



# Governor's Task Force on Infant Mortality in Ohio Prematurity 2009

**Jay D. Iams MD**

*Frederick P. Zuspan Professor*

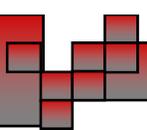
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*Disclosures: None*

*No Commercial Affiliations, Grants, Speaker's Bureaus,  
Consultancies, Stock etc*



# Preterm Birth: Paradox & Opportunity

- Preterm Birth is the #1 Cause of Infant Mortality
- Preterm Birth is Increasing
- Perinatal & Infant Mortality are Decreasing
  - Sometimes PTB is better than the alternative
- Elimination of Risk Factors  $\neq$  Decreased PTB
  - Half of PTB Occurs in Women Without Apparent Risk Factors
- Some Risks are Avoidable
- Some Risks are Misunderstood
- There Are Opportunities for Significant ↓ in PTB

# Preterm Birth is the Most Common Cause of Infant Mortality in the USA (CDC 2006)

**PEDIATRICS**<sup>®</sup>  
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

The Contribution of Preterm Birth to Infant Mortality Rates in the United States

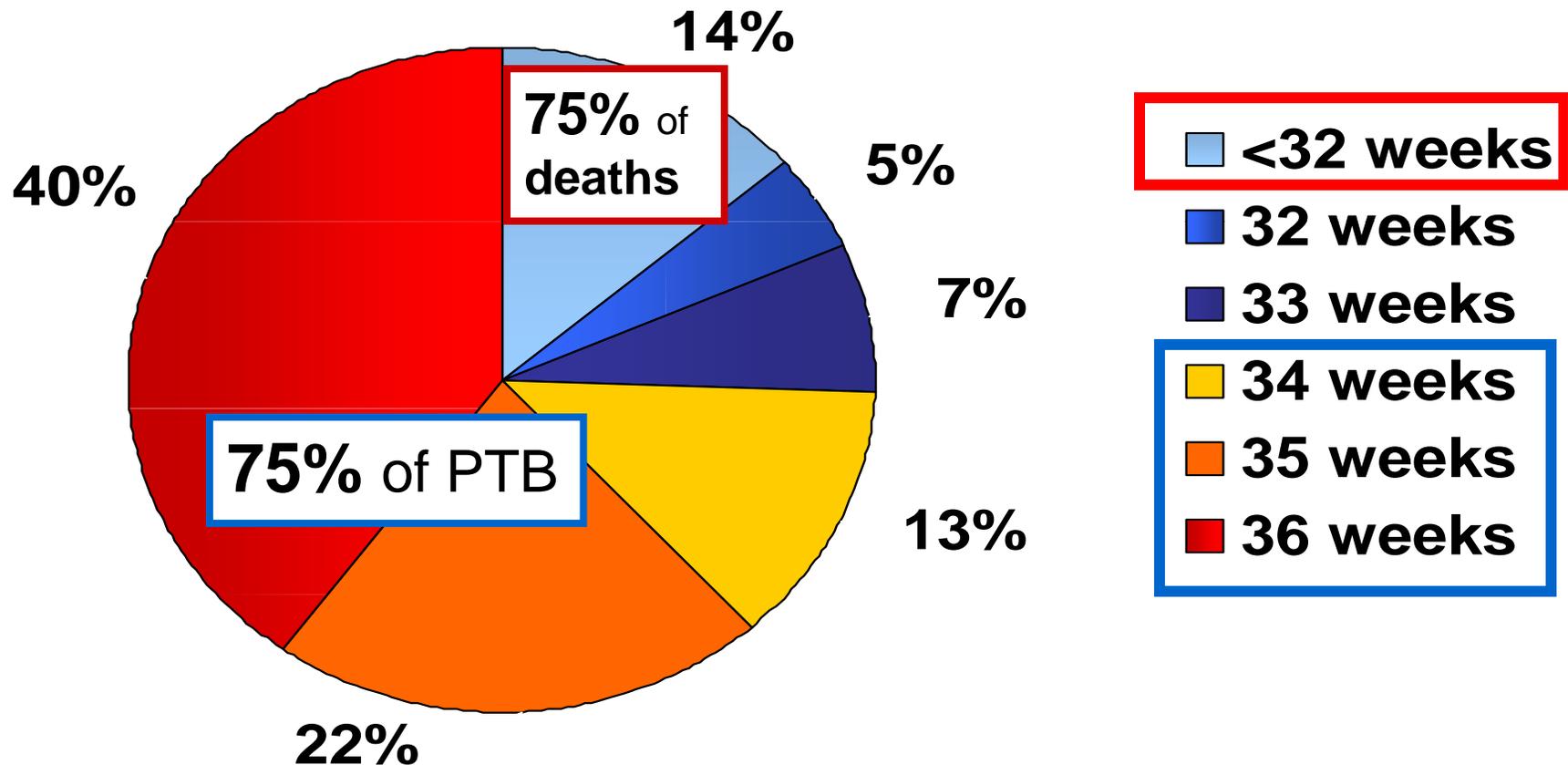
William M. Callaghan, Marian F. MacDorman, Sonja A. Rasmussen, Cheng Qin and  
Eve M. Lackritz  
*Pediatrics* 2006;118:1566-1573  
DOI: 10.1542/peds.2006-0860

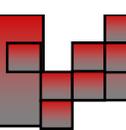
The Contribution of Preterm Birth to Infant  
Mortality Rates in the United States

William M. Callaghan, MD, MPH, Marian F. MacDorman, PhD, Sonja A. Rasmussen, MD, MS, Cheng Qin, MD, DrPH, Eve M. Lackritz, MD

- **34%** of infant deaths can be attributed to preterm birth
- **>75%** of infant deaths occur in infants born before 32 weeks' and below 1500 grams birth weight

# Gestational Age Distribution of Preterm Singleton Births & Infant Deaths





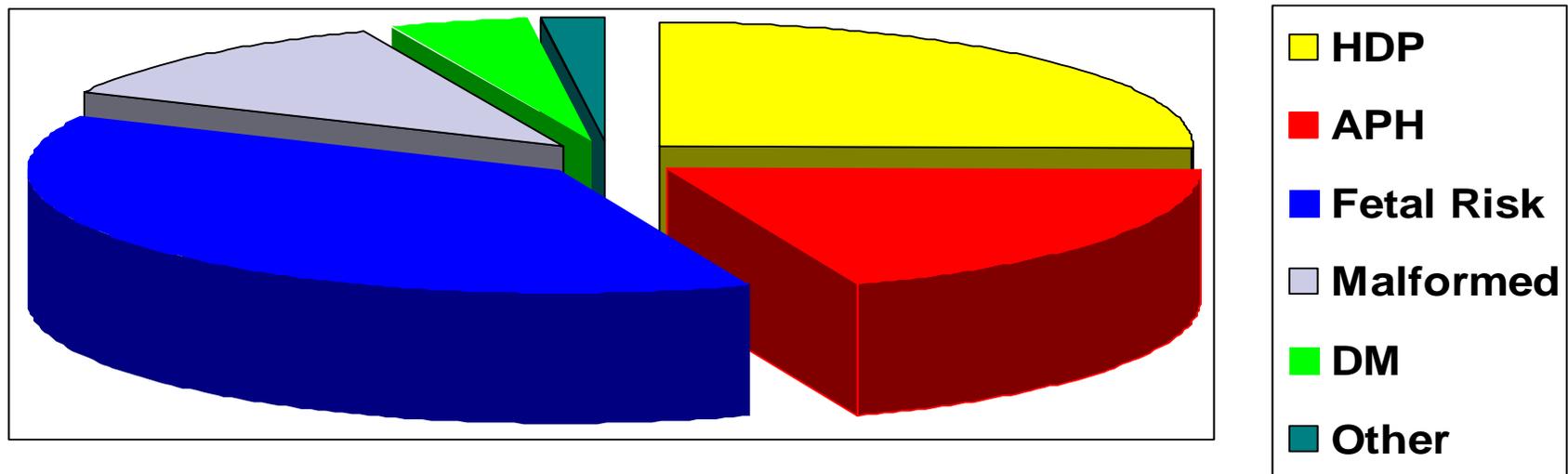
# What Conditions Precede Preterm Birth?

