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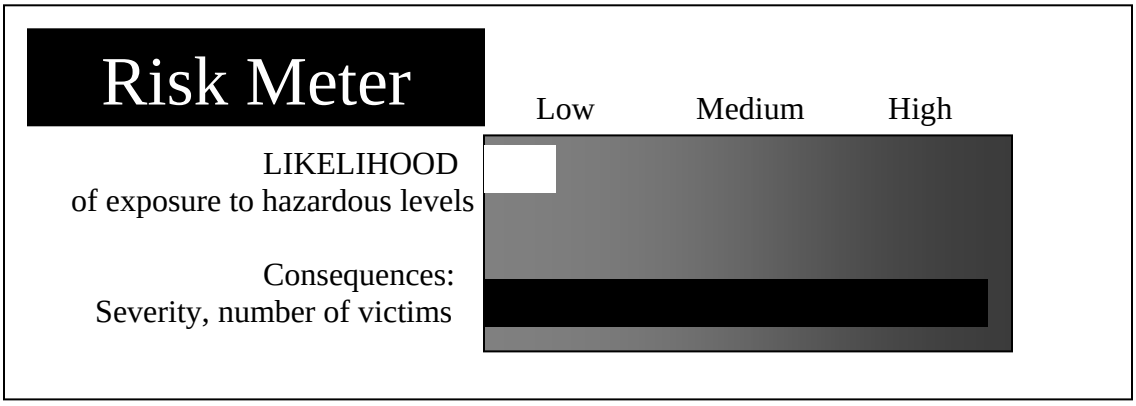
Stat 157 course project
More Risk in Everyday Life

49. INFANT MORTALITY RATE



Infant mortality rate is defined as the death of an infant before his or her first birthday. It is a useful indicator on the nation's health because it is often associated with other health factors such as maternal health, quality and accessibility of medical care, and socioeconomic conditions. The leading causes of infant mortality are dehydration, disease, congenital malformation, infection, drugs and alcohol, sudden infant death syndrome. Other causes and factors that contribute to infant mortality are prenatal care, mother's marital status, social and income status, poverty, race, smoking and substance abuse, air pollution and environmental factors.

Infant mortality rate is defined as the number of newborns dying under a year divided by the number of live births during a year and measures the rate of infant mortality. It is often referred to as the infant death rate. Infant mortality rate has dropped significantly in the West due to recent healthcare and sanitary improvements and high technology medical advances, but

continues to remain high in undeveloped countries. Infant mortality rate is commonly included as a part of standard of living evaluations in economics.

THE HAZARD

There are many factors that would increase the risk of infant mortality. One of which is smoking. When compare nonsmoking women with smoking women, smoking women having their first birth and smoking less than one pack per day have a 56% greater risk than nonsmoking women. Among women having their second or higher birth, smoking women have 30% greater infant mortality risk than nonsmokers.

Air pollution also contributes to the higher risk of infant mortality. By studying the changes in air pollution level before and after the implementation of the Clean Air Act Amendment in 1970 and its effect on infant mortality rate, researchers concluded that for an one percent decline in Total Suspended Particles which contributes to air pollution, results in a 0.5% decline in infant mortality rate.

Race is an important factor that influence infant mortality rate due to differences in socioeconomic status and experiences with racism. African Americans, for example, have a higher risk of infant mortality rate of about 2.2 times than non-Hispanic Whites. African Americans' infant mortality rate is about 18.6 per 1000 birth while non-Hispanic Whites' is about 8.1 per 1000 births.

The differences between infant mortality risk could be explained by the differences in socioeconomics status an experiences with racism. For example, African Americans are more likely to be at the lower ranking in the socioeconomics status and are also more likely to be subjected racial segregation and discriminations.

THE RANGE OF CONSEQUENCES

Studies have shown that racism is linked to the accessibility to medical care. Among Medicare patients, blacks were less likely than whites to receive the same treatment. The four procedures that blacks were more likely to receive than whites are amputation of a lower limb, removal of both testes, removal of tissue related to decubitus ulcers, implantation of shunts for rental dialysis. All of these procedures reflect delayed diagnosis and poor medical care.

Racism also leads to segregation. Studies have shown a positive association between infant mortality and residence in segregated areas and for areas with higher level of segregations also has a higher mortality rates.

Stress is also associated with racism. Subtle discrimination increases stress which increases cardiovascular reactivity which increase the risk for cardiovascular syndromes such as coronary heart disease. In a national sample of Americans adult, those who reported a high level of daily discrimination had over twice the odds for major depression and over three times the odds for generalized anxiety disorders.

