The Epidemiology of Infant Mortality in Ohio: An Overview

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State Maternal and Child Health Epidemiologist
Acknowledgements

- ODH Center for Public Health Statistics and Informatics
  - John Paulson
  - Connie Geidenberger
  - Carrie Hornbeck
  - John Bonza
  - Ken Plunkett

- State Epidemiology Office
Overview

• Ohio: 8th highest Infant Mortality Rate in US
• Higher rates in some areas of state
• Predominantly black/white (97%)
• Large feto-infant mortality disparity
• No mortality rate change in last decade
• Disparity due more to birth weight distribution than birth weight specific mortality
• Greatest opportunities for improving feto-infant mortality
  – maternal health
  – infant care
Reported Vital Events

Conception

Gestation
20 wks

1. Fetal Death

Live Birth
28 days

2. Fetal Death
3. Neonatal Death
4. Postneonatal Death

Infancy

Infant Death

5. Infant Death

1 Year

6. Feto-Infant Death
Highest 10 Infant Mortality Rates—US, 2005

Source: National Center for Health Statistics
### Infant Mortality Rankings – 1960-2002, Developed Countries

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<td>Costa Rica</td>
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Source: Ohio Public Health Analysis Network (OPHAN) and Ohio Vital Statistics. From 2004 through 2006, 3,535 infant deaths occurred in Ohio, however, 346 death certificates were not able to be geocoded beyond the county level and are not included in this illustration.
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Child Fatality Review– Ohio, 2006

Reviews of Infant Deaths by Leading Causes of Death

- Prematurity: 508
- Congenital Anomalies: 165
- SIDS: 73
- All Other Medical Causes: 219
- Asphyxia: 68
- Unknown/Undetermined External Injury: 23
- All Other External Injury: 22

62% of all deaths

http://www.odh.ohio.gov/odhPrograms/cfhs/cfr/cfr1.aspx
Infant Mortality by Race—Ohio, 1910-2005

Ohio Vital Statistics. Beginning in 1989 specific race groups were collected. In this chart the rates for 1990-2005 are for Whites and African Americans.
Infant mortality rates by race—Ohio, 1990-2007

Ohio Vital Statistics

IMR decreased 1.7

No change

Ohio Vital Statistics. Joinpoint analysis

IMR decreased 4.7
Ratio of Black to White Infant Mortality – Ohio, 1996-2007

Ohio ratio

U.S. ratio

Goal -- No disparity

Ohio Vital Statistics
Neonatal Mortality Rate per 1,000 Live Births, by Race—Ohio, 1996-2007

Rate per 1,000 Live Births


Total
White
Black
HP2010
HP 2010

Ohio Vital Statistics
Infant Mortality Rate by Birth Weight—Ohio, 2004-5

Ohio Vital Statistics linked birth/infant death files: Year is year of birth
Infant Mortality Rates by Birth Weight in 3-year Rolling Averages—Ohio, 1995-2005

Ohio Vital Statistics linked birth/infant death files: Year is the year of birth
Infant Mortality Rate by Birth Weight and Race—Ohio, 2004-5

Ohio Vital Statistics linked birth/infant death files: Year is year of birth
Update with 2005
Administrator, 2/24/2009
Low Birth Weight (<1500g) by County and Selected Cities—Ohio, 2004-6

Healthy People 2010 Goal: 5.0 percent
Infant Mortality Rate for Ohio 2004-2006: 8.7 percent
Source: Ohio Vital Statistics
Birth Weight Distribution by Race—Ohio, 1999-2002

Percent of Birthweight Distribution (< 2,500 g) between Black and Reference Groups

- Black Group
- Reference Group

<table>
<thead>
<tr>
<th>Birthweight (g)</th>
<th>Black Group</th>
<th>Reference Group</th>
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</thead>
<tbody>
<tr>
<td>500-749</td>
<td>0.70</td>
<td>0.19</td>
</tr>
<tr>
<td>750-999</td>
<td>0.65</td>
<td>0.21</td>
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<tr>
<td>1000-1249</td>
<td>0.71</td>
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<tr>
<td>1250-1499</td>
<td>0.79</td>
<td>0.35</td>
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<tr>
<td>1500-1999</td>
<td>2.64</td>
<td>1.29</td>
</tr>
<tr>
<td>2000-2499</td>
<td>7.83</td>
<td>3.68</td>
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Proportion of Births by Gestational Age Grouping and Birth Year– Ohio

