CityMatCH DUI
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Part 1

Ethnic Disparities in Perinatal Outcomes in the U.S.

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To eliminate disparities in health we need to know:

- What causes the disease
- What causes the disparity
Outline

• Review of trends in race/ethnic disparities in perinatal health

• Etiology of PTB and limitations of science

• Causes /contributors to disparity

• In focus: Racism, genes and SES
Mission Impossible
Process for Defining Evidence-Based Strategies

0 Many potential approaches:

1 Programs implemented using conceptually valid strategies

2 Existing programs refine implementation

3 Evaluation Studies conducted on existing programs

4 Evaluation studies published in peer-reviewed literature

5 Review and synthesis of existing published evidence

6 Guidelines: Evidence-based Strategies

Scientific guidance needed at this stage to define conceptually valid strategies.
Part I
Data: Disparities in Perinatal Outcomes
Maternal Mortality Ratios by Race
United States, 1987-1996

Danel, et al, 1999
Infant Mortality Rates by Maternal Race and Ethnicity, 1997 U.S. Death Cohort

Deaths per 100,000 live births

Race and Ethnicity of Mother

- Black: 1368.5
- American/Indian: 868.5
- White: 604.6
- Hispanic: 595.4
- Asian/Pacific Islander: 497.7
Leading Cause-Specific Infant Mortality Rates
By Maternal Race, United States, 1997

Rate per 100,000 live births

- Birth Defects: 155.7 (Total), 153.6 (White), 182.1 (Black)
- Preterm/LBW: 95.7 (Total), 65.2 (White), 269.4 (Black)
- SIDS: 69.4 (Total), 57.9 (White), 137.5 (Black)
- RDS: 32.4 (Total), 26.1 (White), 69.4 (Black)
- Maternal Preg. Comp.: 31.9 (Total), 25.9 (White), 69.9 (Black)
Distribution of Deaths Due to Top Five Causes of Infant Mortality, 1995

Black Infants

- Birth Defects: 44.7%
- PT/LBW: 19.9%
- Maternal: 13.2%
- Other: 11.8%
- SIDS: 5.0%

White Infants

- Birth Defects: 43.2%
- PT/LBW: 26.1%
- Maternal: 10.5%
- Other: 11.3%
- SIDS: 4.2%

Source: NCHS vital statistics public use data tapes.
Infant Mortality Rates Due to SIDS, United States by race, 1973-1998*

*Preliminary Data
LBW Among Singletons by Race

Source: National Center for Health Statistics, 1996 period linked birth/infant death file
Prepared by March of Dimes Perinatal Data Center, 1999
Rate* of Singleton PTD by Maternal Race/Ethnicity, United States, 1989-1997

Rate per 1000 Live Births

- Black
- Nat Am
- Hispanic
- API
- White

*Rate data adjusted for smoking and maternal age.
Part II: Epidemiology of PTB
Epidemiology of *Preterm Delivery (PTD)*

- **Affects many infants**
  - 11% of live births (400,000 infants/year)

- **Mortality:**
  - #1 cause of infant death among blacks
  - #2 cause of infant death overall
  - #1 contributor to infant mortality disparity

- **Morbidity:**
  - lung disease, vision and hearing impairment, developmental delays, cerebral palsy
Preterm Delivery: Epidemiologic Risk Factors

- Race/Ethnicity
- Incompetent cervix
- Marital Status
- Substance use
- Number of prenatal care visits
- Smoking
- Multiple Births

- Mother's Pre-Pregnancy Weight
- Previous Obstetric History
- Bacterial vaginosis
- Congenital Anomalies
- Stress
- Maternal Age
The higher proportion of black infants with very low birth weights was related to an elevated risk in their mothers of major conditions associated with very low birth weight, primarily chorioamnionitis or premature rupture of the amniotic membrane (associated with 38.0 percent of the excess proportion of black infants with very low birth weights).

idiopathic preterm labor (20.9 percent of the excess)

hypertensive disorders (12.3 percent of the excess)

hemorrhage (9.8 percent of the excess)

(Kempe et al, NEJM, 1992)
• Maternal hypertensive disorders (Preeclampsia) account for about 15% PTB

*Delivery is the only intervention*

(Goldenberg, 2001)

• Infection may account for 85-90% of PTB <26 weeks
How do we determine which strategy has the greatest potential for reducing maternal, perinatal, and infant mortality?