- ~ 25 to 33% are “**Indicated**”
  - Medical Problems: High Blood Pressure, Diabetes
  - Obstetrical Problems
    - Chronic or Acute Fetal Jeopardy
      - Poor Fetal Growth or Fetal “Distress”
    - Maternal Bleeding due to placental problems
  - Fetal Problems – Birth Defects
- ~ 67 to 75% are “**Spontaneous**”
  - Preterm onset of *parturition*
  - Cervix softens, membranes “activate”, &/or uterus contracts, for reasons not always clear

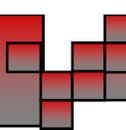
# Maternal-fetal conditions necessitating a medical intervention resulting in preterm birth

Cande V. Ananth, PhD, MPH,<sup>a,\*</sup> Anthony M. Vintzileos, MD<sup>b</sup>

American Journal of  
**Obstetrics &  
Gynecology**  
[www.ajog.org](http://www.ajog.org)



➤ Indicated PTB Before 35 Weeks

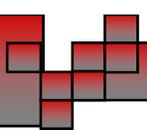


# How Does Preterm Birth Cause the Death of Fetuses & Infants?

- The Cause of Preterm Birth → Fetal Jeopardy
  - Poor placental function – Oxygen & nutrients limited
  - Bleeding – placental separation
  - Infection / Inflammation

## And / Or

- The Baby is Born Too Soon to Perform Essential Life Functions
  - Breathe, digest, stay warm, clot blood, fight infection, regulate blood flow



# Paradoxical Trends in Preterm Birth

- **The Preterm Birth Rate is Rising**

- More Multi-fetal Pregnancies**

- Better Obstetrical Dating**

- More Indicated Preterm Births**

- **The Perinatal Mortality Rate is Falling**

# Gestational Age Distribution of U.S. Births 1990 - 2006

- \* Better dates
- \* More Indicated
- \* Fewer Post Dates

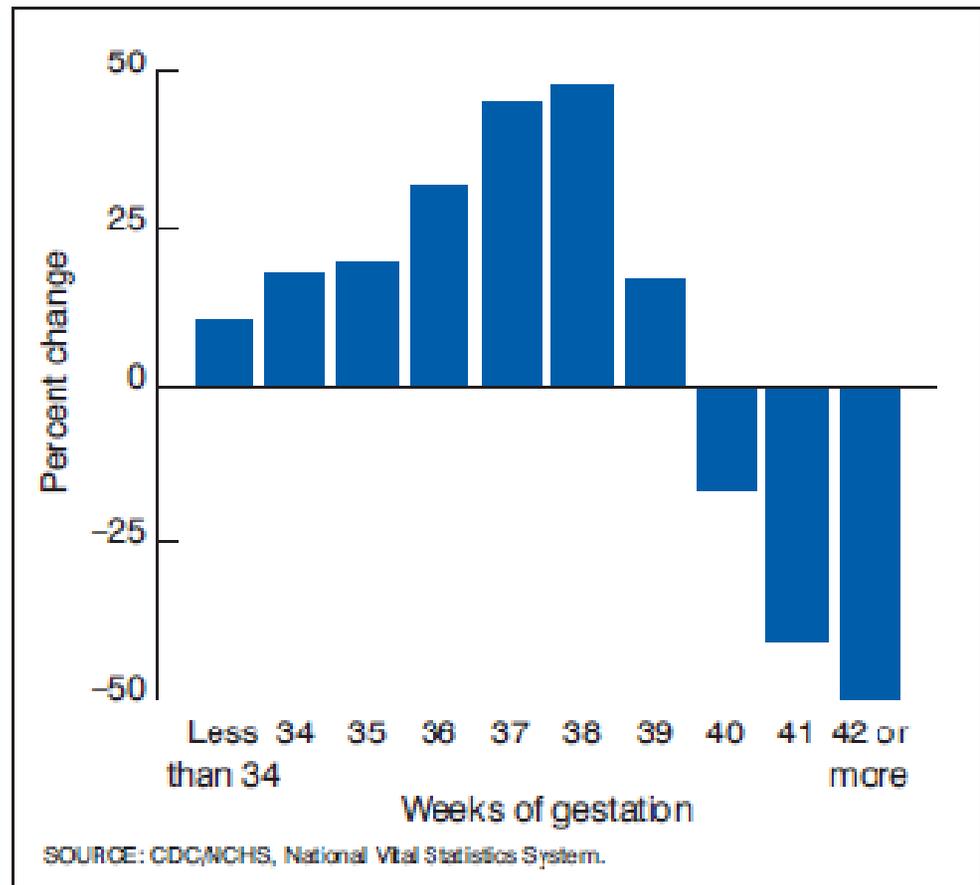


Figure 8. Percent change in the distribution of births by gestational age: United States, 1990 and 2006

# Late Preterm (34-36 Wks) Births Account for ALL of the Rise in Singleton PTBs

6 National Vital Statistics Reports, Vol. 55, No. 11, December 28, 2006

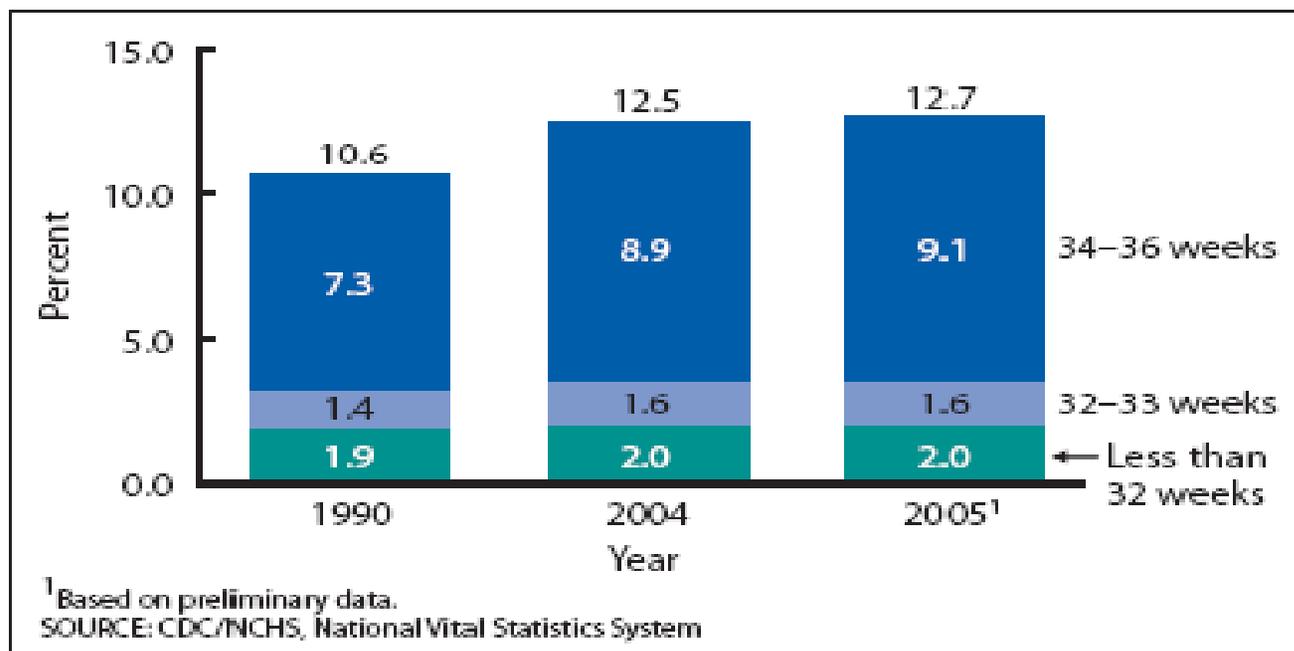
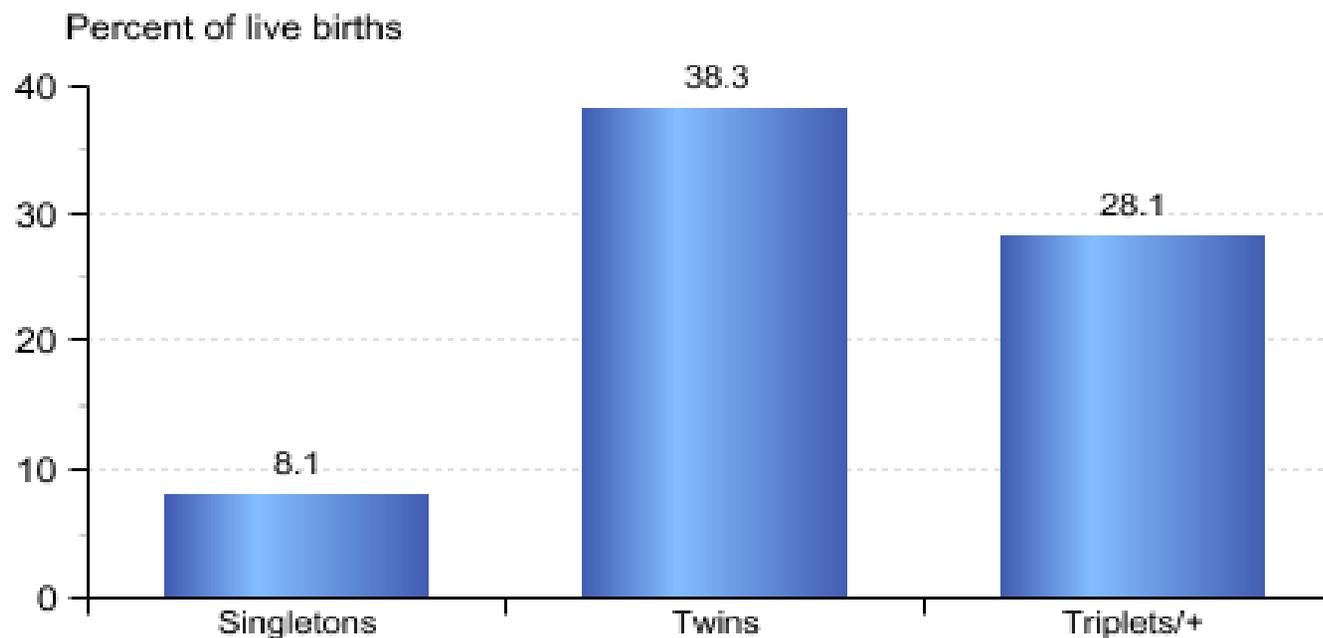