Ohio Vital Statistics linked birth/infant death files: Year is the year of birth

- 1990: 6.5
- 1998: 8.0 (2.6% increase, not late PTB 4000 babies)
- 2007: 9.1

Colors: 28-33 wks (brown), 34-36 wks (orange), 37-39wks (green), 40-41 wks (blue), 42+wks (light blue)
Proportion of Births by Gestational Age Grouping and Birth Year – Ohio

↑ 16.6% “early term” = 25,000 babies

Ohio Vital Statistics linked birth/infant death files: Year is the year of birth
Feto-Infant Deaths–Ohio, 1999-2002

- Postneonatal: 28%
- Neonatal: 36%
- Fetal: 36%
Birth Outcomes for U.S. Pregnancies (n=6.4 million)

- 63% Live Births
- 20% Abortions
- 16% Other
- 7% Reportable Vital Events (20+ wks)

Fetal Mortality Rates by Period of Gestation—US, 1990-2004

Fetal Mortality Rates by Race and Ethnicity of Mother: US, 2004

SOURCE: National Center for Health Statistics

NOTE: Rates for subtotals do not add exactly to totals due to slight differences in the denominators used for rate computations. Excludes Oklahoma which did not report Hispanic origin for fetal deaths.
Perinatal Periods of Risk: What is PPOR?

Methodology to develop community-based prevention strategies to reduce racial and ethnic disparities in feto-infant mortality

It attempts to do this by:

- Providing a framework to focus interventions to improve outcomes
- Identifying excess fetal/infant mortality (Phase I)
- Explaining reasons for the excess deaths (Phase II)
- Stimulating further analysis of linked birth/death data
Perinatal Periods of Risk: What is the “Gap”?

✓ **ASK**: Which women/infants have the "best" outcomes?

✓ **ASSUME**: all infants can have similar “best” outcomes

✓ **CHOOSE**: a comparison group(s) (‘reference group’) who already has achieved “best” outcomes

✓ **COMPARE**: fetal-infant mortality rates in your target group with those of the comparison group(s)

✓ **CALCULATE**: excess deaths (= target – comparison groups). This is your community’s “Opportunity Gap.”
Perinatal Periods of Risk (PPOR)  
Feto-Infant Mortality Map

Age at Death

Fetal Death

Neonatal

Post-neonatal

Maternal Health/
Prematurity

Maternal Care

Newborn Care

Infant Health

500-1499 g

1500+ g

More information: www.citymatch.org
PPOR is about **ACTION**

- **Maternal Health/Prematurity**
  - Preconception Health
  - Health Behaviors
  - Perinatal Care

- **Maternal Care**
  - Prenatal Care High Risk Referral
  - Obstetric Care

- **Newborn Care**
  - Perinatal Management
  - Neonatal Care
  - Pediatric Surgery

- **Infant Health**
  - Sleep Position
  - Breastfeeding
  - Injury Prevention
Feto-Infant Mortality Map
Ohio, 1999-2002

8.9 per 1000

Age at Death

Fetal Deaths Neonatal Post neonatal

500-1499 g

715 1042 260

1500+ g

1149 810 1153

Total: 5129
Reference Groups

Choose a group of “best performers.”

U.S. studies have shown that this group consists of women who:

- are Non-Hispanic white
- are 20 years old or older
- have 13 or more years of education
Excess Feto-Infant Mortality
Ohio, 1999-2002

Non-reference

Reference*

“Excess”

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<th>“Excess”</th>
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<td>2.1</td>
<td>1.3</td>
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<td>1.9 1.4 1.9</td>
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<td>8.6</td>
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* Reference group: Ohio non-Hispanic white women greater than 19 years of age with more than 12 years of education
Excess Feto-Infant Mortality
Ohio, 1999-2002

Black race

6.4

Reference*

2.1

“Excess”

4.3

* Reference group: Ohio non-Hispanic white women greater than 19 years of age with more than 12 years of education
Feto-Infant Mortality Rates: teens vs. reference group – Ohio, 1999-2002

“Excess” = 3.7

**Maternal Health & Prematurity**
- Teen Aged 15-17: 5.8
- Reference: 2.1

**Maternal Care**
- Teen Aged 15-17: 2.8
- Reference: 1.4

**Newborn Care**
- Teen Aged 15-17: 1.8
- Reference: 1.2

**Infant Care**
- Teen Aged 15-17: 3.1
- Reference: 1.0
“Excess” Feto-Infant Mortality Rates among Teens, by Race—Ohio, 1999-2002

Maternal Health & Prematurity
Maternal Care
Newborn Care
Infant Care
Phase II Analyses: Why does gap exist?

