

STUDENT VERSION

*Cases in Population-Oriented
Prevention
(C-POP)*

*Racial and Ethnic Disparity
In Birth Weight in Syracuse, NY*

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Abstract:

Low birth weight is a leading cause of infant mortality. Unfortunately, despite declining rates of infant mortality, racial and ethnic disparities in both low birth weight and infant mortality rates persist. In this teaching case, a clinical vignette is used to draw attention to this public health priority in Syracuse, NY. Students learn essential epidemiological skills, such as identifying limitations of sources of data and calculating relative risks, using the example of low birth weight. In performing these skills, students also identify etiologies for such disparity. Finally, students discuss interventions that, when implemented, may decrease infant mortality rates.

Recommended Reading:

- David RJ, Collins Jr RJ. Differing Birth Weight Among Infants of U.S.-Born Blacks, African-Born Blacks, and U.S. Born Whites. *N Engl J Med.* 1997; 337 (17); 1209-1214.
- Lane SD, Cibula DA, et al. Racial and Ethnic Disparities in Infant Mortality: Risk in Social Context. *J Public Health Management Practice.* 20:1,7(3); 30-46.
- A chapter in your text on measuring associations (estimating risks.)

Objectives: At the end of the case, the student will be able to:

- Calculate infant mortality rates
- Compare African American and White infant mortality rates in a given population and contrast these figures to national standards
- Understand sources and limitations of data
- Identify possible etiologies for racial/ethnic disparities
- Apply relative risk and population attributable risk
- Critically appraise medical literature (*Teaching note: This objective is met only when the case is taught in two sessions. During the second session, students report on the results of their research of the medical literature*)
- Develop community-wide recommendations to decrease infant mortality and racial disparities in infant mortality rates

Section A: Infant Mortality

Clinical vignette: ST is a 16-year-old single, African American woman. She began prenatal care during the second trimester of a recent pregnancy and subsequently only had intermittent care with her medical provider. Her pregnancy was complicated by smoking, poor weight gain, a chlamydial infection of her cervix, and ongoing psychosocial stressors (including unemployment, dropping out of high school, and a faltering relationship with the father of the baby).

At 30 weeks gestation, ST developed vaginal spotting associated with lower abdominal cramping. After two days, she called her medical provider and was seen at the hospital. Unfortunately, by the time she sought medical attention, ST was already in advanced preterm labor. Despite medical interventions, labor was not arrested and ST delivered an 1100 gram baby boy. The infant developed Group B Streptococcal septicemia and died on his 5th day of life despite aggressive treatment.

Statement of the problem: Low birth weight (LBW) is one of the greatest contributors to infant mortality and morbidity in the United States. In addition, racial disparity presents a significant challenge in the U.S., where the African American population has a higher rate of LBW births than does the White population.

In the late 1980s, the City of Syracuse had the highest infant mortality rate (IMR) of any comparable size city in the U.S. (with rates of 30.8/1,000 live births for African American infants and 9.5/1,000 live births for White infants). During this time, 14% of African American infants and 6.1% of White infants were classified as LBW.

For the past decade, the Onondaga County Health Department, SUNY/Upstate Medical University, and other institutions have started a number of programs aimed at reducing infant mortality and LBW births. Since 1997, a federally funded program called Syracuse Healthy Start has had a specific focus on eliminating the racial disparity in infant deaths and LBW.

Definitions:

Infants: a child of < 1 year

LBW: low birth weight; infants born at < 2500 grams

VLBW: very low birth weight; infants born at < 1500 grams

Preterm: <37 weeks gestation

Questions:

1. Using the data in Table 1, calculate the following: percentage of LBW, VLBW, and preterm births for African American and White infants in Syracuse during 2000.

	African American	White
LBW (include. VLBW)		
VLBW		
Preterm		

Infant Mortality Rate (IMR) has four components:

- (1) Numerator—all infants who are born with signs of life and who die before their first birthday in a given geographical area
- (2) Denominator—all live births in that geographical area
- (3) Multiplier—for IMR it is conventional to use 1,000
- (4) Time period during which the deaths and live births occurred- usually one year

2. Using the data in Table 1, calculate the IMR for African American and White infants for 2000.

African American IMR

White IMR:

3. How do the following IMRs compare to the IMRs from Syracuse in 2000? What are the implications?
- A. Syracuse in the late 1980s? (Please refer to information presented in the “Statement of the problem”.)
 - B. U.S. data from 1998?
 - C. Healthy People 2010 goals?

Section B: Maternal Demographics for All Mothers

In Section A, you calculated the LBW, VLBW, preterm births, and IMR for African American and White infants using data from Syracuse in 2000.