Figure 5. Percentage of preterm births: United States, 1990, 2004, and 2005

# Late preterm births by plurality

US, 2005



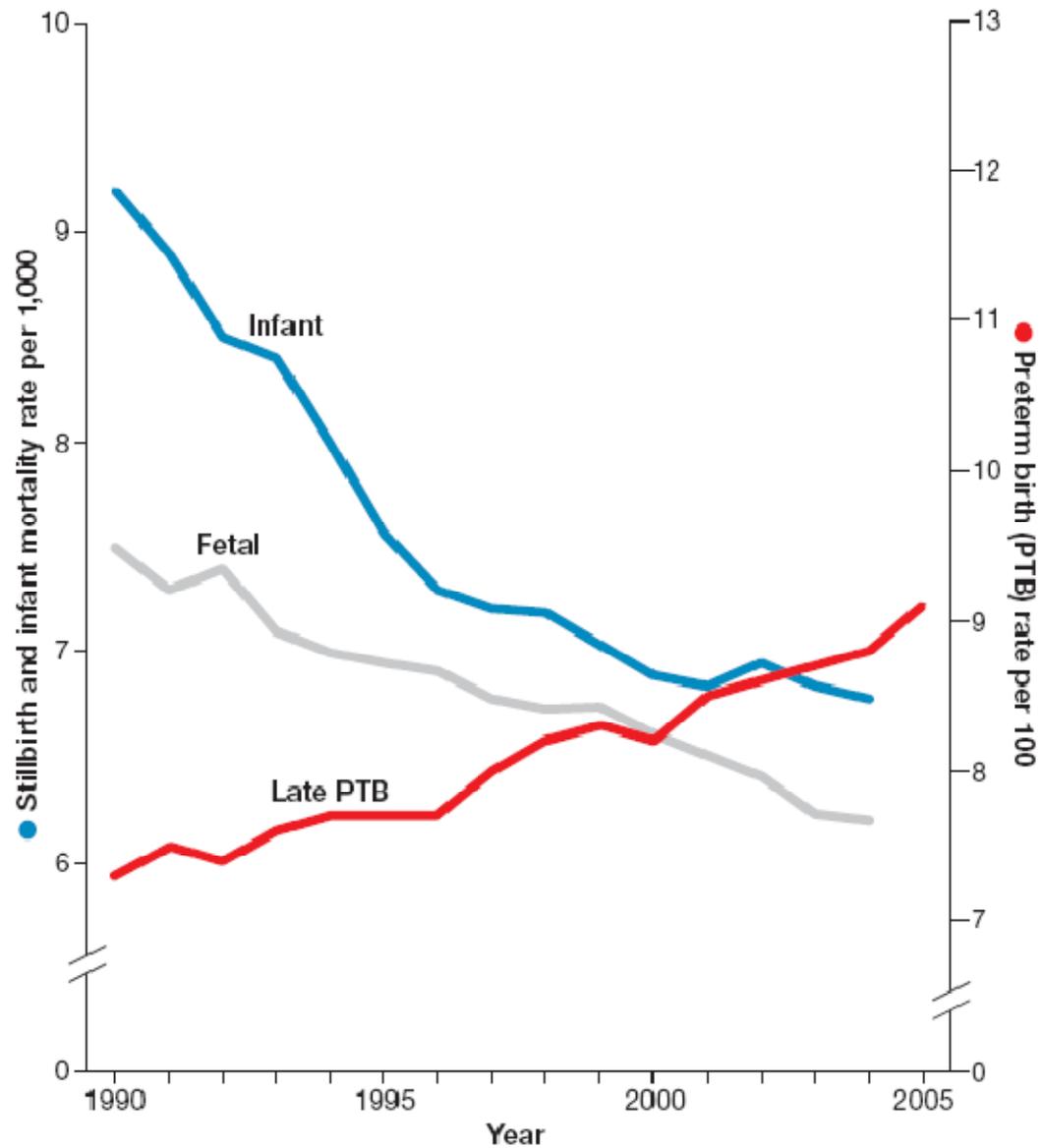
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Late preterm is between 34 and 36 completed weeks gestation.

Source: National Center for Health Statistics, final natality data. Retrieved February 11, 2009, from [www.marchofdimes.com/peristats](http://www.marchofdimes.com/peristats).

# Fetal and Infant Deaths per 1000 Total Births

Ananth et al  
AJOG 2008

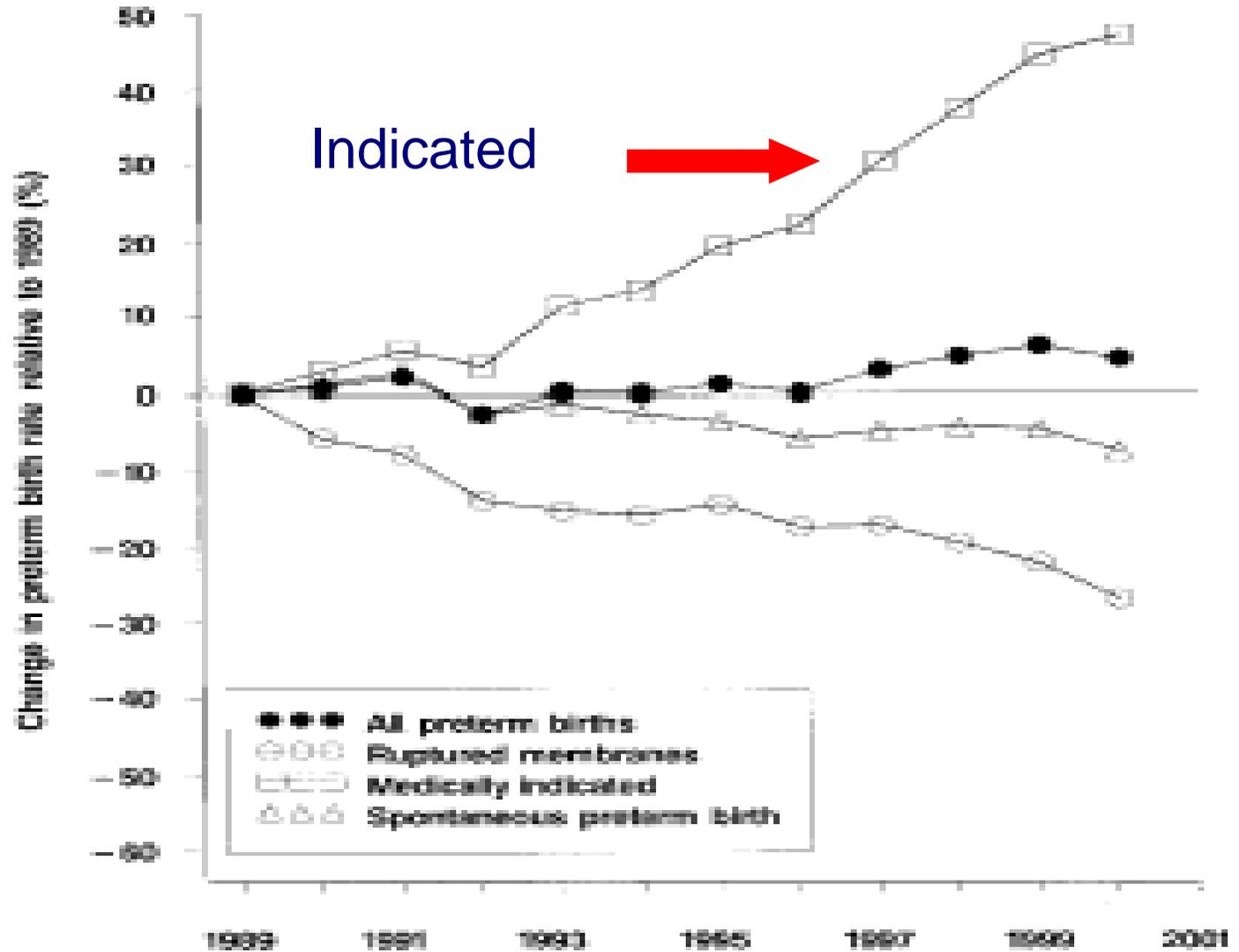


Percent of Births that are Preterm (before 37 wks)