Age at Death

<table>
<thead>
<tr>
<th>Birth Weight (grams)</th>
<th>Late Fetal Death (28+wks)</th>
<th>Early Neonatal Death (&lt;7 days)</th>
<th>Late Neonatal Death (7-27 days)</th>
<th>Post Neonatal Death (28+ days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELBW (&lt;1000)</td>
<td></td>
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<td></td>
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<tr>
<td>VLBW (1000-1499)</td>
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<tr>
<td>IBW (1500-2499)</td>
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<tr>
<td>NBW (2500+)</td>
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</tbody>
</table>

Maternal Health

Newborn Care

Infant Care

CDC
Stress: Physiologic Effects

- Stress harms health:
  - Biondi M et al “Psychological Stress, neuroimmunomodulation and susceptibility to infectious diseases in animals and man: a Review” Psychotherapy and Psychosomatics 66:3-26; 1997
Stress and Pregnancy

• Stress has negative physiologic effects

• Stress is associated with Preterm Delivery
How Does Stress Affect Health?

- Stress can affect:
  - Endocrine system (corticotropin-releasing hormone (CRH) production
  - Immune system response
  - Maternal Behaviors
    - smoking
    - nutrition
    - substance use
Stress and the Infection Interaction

Chronic stress can suppress immune response

Acute stress can increase immune response (slows or halts shut-off of immune response leading to over-production of cytokines) (auto-immune response leading to PTD?)

Shulkin, McEwen, Gold; 1993
Chrousos, Gold; 1992
McEwen; 1998
Stress and Vulnerability

Pregnant women who were moderately or highly stressed were over 2 times more likely to be BV positive compared to women in the low stress group

“Maternal Stress is associated with bacterial vaginosis in human pregnancy”

– Culhane, Rauh, McCollum, Hogan, Agnew and Wadhwa; *MCH Journal* 5(2) 2001
Fetal Effects of Stress

If a pregnant woman is stressed or malnourished, the fetus’s development may be upset, increasing the chances of diabetes, heart disease and high blood pressure when the offspring reaches middle age.

- **Brain:** may be hard-wired to secrete high levels of stress hormones, leading to high blood pressure and heart disease.
- **Placenta:** may allow stress hormones to flood into the fetus.
- **Blood vessels:** may be thin-walled and stiff, leading to high blood pressure.
- **Liver:** may be small with abnormal enzyme activity and low numbers of cholesterol receptors, leading to high cholesterol and high blood sugar.
- **Pancreas:** may have poorly functioning beta cells and fewer capillaries, leading to disrupted blood sugar control.
- **Kidneys:** may have fewer nephrons, and reduced ability to regulate salt balance, leading to high blood pressure.

Source: New Scientist, 17 July 1999
Bacterial Vaginosis (BV)

• Lower tract marker of upper reproductive tract infection

• Can be assessed during pregnancy
Bacterial Vaginosis (BV)

- Syndrome resulting from alteration in normal vaginal flora
- Reduction in hydrogen peroxide-producing lactobacilli
- Reduction in natural protection against overgrowth of more harmful bacteria
  - mycoplasmas, gardnerella vaginalis, bacteroides
- Microbe concentration increases to level of stool
Bacterial Vaginosis, cont.

- BV is 2 x more prevalent among African American women

- Higher prevalence not explained by sexual behaviors or most known risk factors.

- High BV rates in African-American women may account for up to 30% of excess risk of PTD
Prevalence of BV among Pregnant Black and White Women by Diagnostic Method

<table>
<thead>
<tr>
<th></th>
<th>Gram stain</th>
<th>MD Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>White</strong></td>
<td>27%</td>
<td>18.7%</td>
</tr>
<tr>
<td><strong>95% CI</strong></td>
<td>(19-35)</td>
<td>(11-26)</td>
</tr>
<tr>
<td><strong>Black</strong></td>
<td>64.4%</td>
<td>40.5%</td>
</tr>
<tr>
<td><strong>95% CI</strong></td>
<td>(61-69)</td>
<td>(36-45)</td>
</tr>
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</table>

Hogan et al, SPEAC Study, Philadelphia
Treatment of BV

Studies demonstrate a reduction of PTD with tx.


Treatment Guidelines

Treatment for BV during Pregnancy:

**CDC (November 1997):**
- Screening high risk women in early 2nd trimester
- 250 mg metronidazole t.i.d. x 7 days

**ACOG (February, 1998)**
- Screening high risk women in 2nd trimester
- 500 mg oral metronidazole b.i.d. x 7 days
Limits of Medical Practice in Reducing PTD

SPEAC STUDY - Philadelphia Public Health Clinics

• 48% true high risk BV+ cases not identified by providers via routine clinical assessment
• Clinicians *treated* 67% of high risk, BV positive women id’d via clinical assessment
Potential Impact on Preterm Birth

