rapid Immunization Safety Monitoring Program (PRISM)

- To develop a **mother-infant cohort**

- To develop and validate a **claims-based gestational age algorithm** within the mother-infant cohort
Study population

- 4 large Sentinel Data Partners: Aetna, HealthCore, Humana, Optum

- Women ages 10-54 with a diagnosis or procedure code for live birth delivery from 2004 through 2011
  - Continuous enrollment from 180 days before pregnancy start through 30 days after delivery

- Infants enrolled for at least one day
Claims Data in Sentinel Distributed Database

- Maternal data
- Infant data

Linked mom-infant pairs
Unlinked mothers
Unlinked infants

State Departments of Health
Birth certificate data*

*Birth certificates available for 9 states
Methods to link deliveries to infants

- Subscriber ID, date of delivery
- Last names, addresses, date of delivery
- Linkage to the same birth certificate
Percent deliveries linked to infants (N=651,607)

- DP 1: 84% not linked, 84% linked
- DP 2: 80% not linked, 80% linked
- DP 3: 83% not linked, 83% linked
- DP 4: 66% not linked, 15% linked using birth certificates, 66% linked using last names and addresses, 15% linked using subscriber ID
## Mother-infant cohort (N=543,036)

<table>
<thead>
<tr>
<th>Maternal age</th>
<th>PRISM (4 DPs)</th>
<th>2009 Birth Data from U.S. Vital Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>4,903 (0.9%)</td>
<td>10.0%</td>
</tr>
<tr>
<td>20 to 24</td>
<td>33,973 (6.3%)</td>
<td>24.4%</td>
</tr>
<tr>
<td>25 to 29</td>
<td>149,325 (27.5%)</td>
<td>28.2%</td>
</tr>
<tr>
<td>30 to 34</td>
<td>207,920 (38.3%)</td>
<td>23.1%</td>
</tr>
<tr>
<td>35 to 39</td>
<td>117,937 (21.7%)</td>
<td>11.5%</td>
</tr>
<tr>
<td>40 +</td>
<td>28,978 (5.3%)</td>
<td>2.8%</td>
</tr>
<tr>
<td>Preterm birth</td>
<td>56,130 (10.3%)</td>
<td>12.2%</td>
</tr>
<tr>
<td>Multiple gestation</td>
<td>24,666 (4.5%)</td>
<td>3.5%</td>
</tr>
</tbody>
</table>
Percent mother-infant pairs linked to birth certificates

Births from 9 states
% of total: 31%

% mother-infant pairs linked to birth certificates: 67%

Mother-infant pairs
N=543,036

Sent for birth certificate matching
N=167,750

Matched to birth certificates
N=112,131
Claims algorithm for pregnancy start

- Identify date of delivery

- Identify maternal and infant ICD-9 codes specifying gestational age at delivery
  - Based on these codes assume gestational length

- Subtract assumed gestational length from date of delivery

Claims algorithm for pregnancy start

- ICD-9 codes for prolonged pregnancy (>42 weeks)
- ICD-9 codes for post-term pregnancy (>40-42 weeks)
- ICD-9 codes for preterm pregnancy
  - Not otherwise specified
  - <24 or 24 weeks
  - 25-26, 27-28,…35-36 weeks
- None of the above: Assume at-term (38 wks 4 d)

Validation of pregnancy start algorithm*
N=223 mother-infant pairs

2-week agreement: 96%
1-week agreement: 74%

* A total of 313 mother-infant pairs were chart-reviewed
Conclusions

- Successfully linked mothers to infants in 4 large Sentinel Data Partners

- Demonstrated the validity of a claims-based algorithm for pregnancy start
  - Within 2-week agreement of claims and medical records in >90% mother-infant pairs

- Supports the feasibility of assessing infant outcomes following maternal vaccination exposures

- Further validation of electronic data elements is needed
Acknowledgements

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  - Sentinel Operations Center Staff
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  - Staff at Aetna, HealthCore, Humana, and Optum who provided data and expertise
  - State Departments of Health who participated in birth certificate matches
Thank you!

- Questions?
- Alison_Kawai@harvardpilgrim.org
## Birth certificate matches

<table>
<thead>
<tr>
<th>Data Partner</th>
<th>States for birth certificate matching</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Partner 1</strong></td>
<td>Colorado, Florida, Georgia, Pennsylvania, Virginia</td>
</tr>
<tr>
<td><strong>Data Partner 2</strong></td>
<td>California, Georgia, Missouri, Virginia</td>
</tr>
<tr>
<td><strong>Data Partner 3</strong></td>
<td>Colorado, Florida, Georgia, Louisiana, Utah</td>
</tr>
<tr>
<td><strong>Data Partner 4</strong></td>
<td>Colorado, Georgia</td>
</tr>
</tbody>
</table>
Validation of pregnancy start algorithm

- Medical record review conducted on sample of 223 mother-infant pairs

- Prenatal, labor and delivery, and birth records retrieved

- If available, ultrasound and date of last menstrual period used to confirm pregnancy start
  - Otherwise, labor and delivery or birth record used
Algorithm to match to birth certificates

- **Child**
  - First and last name
  - Date of birth
  - Sex

- **Mother**
  - First and last name
  - Social security number
  - Maiden name
  - Date of birth
  - Age at delivery