# Percent Change in PTB By Cause 1989 - 2001

- ALL
- Indicated
- PPROM
- △ Spont

Ananth 2005



# Stillbirth Rates USA 1989 to 2001

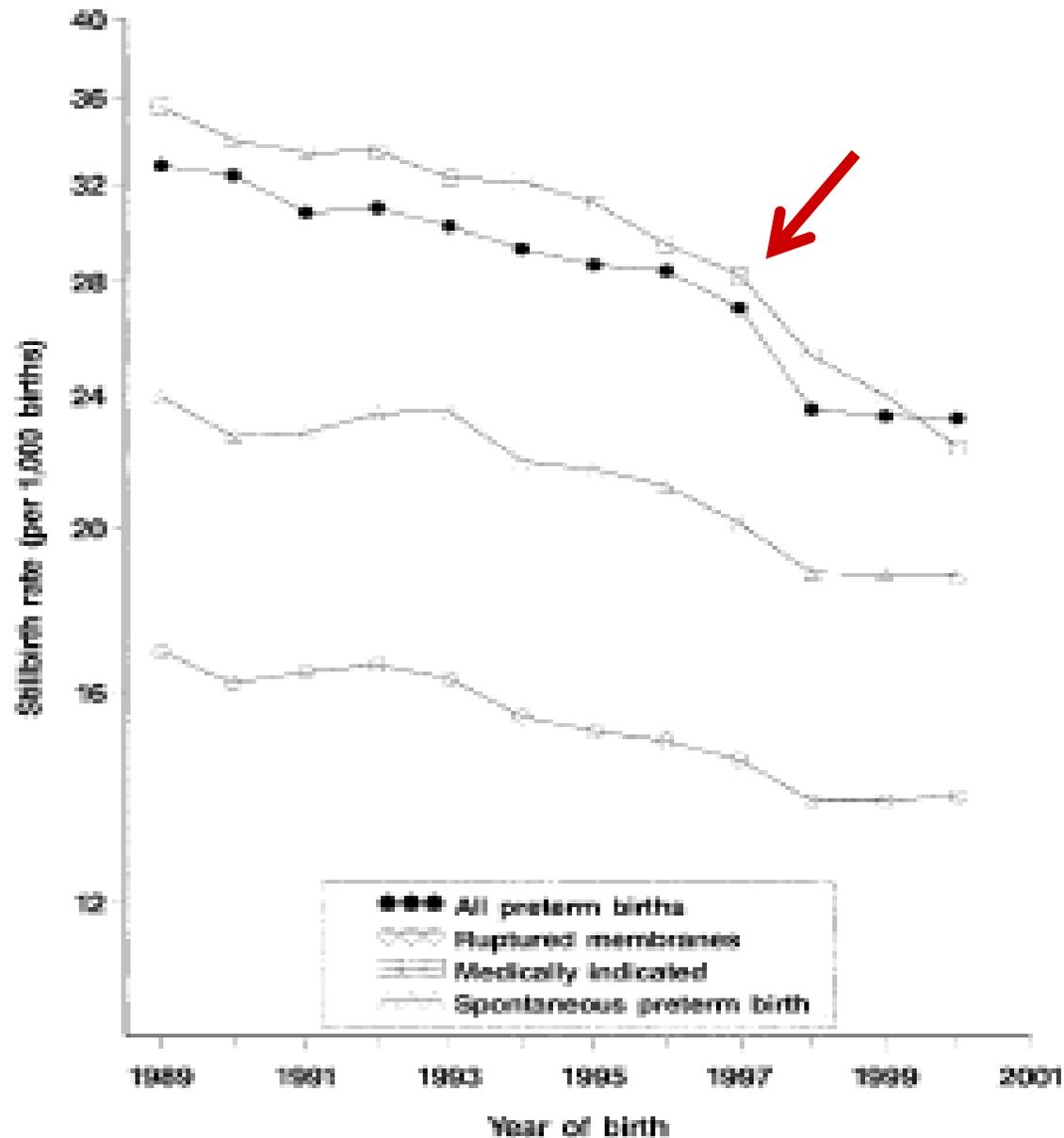
Indicated

ALL ●

Spont

PPROM

Ananth 2005



# U.S. Infant and Fetal Mortality Rates 1990 to 2004

NCHS 2007

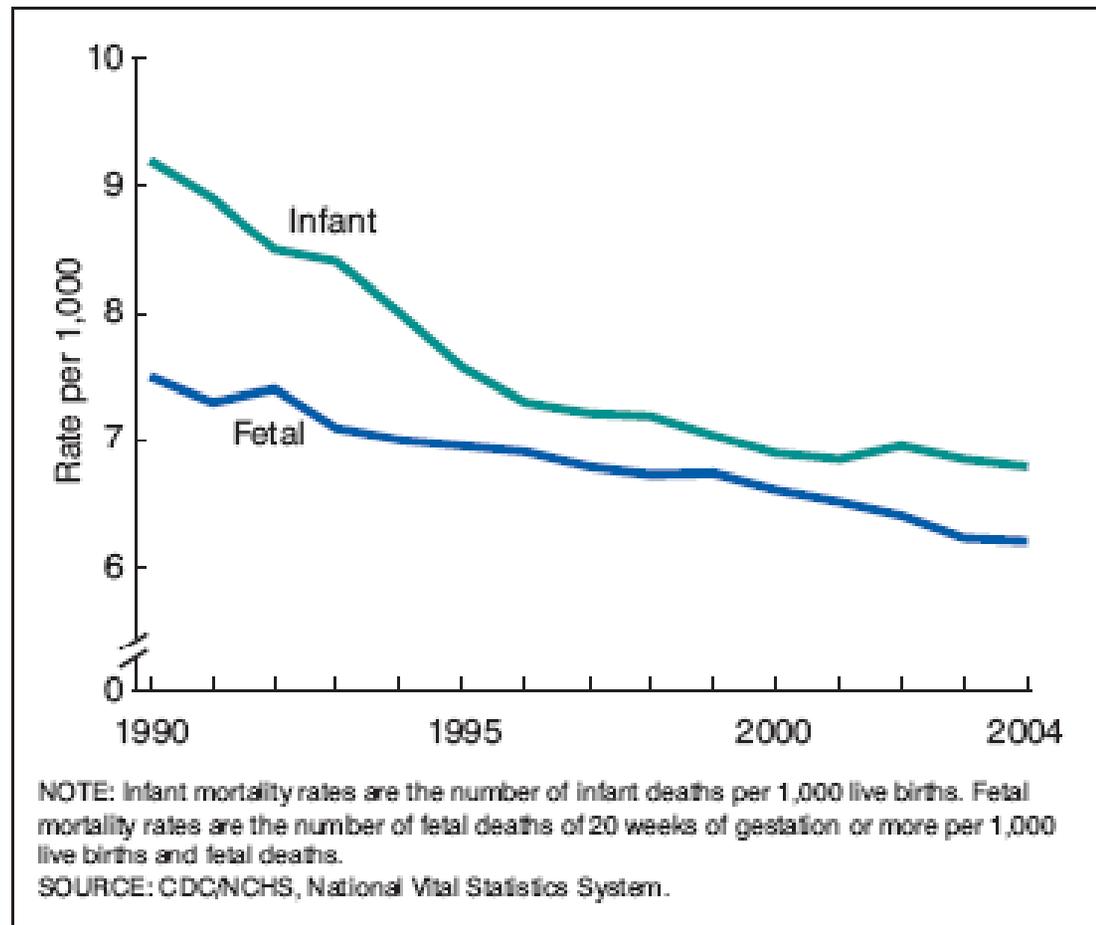


Figure 2. Fetal and infant mortality rates: United States, 1990–2004

# Fetal Mortality Rates

≥ 28 weeks  
&  
20-27 weeks

1990 - 2004

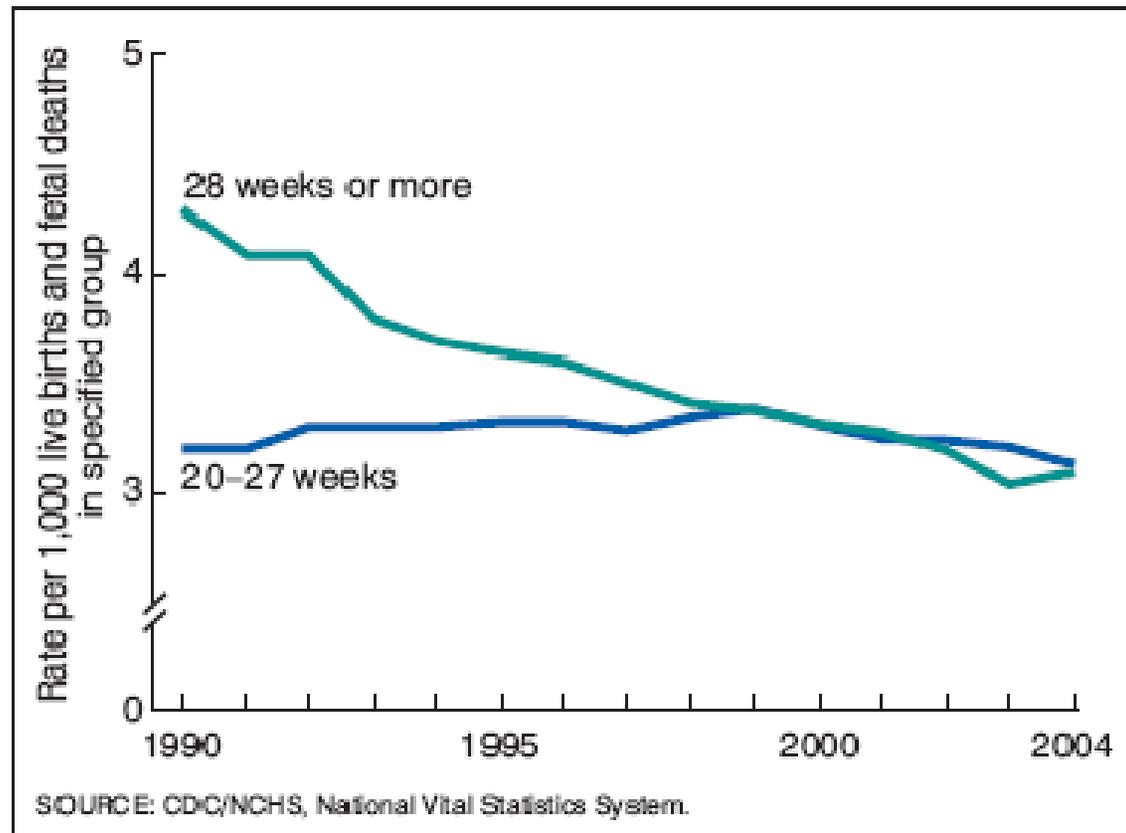
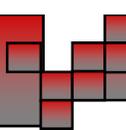
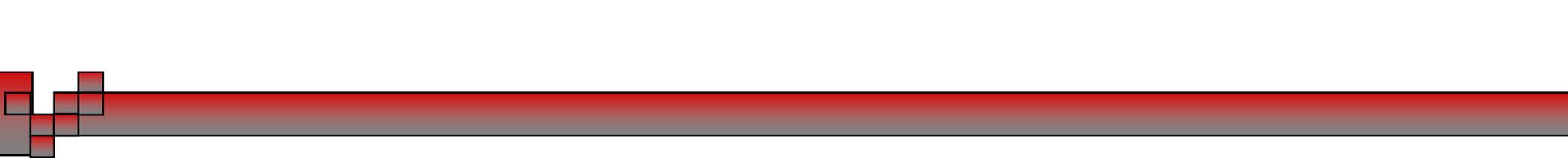


Figure 3. Fetal mortality rates by period of gestation: United States, 1990–2004



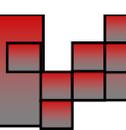
# What Do These Trends Mean?

- **Preterm Birth Sometimes Best for Mother &/or Baby**
- **Fetal Compromise Can Cause Preterm Birth**
- **Fetal & Infant (& Maternal) Outcomes Are More Important than Rates**
- **Increased Indicated Preterm Birth Means:**
  - **↑ Late Preterm & Near Term Infants in NICU**
  - **OB - Pediatrics communication is essential**
  - **Fewer Stillbirths, but ...**
  - **A Culture of Intervention Has Arisen → Inappropriate Scheduled Births**



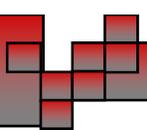
# What's Been Tried to Prevent PTB ?

- Drugs to Stop Labor
- Improved Access to Prenatal Care
- Enhanced Prenatal Care