Other factors that influence the risk of infant mortality rate are socioeconomics status, maternal health, and birth weights. As mentioned before, African Americans are 2.2 times more likely than non-Hispanic whites to be subjected to infant mortality. As shown in the table below, (model 2) when control for socioeconomics status, the risk is reduce from 2.2 times to 1.97 times. Controlling for maternal health and health care, model 3, the risk is further reduced to 1.56, and when controls for birth a weight, model 4, the risk is reduce to 1.029.

TABLE 4: Logistic Regression Coefficients for the Main Effects of Independent Variables on Endogenous Causes of Infant Mortality

	Model			
	1	2	3	4
Sociodemographic				
Race (African American)	.770***	.677***	.447***	.029
Odds ratio	2.160***	1.968***	1.564***	1.029
Income (ln)		-.058**	-.007	.021
Maternal education (less than 12 years)		.188***	.079	.019
Maternal age				
Age		-.099***	-.080**	-.000
Age^2		.002***	.001	.000
Maternal health				
Health problems			.364***	.086***
Inactivity (less than 3 times a week)			.393***	.315***
Weight gain (less than 16 lbs.)			1.357***	.405***
Health care				
Prenatal care				
Intermediate care			.153**	.189**
Inadequate care			.517***	.264
Insurance (none)			.067	.153
Infant health				
Gestation (less than 37 weeks)				1.457***
Birth weight (ln)				-2.235***
Log likelihood	-7,225.0	-7,199.9	-6,494.0	-4,322.0
χ^2	288.7	338.9	1,750.7	6,094.7
Degrees of freedom	1	5	11	13

** $p < .01$ *** $p < .001$

LIKELY INFLUENCES

Many factors increase or decrease risk of infant mortality. One primary factor that reduces infant mortality risk is prenatal care. Early prenatal care tends to lead to decrease in infant mortality. Prenatal care involves having normal birth weight (low birth rate <2500 grams). Less than 0.5% of infants with birth weights >2500 g die during the first year of life compared to 10.2% of infants with birth weights <2500 g and 45.3% with birth weights <1500 g.

Another factor shown to have influence on infant mortality risk is mother's marital status. Unmarried motherhood has been associated with increased risk of infant mortality. However, the risk is associated is concentrated among subgroups, often vary based on confounding factors, such as mother's race and age. For example, risks of infant mortality among married white woman relative to unmarried white woman are highest among 25-29 year olds. However, being unmarried did not affect the risk of infant mortality among babies born to college-educated white woman.

One study that has shown to prove this theory consists of 10,347,103 women of which 1,656,044 were Black and 8,691,059 were White. The marital status was identified using birth certificates or by comparing parents' and child's surnames on certificate. The variables studied were race (Black or White), mother's age ($\leq$17, 18-19, 20-24, 25-29, 30-34, $\geq$35), parity (total number of live births), maternal education (<12 yrs, 12 yrs, 13-15 yrs, $\geq$16 yrs, unknown), prenatal care (early or delayed), maternal residence (metropolitan or suburban). The sampling method used was a stratified sample by race and marital status. We examined the distributions of births by those risk characteristics that have been associated with adverse birth outcomes (age, parity, education, initiation of prenatal care and urban residence). Then infant mortality rates was calculated by race and marital status for the subgroups defined by these risk characteristics, and compared ratios of nonmarital and marital infant mortality rates across these subgroups. The results of infant mortality rate across these subgroups are as follow:

Table 2. Infant mortality rates (IMRs), by marital status, and risk ratios (with 95% confidence intervals) for unmarried compared with married women, according to race and other maternal characteristics

