Racial Disparity and Preterm Birth

Timothy L. Bennett, M.D.
University of Missouri – Kansas City
Disclaimers

• No agenda, no offense intended
Terminology

- Race
- Ethnicity
- Inconsistencies in the scientific literature
Racial Disparity and Preterm Birth

• Differences between non-Hispanic Blacks and other women in terms of preterm birth and resulting outcomes are:
  – Quantitatively Significant
  – Well documented
  – Largely unexplained
Preterm by race

Kansas, 2004-2006 Average

Preterm is less than 37 completed weeks gestation.
Very preterm by race

Kansas, 2004-2006 Average

Very preterm is less than 32 completed weeks gestation.
Infant mortality rates by race
Kansas, 2003-2005 Average

An infant death occurs within the first year of life.
Racial Disparity – Causes

• Access to health care
• Social/Demographic factors
• Medical factors
• Behaviors
• Genetics
• Stress
Racial Disparity – FASTER Trial
all with early prenatal care

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Black (n = 1,803)</th>
<th>Hispanic (n = 7,762)</th>
<th>White (n = 24,221)</th>
<th>Other (n = 1,743)</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>IUGR</td>
<td>31 (1.7)</td>
<td>101 (1.3)</td>
<td>242 (1.0)</td>
<td>21 (1.2)</td>
<td>&lt; .009</td>
</tr>
<tr>
<td>Gestational hypertension</td>
<td>96 (5.3)</td>
<td>225 (2.9)</td>
<td>1211 (5.0)</td>
<td>61 (3.5)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Preeclampsia</td>
<td>67 (3.7)</td>
<td>210 (2.7)</td>
<td>484 (2.0)</td>
<td>38 (2.2)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Preterm labor</td>
<td>99 (5.5)</td>
<td>272 (3.5)</td>
<td>1356 (5.6)</td>
<td>91 (5.2)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Preterm PROM</td>
<td>49 (2.7)</td>
<td>140 (1.8)</td>
<td>363 (1.5)</td>
<td>31 (1.8)</td>
<td>&lt; .002</td>
</tr>
<tr>
<td>Gestational diabetes</td>
<td>83 (4.6)</td>
<td>349 (4.5)</td>
<td>678 (2.8)</td>
<td>120 (6.9)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Placental abruption</td>
<td>13 (0.7)</td>
<td>31 (0.4)</td>
<td>194 (0.8)</td>
<td>14 (0.8)</td>
<td>&lt; .003</td>
</tr>
<tr>
<td>Placenta previa</td>
<td>13 (0.7)</td>
<td>47 (0.6)</td>
<td>121 (0.5)</td>
<td>17 (1.0)</td>
<td>&lt; .090</td>
</tr>
<tr>
<td>Preterm birth†</td>
<td>188 (10.4)</td>
<td>567 (7.3)</td>
<td>1574 (6.5)</td>
<td>131 (7.5)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Very preterm birth‡</td>
<td>97 (5.4)</td>
<td>186 (2.4)</td>
<td>315 (1.3)</td>
<td>35 (2.0)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Cesarean delivery</td>
<td>526 (29.2)</td>
<td>2065 (26.6)</td>
<td>5353 (22.1)</td>
<td>450 (25.8)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Light bleeding§</td>
<td>274 (15.2)</td>
<td>1025 (13.2)</td>
<td>3003 (12.4)</td>
<td>230 (13.2)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Heavy bleeding∥</td>
<td>40 (2.2)</td>
<td>186 (2.4)</td>
<td>315 (1.3)</td>
<td>31 (1.8)</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>
Racial Disparity – FASTER Trial

n= 35000
all with early care

OG 2006 Healy et al
Racial Disparity – Causes

- Access to health care
  - Disparity persists with early care
- Social/Demographic factors
- Education
- Medical factors
- Behaviors
- Infections
- Genetics
- Stress
Socioeconomic Factors

• Socioeconomic risks similar in indigent black and non-black population in rural Alabama (Goldenberg, 1994)

• As income levels rise, rates of preterm birth decrease, but racial disparity persists
Racial Disparity – Causes

• Access to health care
  – Disparity persists with early care
• Social/Demographic factors
  – Disparity persists after adjustment
• Education
• Medical factors
• Behaviors
• Infections
• Genetics
• Stress
Preterm Birth – Education and Race

<table>
<thead>
<tr>
<th>Years of Education</th>
<th>NHB</th>
<th>NHW</th>
<th>Asian Pacific</th>
<th>Native American</th>
<th>Hispanic</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;8</td>
<td>19.6</td>
<td>11.0</td>
<td>11.5</td>
<td>14.8</td>
<td>10.7</td>
</tr>
<tr>
<td>8-12</td>
<td>16.8</td>
<td>9.9</td>
<td>10.5</td>
<td>11.8</td>
<td>10.4</td>
</tr>
<tr>
<td>13-15</td>
<td>14.5</td>
<td>8.3</td>
<td>9.1</td>
<td>9.9</td>
<td>9.3</td>
</tr>
<tr>
<td>&gt;16</td>
<td>12.8</td>
<td>7.0</td>
<td>7.5</td>
<td>9.4</td>
<td>8.4</td>
</tr>
</tbody>
</table>

IOM 2006
Preterm Birth – Education and Race

![Bar chart showing preterm birth rates by education level and race]

- NHB
- NHW
- Asian Pacific
- Native American
- Hispanic
Racial Disparity – Causes

- Access to health care
  - Disparity persists with early care
- Social/Demographic factors
  - Disparity persists
- Education
  - Disparity persists
- Medical factors
- Behaviors
- Infections
- Genetics
- Stress
Medical Causes