- Periodontal Care
- Improved Nutrition &/or Dietary Supplements
- Social Support for Pregnant Women
- Better Rx of Medical Disorders → Indicated PTB
- Antibiotics to Treat Infections Linked to PTB



# Strategies That Have Not Worked in Research or Practice to Reduce PTB

- Drugs to Stop Labor (delay birth by 2 – 5 days)
- Improved Nutrition or Supplements
  - Calcium, Minerals, Vitamins C & E, Omega-3 PUFA, Protein supplements, Baby Aspirin
- Periodontal Care – No benefit in large RCT's
- Antibiotics to Treat Infections Linked to PTB
  - Some have actually *increased* PTB rate
- Rx of Medical Problems → More Indicated PTB



# Strategies Commonly Employed to ↓ PTB

## ■ Enhanced Prenatal Care

- Uterine monitors – No benefit in RCT or practice but still used – Why?
- Social support programs – Hope ≠ Evidence
- Group prenatal care – preliminary data only
- Nurse Family Partnership → Improved Childhood Outcomes but ± effect on PTB Rates

## ■ Access to Prenatal Care ?

# Preterm Birth Rate by Maternal Race/Ethnicity & 1st Prenatal Visit

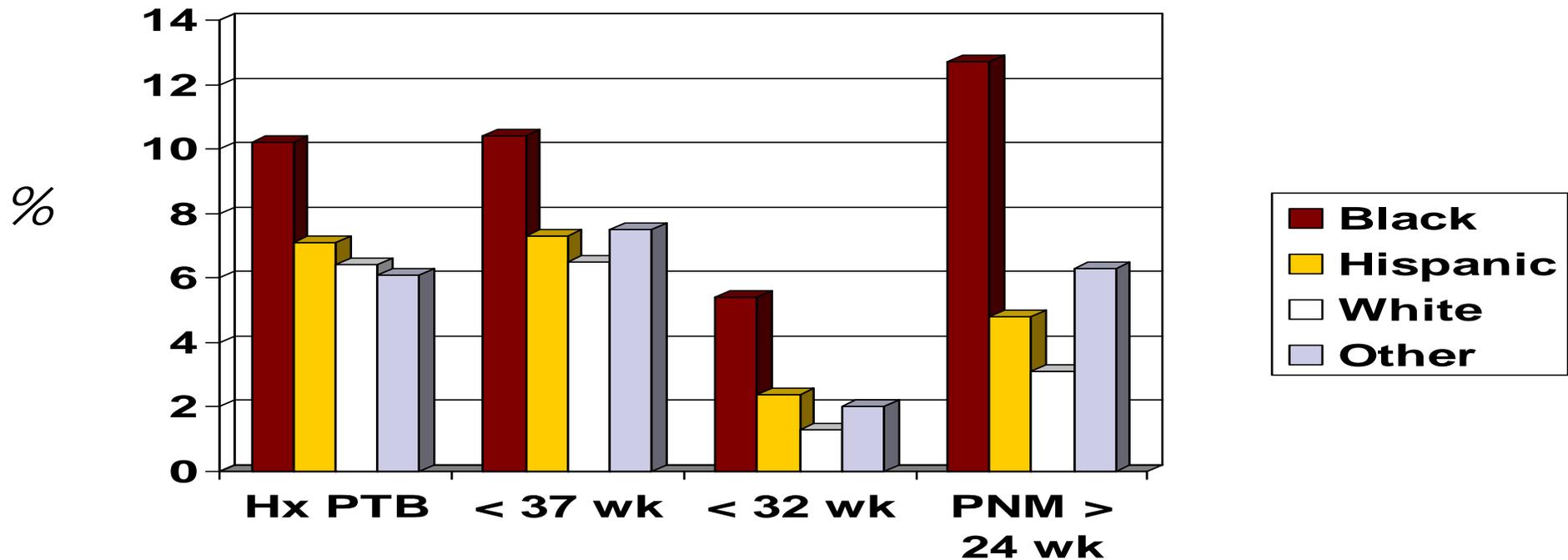
Trimester	<b>NHB</b>	NHW	Asian Pacific	Native Amer	Hispanic
1 <sup>st</sup>	<b>14.7</b>	8.3	8.6	10.4	9.7
2 <sup>nd</sup>	<b>17.5</b>	10.2	10.8	12.7	11.0
3 <sup>rd</sup>	<b>16.0</b>	10.0	9.5	12.3	10.0
<b>None</b>	<b>33.4</b>	<b>21.7</b>	<b>19.4</b>	<b>24.0</b>	<b>19.8</b>