You are ST's obstetrician and you learn that many of your patients live in areas with high infant mortality rates. In an effort to gain insight into how to prevent further infant deaths in your patient population, you approach your County Health Department and ask them for more information about this problem. The County Health Department provides you with the information in Table 2.

Teaching note: For the next question and for several questions in the next section, we strongly encourage preceptors to divide the students into four groups and divide the work such that each group only does a few of the calculations. For example, one group can do the first four characteristics for African Americans, the second group can do the first four characteristics for Whites and the third and fourth group can do the same for the latter four variables. While it is important for students to do the calculations in order to identify disparities, the calculations can become tedious if they are not split up.

Questions:

- 1. How do you think the local health department gathered this information? What are the limitations of data gathered from this source?**
- 2. Using the above data, compare the African American and White births with regard to the following characteristics:**

Characteristic	African American (% in which the characteristic is present)	White (% in which the characteristic is present)
Maternal age 14-17 years		
Medicaid insurance		
Enrolled in WIC		
No father on birth certificate		
Non-high school completion (if ≥ 19 yrs)		
Alcohol use		
Tobacco use		
No prenatal care 1 st trimester		

3. **In what way are the indicators “Medicaid insurance”, “Enrolled in WIC” and “No father on the birth certificate” helpful to you?**

4. **What are the limitations in using these indicators?**

5. **What do you notice about the proportion of these risk factors by race among Syracuse residents?**

Section C: Maternal Demographics for Mothers of Low Birth Weight Infants

The County Health Department was also able to provide you with information about low birth weight births as is shown in Table 3.

Questions:

1. **Using the above data and the answers for Question 2 of Section B, please complete the following table for African American low birth weight births and compare with the total African American births. (Answers have been provided for you from earlier section.)**

Characteristic	African American- All births (from Section B, Question 2)	African American- LBW births (Calculate %)
Maternal age 14-17 years	9.8%	
Medicaid insurance	55.5%	
Enrolled in WIC	64.7%	
No father on birth certificate	45.2%	
Non-high school completion (if ≥ 19 yrs)	28.9%	
Alcohol use	2.6%	
Tobacco use	23.2%	
No prenatal care 1 st trimester	42.5%	

2. What risk factors seem to be associated with LBW in this population?

3. Now do the same calculations for White low birth weight births.

Characteristic	White- All births (From Section B, Q. 2)	White- LBW births (Calculate %)
Maternal age 14-17 years	5.3%	
Medicaid insurance	34.8%	
Enrolled in WIC	31.3%	
No father on birth certificate	21.5%	
Non-high school completion (if ≥ 19 yrs)	24.9%	
Alcohol use	1.5%	
Tobacco use	29.6%	
No prenatal care 1 st trimester	29.8%	

4. What risks seem to be associated with LBW in this population?

Finally, using your answers from questions 1 and 2, please compare African American LBW characteristics with White LBW characteristics.

Characteristic	African American- LBW births	White- LBW births
Maternal age 14-17 years	10.5%	7.7%
Medicaid insurance	54.3%	30.8%
Enrolled in WIC	66.7%	31.7%
No father on birth certificate	41.9%	25%
Non-high school completion (if ≥ 19 yrs)	28.4%	31.2%
Alcohol use	4.8%	1%
Tobacco use	28.6%	49%
No prenatal care 1 st trimester	47.6%	38.5%

5. What differences did you find?

6. If you were given \$100,000 to spend on a local program to eliminate racial disparities in LBW, where would you put your money?

Section D: Relative Risk

The Relative Risk measures the strength of the association that a risk factor or exposure has with an outcome. It is interpreted based on 1 representing no association. A relative risk that is greater than 1 indicates that the risk factor/exposure is positively associated with the outcome and may indicate a causal relationship. A relative risk that is less than 1 indicates that the risk factor/exposure is negatively associated with the outcome and may indicate a protective effect.

The formula for Relative Risk (RR) is:

$$\frac{\text{Incidence of the disease (or outcome) with the risk factor present}}{\text{Incidence of the disease (or outcome) with the risk factor absent}}$$

A 2X2 table can be constructed to assist in calculating the relative risk:

	Outcome (or Disease) Present	Outcome (or Disease) Absent
Risk Factor Present	a	b
Risk Factor Absent	c	d

Using the 2X2 table, the formula for Relative Risk is:

$$\frac{\text{Incidence of disease in exposed}}{\text{Incidence of disease in unexposed}} = \frac{a/(a+b)}{c/(c+d)}$$

Questions:

1. Using information in Table 4, calculate the relative risk of low birth weight in women who do not receive prenatal care in the 1st trimester. In this example, the risk factor (exposure) is no 1st trimester prenatal care (for the combined African American and White population) and the outcome (disease) is low birth weight.