• Anemia
  – Not different (Cohan 2001)
• Nutrition
  – Not different (Klebanoff 2001)
• Smoking, alcohol
  – Not different (Goldenberg 1996)
• Infection
  – Is different (Fiscella 1996)
Table 4. Proportion of preterm birth associated with genital infection, stratified by racial group

<table>
<thead>
<tr>
<th></th>
<th>Preterm birth rate</th>
<th>Infection present</th>
<th>Infection absent</th>
<th>Prevalence of infection</th>
<th>Total preterm birth rate</th>
<th>Population-attributable risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>7.9%</td>
<td>5.1%</td>
<td>47.2%</td>
<td>6.4%</td>
<td></td>
<td>20.7%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>5.1%</td>
<td>3.3%</td>
<td>24.5%</td>
<td>3.8%</td>
<td></td>
<td>11.6%</td>
</tr>
<tr>
<td>White</td>
<td>5.5%</td>
<td>4.2%</td>
<td>17.0%</td>
<td>4.4%</td>
<td></td>
<td>5.0%</td>
</tr>
</tbody>
</table>

Infection – Race and Preterm Birth
Chlamydia, Trichomonas, Bacterial Vaginosis
Preterm Birth – Infection and Race

- Infection may be responsible for part of racial disparity (<30%)
- Remember BV metronidazole trial
Racial Disparity – Causes

• Access to health care
  – Disparity persists with early care
• Social/Demographic factors
  – Disparity persists after adjustment
• Education
  – Disparity persists
• Medical factors
  – Infection may explain 30%
• Behaviors
• Infections
• Genetics
• Stress
Behaviors – Racial Difference

• Sexual practices, frequency
  – Not different
• Pregnancy spacing
  – Not different
• Douching more frequent in NHB population
  – Might explain increase BV
Racial Disparity – Causes

• Access to health care
  – Disparity persists with early care
• Social/Demographic factors
  – Disparity persists after adjustment
• Education
  – Disparity persists
• Medical factors
  – Infection may explain 30%
• Behaviors
  – Behaviors not different
• Genetics
• Stress
Reasons to suspect genetic component to preterm birth

- Other known factors don’t account for race disparity
- Recurrence pattern
- Familial pattern
- Twins offspring have increased PTB risk
Genetics and Preterm Birth

• Preterm birth is associated with inflammation and/or infection of maternal and fetal tissues with measurable changes in cytokine production

• Gene Polymorphisms of Inflammatory Cytokines
  – 2-4x more gene polymorphisms for IL-1 and IL-6, TNF-alpha in black population – increased inflammation

• Gene-environment interaction
  – TNF-alpha and BV
Allostasis

• The concept of allostasis, maintaining stability through change, is a fundamental process through which organisms actively adjust to both predictable and unpredictable events...

• Allostatic load refers to the cumulative cost to the body of allostasis, with allostatic overload... being a state in which serious pathophysiology can occur...
Stress, Allostasis and Illness

Figure 1. The Stress Response and Development of Allostatic Load.
The perception of stress is influenced by one’s experiences, genetics, and behavior. When the brain perceives an experience as stressful, physiologic and behavioral responses are initiated, leading to allostasis and adaptation. Over time, allostatic load can accumulate, and the overexposure to mediators of neural, endocrine, and immune stress can have adverse effects on various organ systems, leading to disease.
Chronic Stress

- Prolong wound healing
- Alter WBCs
- Associated with BV in pregnancy
- Increase reactivation of genital herpes
- Decrease immune response to vaccines
- Increase susceptibility and severity of clinical infection
- Increase cytokines IL-1, IL-6, TNF-alpha
Health Risks in African-Americans

- More preterm birth, LBW, VLBW
- More heart disease
- More Hypertension
- More Diabetes
- More obesity

Do African-American women live with more chronic stress?
### TABLE 2—Maternal Exposure to Interpersonal Racial Discrimination and Infant Very Low Birthweight

<table>
<thead>
<tr>
<th></th>
<th>Reported Racial Discrimination Incidents</th>
<th>This Pregnancy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lifetime</td>
<td>This Pregnancy</td>
</tr>
<tr>
<td></td>
<td>Percentage (No.) VLBW n = 104</td>
<td>Percentage (No.) NLBW n = 208</td>
</tr>
<tr>
<td>Finding a job</td>
<td>29 (30)</td>
<td>13 (25)</td>
</tr>
<tr>
<td>At work</td>
<td>24 (25)</td>
<td>14 (29)</td>
</tr>
<tr>
<td>At school</td>
<td>18 (19)</td>
<td>11 (22)</td>
</tr>
<tr>
<td>In public settings</td>
<td>37 (38)</td>
<td>29 (61)</td>
</tr>
<tr>
<td>Getting medical care</td>
<td>5 (5)</td>
<td>5 (11)</td>
</tr>
<tr>
<td>≥1 domains</td>
<td>56 (58)</td>
<td>40 (83)</td>
</tr>
<tr>
<td>≥2 domains</td>
<td>41 (32)</td>
<td>25 (41)</td>
</tr>
<tr>
<td>≥3 domains</td>
<td>30 (20)</td>
<td>12 (17)</td>
</tr>
</tbody>
</table>

**Note.** VLBW = very low birthweight; NLBW = non-low-birthweight; OR = odds ratio; CI = confidence interval.
Stress, Race and Preterm Birth

- Discrimination leads to chronic stress
- Alters the immune system, affects health
- May partly explain racial disparities in preterm birth
- No easily solutions
Importance of Understanding Racial disparities in Preterm Birth

• Help vulnerable populations
• Aid in understanding of pathophysiology of preterm birth
• Insights into roles of:
  – Genetics
  – Infection
  – Inflammation
  – Sociodemographic factors
  – Stress