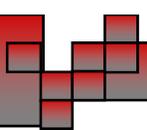
# Early Access to Care

## *Implications for Racial Disparity in Perinatal Mortality*

Healy et al Obstet Gynecol 2006;107:625-31

- Secondary analysis of data from FASTER trial
- 35,529 pregnancies - ***All w/ early care***





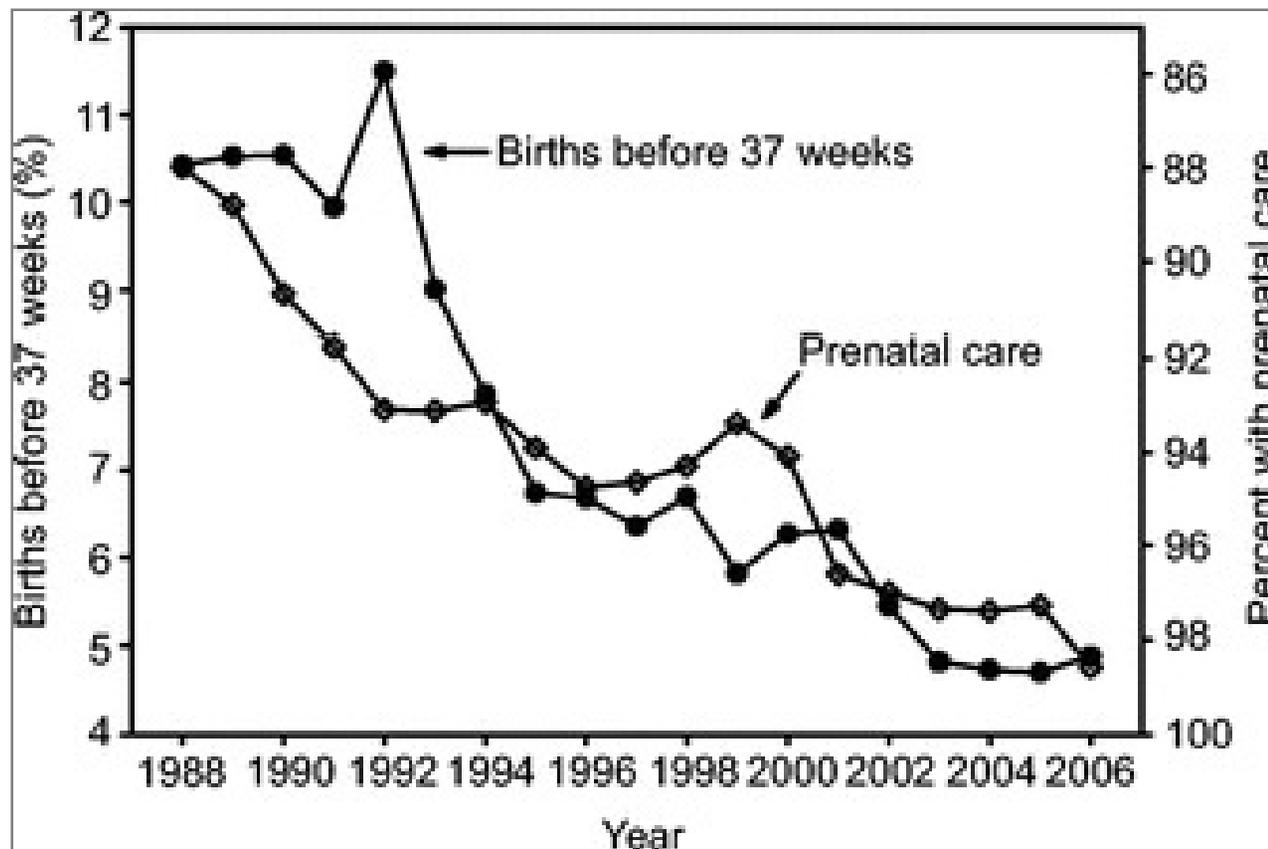
# Preterm Birth Rate by Maternal Race/Ethnicity & Education

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

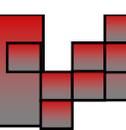
# Decreased Preterm Births in an Inner-City Public Hospital

*Kenneth J. Leveno, MD, Donald D. McIntire, PhD, Steven L. Bloom, MD, Miriam R. Sibley, MD, and Ron J. Anderson, MD*

An  
Observational  
Study at  
Parkland  
Hospital

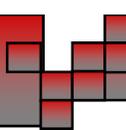


Note  
Inverse  
Scale  
For  
Prenatal  
Care  
Rate



# Strategies That Have Some Evidence of Benefit to Reduce PTB

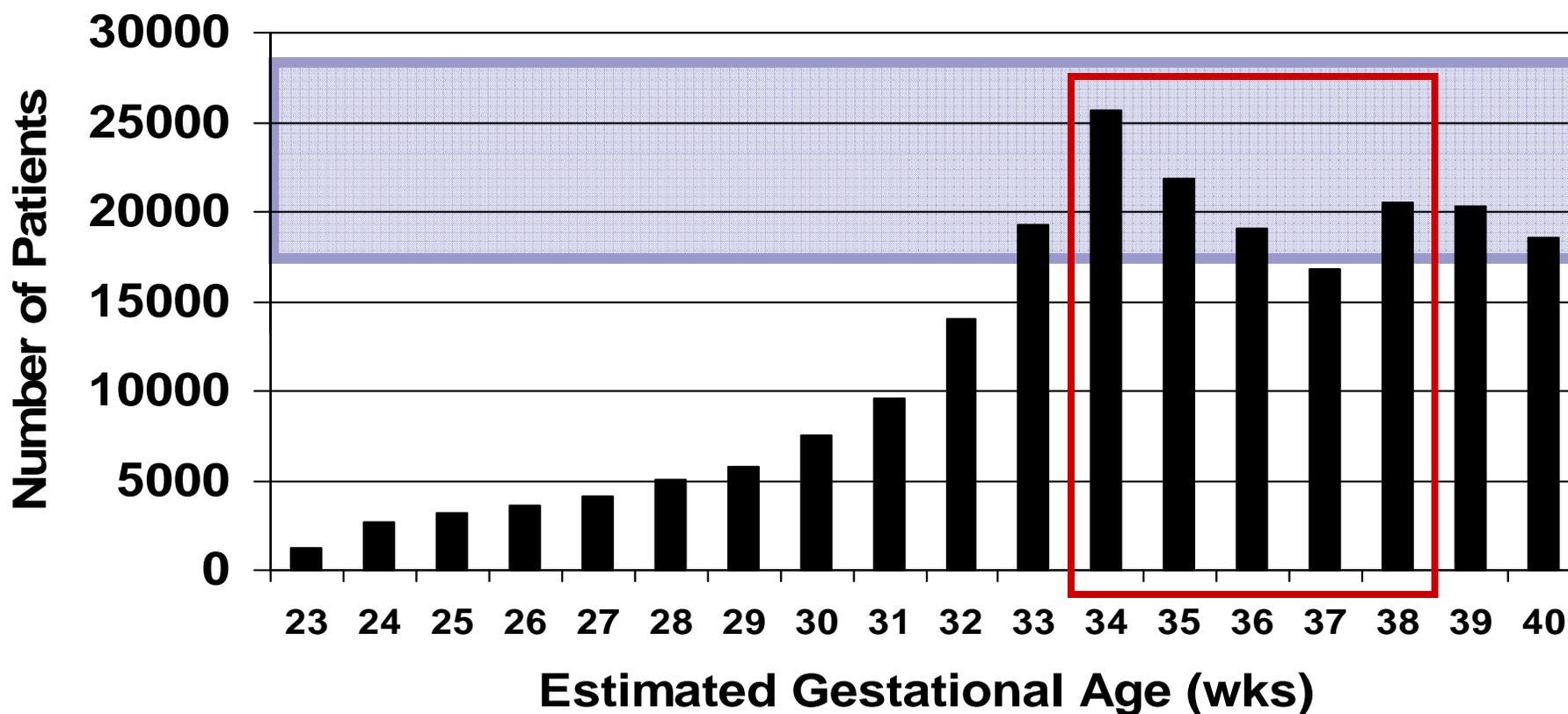
- Smoking cessation programs
- Prolonging Inter-pregnancy Interval
- Progesterone Supplements for Hx Prior PTB
- Cervical Cerclage for Hx Prior PTB + Short Cx
- Pre-Conceptional Folate Supplement
- More Fish in Diet
- Prevention of Inappropriate Scheduled Births
- Prematurity Awareness in Fertility Treatment