	Disease (LBW)	No disease (Normal BW)	Totals
Exposure (No 1 st Trimester PNC)			
No Exposure (Received 1 st Trimester PNC)			
Totals			

Relative Risk calculation: $\frac{\text{Incidence in Exposed}}{\text{Incidence in Unexposed}}$

2. Now calculate the Relative Risk of low birth weight with smoking as the risk factor, for the combined population of African American and White births.

	Disease (+LBW)	No disease (normal BW)	Totals
Exposure (Tobacco Use)			
No Exposure (No Tobacco Use)			
Totals			

3. Which risk factor has a stronger association with low birth weight?

Section E: Attributable Risk and Population Attributable Risk

ATTRIBUTABLE RISK:

Risk can also be measured by how much a certain exposure contributes to the incidence of an outcome or disease in the exposed population. For example, in women who do not seek prenatal care, how much does the lack of prenatal care contribute to the incidence of low birth weight in infants born to these women? The formula of attributable risk is:

$$(Incidence\ of\ disease\ in\ total\ population) - (Incidence\ of\ disease\ in\ non-exposed\ population)$$

Question:

1. Calculate the attributable risk of tobacco for low birth weight.

POPULATION ATTRIBUTABLE RISK:

The Population Attributable Risk (PAR) measures the proportion of the disease *in the total population* that can be attributed to a specific exposure. PAR is an important measurement for clinical practice and for public health. It helps clinicians and public health officials estimate how much the burden of disease for the entire population can be reduced by the elimination of a risk factor or exposure. The formula for PAR is:

$$\frac{(Incidence\ of\ disease\ in\ total\ population) - (Incidence\ of\ disease\ in\ non-exposed\ group)}{Incidence\ of\ disease\ in\ total\ population}$$

OR

$$\frac{[(a+c)/(a+b+c+d)] - [c/(c+d)]}{[(a+c)/(a+b+c+d)]}$$

Questions:

2. Calculate the Population Attributable Risk of tobacco for low birth weight for the total population (African Americans and Whites.)
3. Does this provide convincing evidence that smoking cessation should be a part of prenatal care?

The county health department provides you with the following race specific PAR for tobacco and low birth weight in your community:

African American births : PAR of tobacco for low birth weight rate: 7%

White births: PAR of tobacco for low birth weight rate: 28%

4. What are the implications of this?

Table 1: Data for African American and White Births, City of Syracuse, 2000

	African American	White	HP 2010	U.S.Data (1998)
Total number of infants born:	767	1168		
LBW (includes VLBW):	105	104	5.0%	7.6%
VLBW:	24	23	1.4%	0.9%
Less than 37 week gestation:	123	125	7.6%	11.6%
Total infant deaths (Neonatal and Post-neonatal):	11	9	4.5/1000*	7.2/1000*

*Per 1000 *live births*

Data Source: Onondaga County Health Department, 2000

Table 2: Maternal Characteristics of African American and White Births, City of Syracuse, 2000

Characteristic	African American Births	White Births
Total number of infants born:	767	1168
Maternal age 14-17 years:	75	62
Maternal age 18-19 years:	97	45
Maternal age 40+ years:	8	21
Medicaid insurance:	426	406
Enrolled in WIC:	496	366
No father on birth certificate:	347	251
Non-high school completion (Age \geq19):	187/647	264/1061
Alcohol use:	20	18
Tobacco use:	178	346
No prenatal care 1st trimester:	326	338

Data Source: Onondaga County Health Department, 2000

Table 3: Maternal Characteristics for African American and White Low Birth Weight Births, City of Syracuse, 2000

Characteristics	African American	White
Total number of low birth weight infants born:	105	104
Maternal age 14-17 years:	11	8
Maternal age 18-19 years:	12	3
Maternal age 40+ years:	3	1
Medicaid insurance:	57	32
Enrolled in WIC:	70	33
No father on birth certificate:	44	26
Non-high school completion (Age \geq 19):	25/88	29/93
Alcohol use:	5	1
Tobacco use:	30	51
No prenatal care 1st trimester:	50	40

Data Source: Onondaga County Health Department, 2000

Table 4: Selected Maternal Characteristics for all births and for low birth weight births among African American and White infants in the City of Syracuse in 2000

Risk Factor	All births (1935)	LBW births (209)
No 1 st Trimester Prenatal Care	664	90
1 st Trimester Prenatal Care	1271	119
Tobacco	524	81
No tobacco use	1411	128