*Morales 1994:* PTD rate among:
- treated = 18%
- untreated = 39%

If all 46 high risk women were treated,

*There would be a 36% lower PTB rate among high risk women if all were treated.*
Patient Outcomes Research Team (PORT) Study on Infant Mortality

• None of the main OB or behavioral modification strategies are effective in reducing PTD
• No additional benefit from: *Increasing quality and quantity of PNC, maternal weight gain and nutritional supplements*
• Ineffective against PTD: *Bed rest, risk scoring systems, iron supplementation, tocolytics, substance use programs, IV hydration, HUAM*
Preterm Delivery

- Good illustration of multiple dimensions to causal pathway leading to disease and disparity

- If we can successfully address this health outcome, we will likely have the keys to addressing all disparities
Factors contributing to race/ethnic health disparities

• Higher exposure to risk
  – *may be imposed by environmental and social policies*

• Higher vulnerability/susceptibility
  – *may be determined by chronic environmental and social exposures*

• Insufficient resources to protect health
  – *lack of time, money, etc…for health promotion, health care access*

• Unequal access to care
  – *“snowball” exposure effect*

• Lower quality of care
Multiple Layers of Contributors to Disparities
Multiple Layers of Contributors to Disparities

black
Intergenerational exposures (social, cultural, environmental)

white
Multiple Layers of Contributors to Disparities

black
Intergenerational exposures (social, cultural, environmental)
Cumulative History (reproductive health)

white
Multiple Layers of Contributors to Disparities

- Intergenerational exposures (social, cultural, environmental)
- Cumulative History (reproductive health)
- Social environment (current)
Multiple Layers of Contributors to Disparities

black
Intergenerational exposures (social, cultural, environmental)
Cumulative History (reproductive health)
Social environment (current)
Vulnerability

white
Multiple Layers of Contributors to Disparities

black

Intergenerational exposures (social, cultural, environmental)
Cumulative History (reproductive health)
Social environment (current)
Vulnerability
Medical Factors

white
Multiple Layers of Contributors to Disparities

**black**
- Intergenerational exposures (social, cultural, environmental)
- Cumulative History (reproductive health)
- Social environment (current)
- Vulnerability
- Medical Factors

**white**
- Etiologic pathways, periods of risk and mis-match with current systems of care
Multiple Layers of Contributors to Disparities

- Intergenerational exposures (social, cultural, environmental)
- Cumulative History (reproductive health)
  - Social environment (current)
  - Vulnerability
  - Medical Factors
- Etiologic pathways, periods of risk and mis-match with current systems of care
- Health care (access and quality)
Racism, Genes and SES
Genes

- While genetic factors may explain some diseases, there is little evidence to suggest that racial disparities in perinatal outcomes are due to genetic differences
  - *more genetic variation by eye shape than by race*
  - *outcomes of African born women*
  - *race is not a scientific but a social construct*
  - *measurement of race as social construct is imprecise*
Socioeconomic Status (SES)

• Health disparities exist by SES
• Among African Americans, SES gradient in health exists
• Wider gap between upper income blacks vs. whites for PTB than between lower income blacks vs whites
• Statistical control for SES does not explain all of disparities
Racism

• What is unique about being a black woman in the US that puts her at increased risk of adverse health outcomes?

  – Social context is key
Findings: CDC Qualitative Studies

- Women are not passive victims

- Options are limited and constrained by social environment
  - housing
  - material resources
  - service availability
  - violence (illegal activity and law enforcement)
  - race/racism

- Living "between a rock and a hard place"
  - Choosing "lesser of two evils"
Findings

Reported stressors are pervasive

- partner
- family
- work
- friends

- children
- housing
- money
- discrimination

e.g., *all daily activities potentially stressful*
Stressors

• Pervasive experience of multiple and simultaneous stressors

• Unique stressors experienced by African Americans
  • effects of race, racism, history and social order

• Living between a "rock and a hard place" a common experience

• Types of stressors don't vary by educational or income level
How do social experiences translate into physiologic changes that adversely affect health?

- CDC hypothesis: Stress
- MacArthur Foundation model: Stress
- Fetal programming
Summary

• After national SIDS campaign, rates declined in all groups, no change in disparity
• PTD declines among African American women still unexplained
• Etiology of PTB probably begins preconceptionally
• Pregnancy introduces complications to treatment
• Most PNC interventions to prevent PTB are not effective
• There are few intervenable risk factors for PTB
• Of intervenable risks, some have no proven intervention as yet, some known effective interventions not consistently practiced
• Good theories exist for social attribution of disease and disparity; questions remain as to health care and public health role in addressing non-medical factors
Next Session

• What are the clues in the current knowledge?

• How can they help us define promising strategies, new directions, policies or research to reduce PTB and make progress toward eliminating disparities?
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