Maternal Health/Prematurity

- Birthweight Distribution
- Birthweight-Specific Mortality

Infant Health

- SIDS
- Injury
- Infection
- Anomalies
- Breastfeeding
Percent overall excess mortality rates among Black infants vs. reference group – Ohio, 1999-2002

Conclusion: Black vs. reference group difference in maternal health deaths (birthweight < 1,500 g) mainly due to differences in birthweight distribution
Time For a Paradigm Shift?

Healthy Women

Healthy Mothers

Healthy Babies
The preconception health of Ohio mothers

- 1 in 4 no health insurance
- 1 in 2 no vitamin
- 1 in 5 obese
- 1 in 2 used alcohol
- 1 in 2 not intending pregnancy
- 1 in 3 smoked

Source: 2007 Ohio PRAMS
RAISING THE ROOF FOR INFANT MORTALITY: What Shape Is Your Community Tent?
Percent of women who smoked in the 3rd trimester—Ohio, 2000-2007

Source: Ohio PRAMS
The Feto-Infant Mortality Map

<table>
<thead>
<tr>
<th>Weight at Birth</th>
<th>Fetal Deaths</th>
<th>Neonatal Deaths</th>
<th>Postneonatal Deaths</th>
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<td>0-499 g</td>
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<tr>
<td>500-1499 g</td>
<td>124</td>
<td>267</td>
<td>64</td>
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<tr>
<td>1500 g +</td>
<td>187</td>
<td>178</td>
<td>300</td>
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Infant Mortality Rates by Birth Weight—Ohio, 1995-2005

Ohio Vital Statistics linked birth/infant death files: Year is the year of birth
Infant Mortality Rates by Gestational Age Group—Ohio, 1995-2005

Infant deaths per 1,000 live births

- very preterm
- preterm
- late preterm
- term

Ohio Vital Statistics linked birth/infant death files: Year is the year of birth
From 2004 through 2006, 3,535 infant deaths occurred in Ohio, however, 346 death certificates were not able to be geocoded beyond the county level and are not included in this illustration.
Infant Mortality Rate by Birth Weight—Ohio, 2003-4

- Birth Weight Category in grams
  - 1250-1499 (very low birth weight)
  - 1500-1999 (low birth weight)
  - 2000-2499 (low birth weight)
  - 2500 + g (normal birth weight)

Ohio Vital Statistics linked birth/infant death files: Year is year of birth
Update with 2004-5
Administrator, 2/24/2009
Percent of Birthweight Distribution (< 2,500 g) between Black and Reference Groups

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The diagram illustrates the distribution of birthweights for the Black Group and Reference Group. The Black Group has a higher percentage of births in the lower weight categories (500-749 g, 750-999 g, 1000-1249 g) compared to the Reference Group.
Birthweight (< 2,500 g) Specific Mortality between Black and Reference Groups, Ohio, 1999-2002

- Rates per 1,000:
  - Black Group:
    - 500-749: 516.2
    - 750-999: 209.8
    - 1000-1249: 122.2
    - 1250-1499: 73.5
    - 1500-1999: 44.7
    - 2000-2499: 20.7
  - Reference Group:
    - 500-749: 550.7
    - 750-999: 808.9
    - 1000-1249: 228.0
    - 1250-1499: 63.5
    - 1500-1999: 40.8
    - 2000-2499: 18.0

- Comparison:
  - The chart shows higher mortality rates for Black Group compared to Reference Group in the 500-749 and 750-999 birthweight categories.
  - Mortality rates decrease as birthweight increases.
## Kitagawa Analysis

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<th>Mort Rate Diff</th>
<th>Avg Specific Mort</th>
<th>Pop proporton Difference</th>
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<th>BW Dist contribution to excess (BD)</th>
<th>SM+BD Total</th>
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<td>(c+C)/2</td>
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<td>VLBW Percent</td>
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<td>51.06%</td>
<td>49.67%</td>
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### Conclusion:
Black vs. reference group difference in maternal health deaths (birthweight < 1,500 g) mainly due to differences in birthweight distribution
All Fetal Deaths
(n=980,000)

20-27 weeks
5%
28+ weeks
2%

reportable vital events

Under 20 weeks, 93%

Under 20 weeks
93%
miscarriages

Source: 1995 National Survey of Family Growth
Black Infant Mortality – Ohio, 1990-2006

2.7 decrease IMR

No change

Joinpoint analysis
The Epidemiology of Infant Mortality in Ohio: An Overview

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