# Promising Strategies to Reduce PTB

- **Women with Prior Preterm Birth**
  - Cerclage → **↓ PTB by 35%**
  - Progesterone → **↓ PTB by 35%**
- **Women with Reasons for Scheduled Birth**
  - **Prevention of Inappropriate Scheduled Births & Inappropriate Timing – Utah Experience, OPQC**
- **Women who Need Fertility Care**
- **All Women – No Known Strategy is Effective or Efficient**

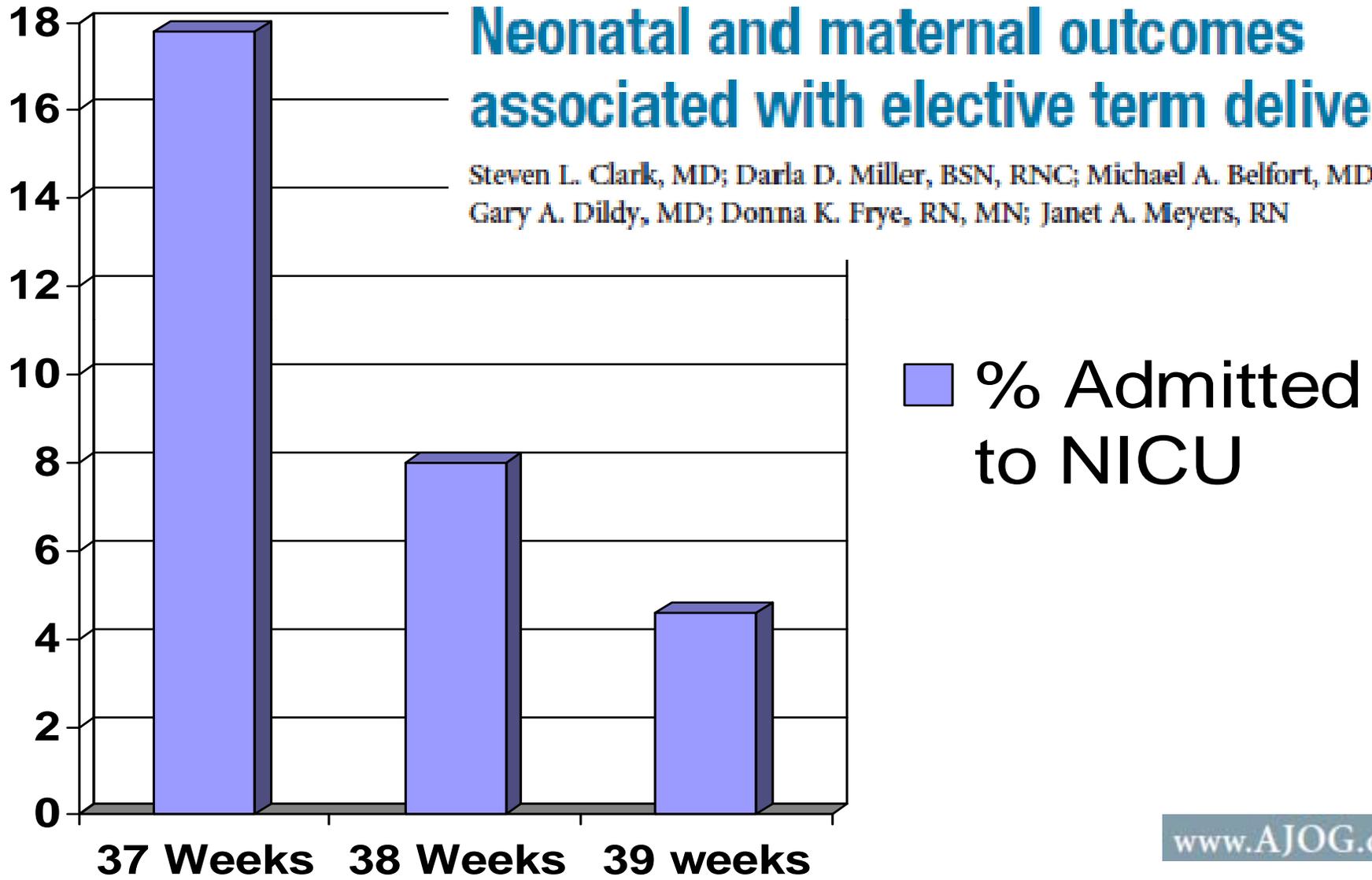
Late Preterm infants occupy most NICU beds,  
*and Near Term infants are close behind*



OBSTETRICS

# Neonatal and maternal outcomes associated with elective term delivery

Steven L. Clark, MD; Darla D. Miller, BSN, RNC; Michael A. Belfort, MD, PhD; Gary A. Dildy, MD; Donna K. Frye, RN, MN; Janet A. Meyers, RN



# Elective Deliveries 1999-2008

## Utah Intermountain Health Care

Oshiro et al Obstet Gynecol 2009

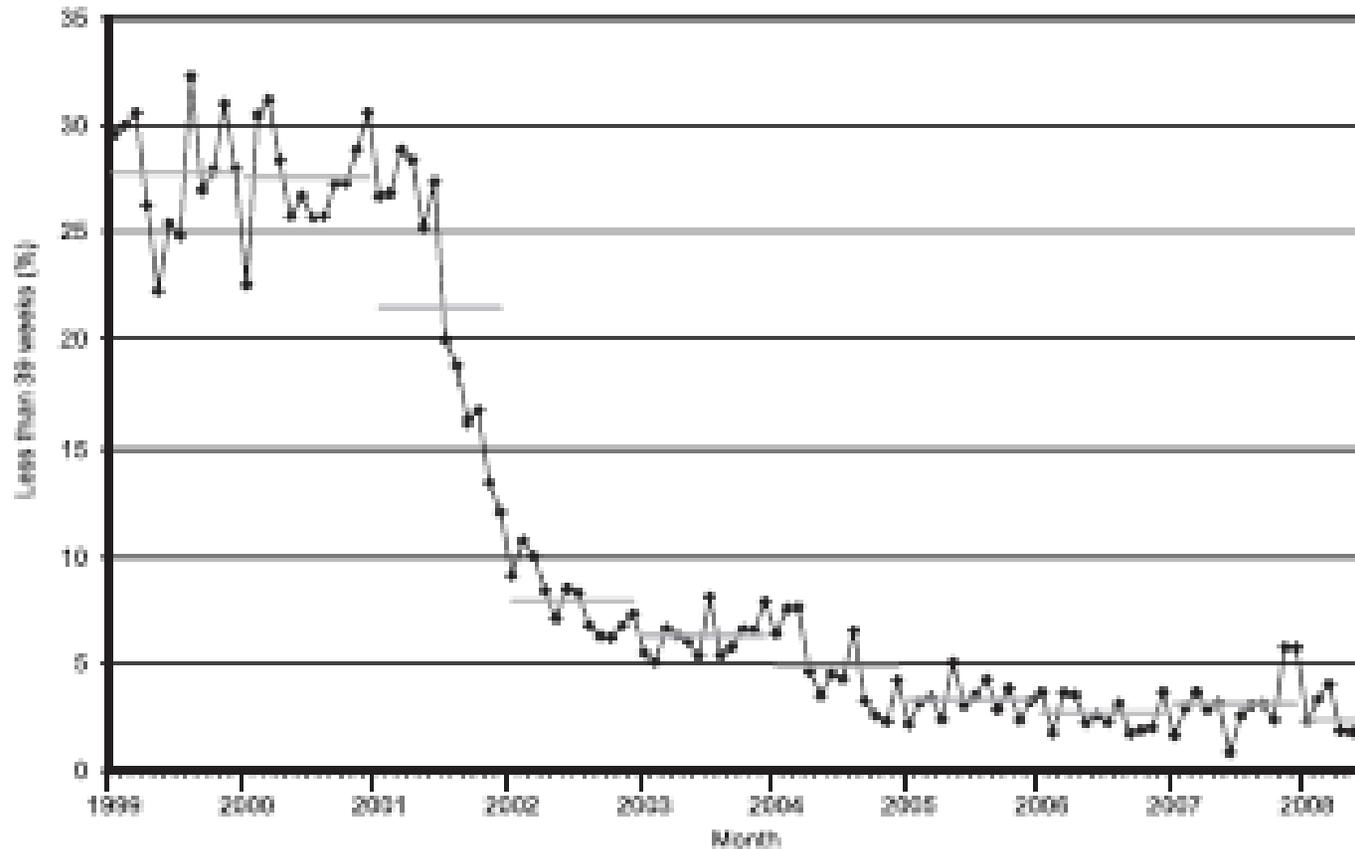
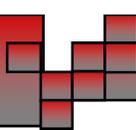


Fig. 3. Percent of elective deliveries before 39 weeks of gestation. Data from Intermountain Healthcare. Oshiro. Decreasing Elective Deliveries Before 39 Weeks. Obstet Gynecol 2009.



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# What Are the Risks of Fertility Rx ?

- **More Multiple Gestation**
- **More Preterm Birth in Singletons too**
- **More Low Birth Weight**
- **Higher rates of stillbirth & infant mortality**

# Gestational Age and Birth Weight by Fetal Number CDC 2002

<b>%</b>	<b>Single</b>	<b>Twin</b>	<b>Triplet</b>	<b>Quad</b>	<b>Quint</b>
<b>&lt; 32 wk</b>	<b>1.6</b>	<b>12</b>	<b>36</b>	<b>60</b>	<b>78</b>
<b>&lt; 37 wk</b>	<b>10.4</b>	<b>58</b>	<b>92</b>	<b>97</b>	<b>91</b>
<b>GA <math>\bar{x}</math></b>	<b>39</b>	<b>35</b>	<b>32</b>	<b>30</b>	<b>28</b>
<b>&lt; 1.5 kg</b>	<b>1.1</b>	<b>10</b>	<b>34</b>	<b>61</b>	<b>84</b>
<b>&lt; 2.5 kg</b>	<b>6.1</b>	<b>55</b>	<b>94</b>	<b>99</b>	<b>94</b>

# The Consequences of Multiple Gestation Increased Fetal and Infant Mortality

Salihu et al 2005

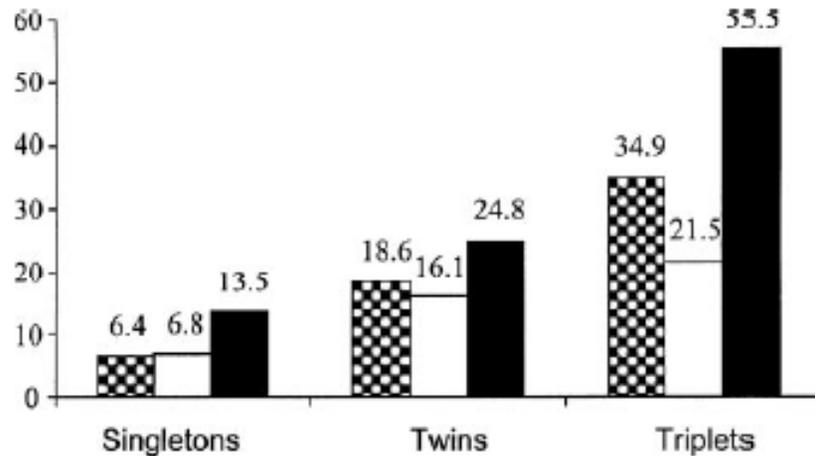


Fig. 1. Crude stillbirth rates for singletons, twins, and triplets by race/ethnicity. Black bars, blacks; white bars, whites; checkered bars, Hispanics.

Salihu. *Fetal and Infant Mortality Rates in Hispanics. Obstet Gynecol* 2005.

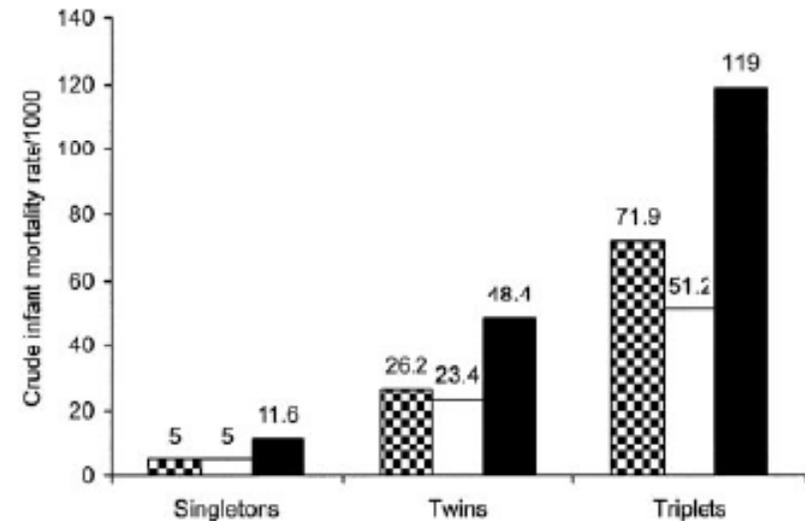
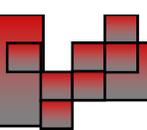


Fig. 2. Crude infant mortality rates for singletons, twins, and triplets by race/ethnicity. Black bars, blacks; white bars, whites; checkered bars, Hispanics.

Salihu. *Fetal and Infant Mortality Rates in Hispanics. Obstet Gynecol* 2005.

**STILLBIRTH RATE**

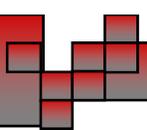
**INFANT MORTALITY RATE**



# Contribution of Multifetal Births to Perinatal Morbidity

- 3% of all births
- 17% of births < 37 weeks
- 23% of births < 32 weeks
- 26% of VLBW infants < 1500 g

Summarized in Van Voorhis Obstet Gynecol 2006 from other sources

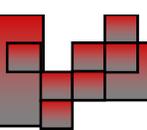


# Perinatal Outcomes in **Singletons** after IVF SART, ASRM and CDC Study

- LBW, VLBW & IUGR decreased after 1996

*But ART Singletons had:*

- **↑ LBW – RR 1.62, CI 1.49, 1.75**
- **↑ VLBW – RR 1.79, CI 1.45, 2.12**
- **↑ PTD – RR 1.41, CI 1.32, 1.51**
- **↑ Preterm (1.74) & Term (1.39) LBW-IUGR**



# Perinatal Outcomes in Singletons

## *After Non-IVF Assisted Reproduction*

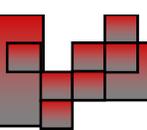
### ■ **Controlled Ovarian Stimulation (Clomid®)**

- +/- Artificial Insemination
- vs. Spontaneously conceived singletons & twins

### ■ **Singletons**

- **3 fold increase in births < 32 weeks and < 1500 g**
- **2 fold increase in births < 37 weeks and < 2500 g**

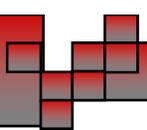
### ■ **Twins** – trends toward increased PTB / LBW



# Epidemiology of Preterm Birth

## Key Facts

- **PTB = The Leading Cause of Infant Mortality**
  - 75% of PTBs occur between 34-36 weeks
  - 75% of Perinatal Mortality occurs in PTB < 32 wks
- **PTB Higher in African Americans.**
- **Some PTBs Reduce Mortality**
  - Outcomes More Important than Rates
  - Track Fetal, Neonatal, and Infant Outcomes
- **Inappropriate Public & Professional View of Risk**
  - Multiple Gestation – ART/IVF = Techo-Cute
  - It's All About Lack of Prenatal Care / Personal Behaviors
- **An Association  $\neq$  Cause or Prevention Strategy**



# How Can PTB-Related Infant Deaths Be Reduced?

- ☑ **Prevention of Inappropriate Scheduled Births**
  - ☑ **Optimal Choices in Fertility Therapy**
  - ☑ **Regionalized Care**
    - ☐ Prenatal – not always practical or possible
    - ☑ Intrapartum – Right people & facilities at birth → Better Rx
  - **Promotion and Improved Selection of Candidates for Progesterone & Cerclage**
    - ☐ Improved Access to Care for Women with Risk
- 
- **Better Rx of Medical Disorders → More Indicated PTB**

☑ = Low Hanging Fruit