Characteristic	Black				White			
	Married IMR	Unmarried IMR	Risk ratio	95% C.I.	Married IMR	Unmarried IMR	Risk ratio	95% C.I.
Total	**13.9**	**18.9**	**1.4**	**1.3–1.4**	**7.5**	**12.6**	**1.7**	**1.7–1.7**
Age								
<18	18.7	20.0	1.1	0.9–1.3	14.1	14.1	1.0	0.9–1.1
18–19	17.2	17.9	1.0	1.0–1.1	10.6	13.3	1.3	1.2–1.3
20–24	14.0	18.5	1.3	1.3–1.4	8.1	12.3	1.5	1.5–1.6
25–29	13.1	19.0	1.5	1.4–1.5	6.5	11.7	1.8	1.7–1.9
30–34	13.8	19.9	1.4	1.3–1.5	6.6	11.3	1.7	1.6–1.8
≥35	14.9	22.6	1.5	1.4–1.7	8.0	12.2	1.5	1.4–1.7
Parity								
1	12.8	16.0	1.3	1.2–1.3	6.9	11.5	1.7	1.6–1.7
2	12.5	18.6	1.5	1.4–1.6	7.1	13.0	1.8	1.8–1.9
3	13.6	20.9	1.5	1.5–1.6	7.8	13.6	1.8	1.7–1.9
≥4	16.9	24.4	1.4	1.4–1.5	9.5	15.2	1.6	1.5–1.7
Education								
<12 years	17.5	20.6	1.2	1.1–1.2	11.5	14.5	1.3	1.2–1.3
12 years	13.9	17.7	1.3	1.2–1.3	7.5	11.8	1.6	1.5–1.6
13–15 years	13.1	16.2	1.2	1.2–1.3	6.3	11.2	1.8	1.7–1.9
≥16 years	11.1	16.5	1.5	1.3–1.7	5.6	8.3	1.5	1.3–1.7
Unknown	14.1	20.0	1.4	1.3–1.5	7.8	11.6	1.5	1.4–1.5
Prenatal care								
Early	13.2	17.5	1.3	1.3–1.4	6.8	11.5	1.7	1.6–1.7
Delayed	15.8	20.5	1.3	1.3–1.4	10.4	13.8	1.3	1.3–1.4
Residence								
Metropolitan	13.9	19.1	1.4	1.3–1.4	7.2	12.1	1.7	1.6–1.7
Nonmetropolitan	14.1	18.6	1.3	1.3–1.4	7.8	13.3	1.7	1.7–1.7

The Adjusted Odds Ratio was calculated for the subgroup unmarried versus married woman, after excluding nonsignificant interactions. The results show that there is significant interaction between marital status and age among Blacks, and significant interaction between marital status and age, marital status and education, and marital status and prenatal care among Whites. The adjusted odds ratio results are shown as follow:

Table 3. Adjusted odds ratios (with 95% confidence intervals) for infant mortality among unmarried women compared with married women, by race and other maternal characteristics

Characteristic	Odds ratio	95% C.I.
BLACKS		
Age		
< 18	1.20	0.99–1.46
18–19	1.09	0.56–2.13
20–24	1.25	1.20–1.32
25–29	1.34	1.26–1.41
30–34	1.32	1.22–1.43
≥ 35	1.35	1.20–1.52
WHITES		
Age		
< 18	1.09	1.01–1.17
18–19	1.22	1.15–1.30
20–24	1.34	1.27–1.41
25–29	1.46	1.37–1.56
30–34	1.41	1.29–1.55
≥ 35	1.35	1.19–1.52
Education		
< 12 years	1.09	1.04–1.17
12 years	1.23	1.13–1.34
13–15 years	1.36	1.23–1.51
≥ 16 years	1.13	0.95–1.34
Prenatal Care		
Early	1.09	1.01–1.17
Delayed	0.98	0.91–1.05

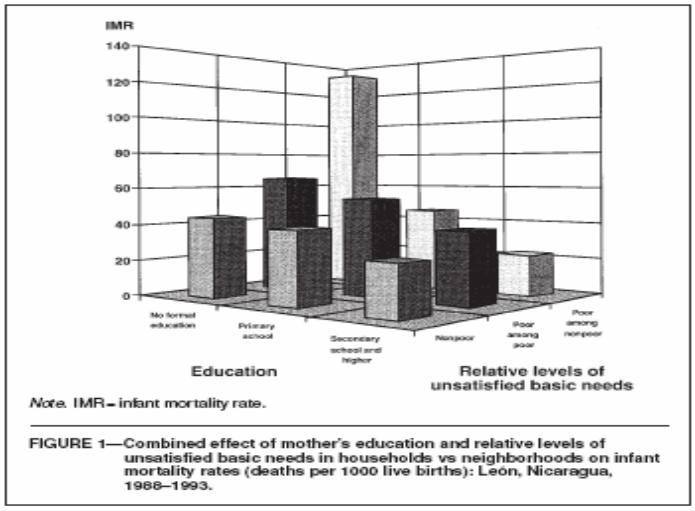
Social and income status is another factor that is shown to have influence on infant mortality risk. The general pattern is that the higher the individual income the lower the risk of disease and mortality. The hypothesis from a study on infant mortality rate in Nicaragua states that the absolute level of household poverty in a low-income country such as Nicaragua is associated with infant mortality; may be further modified by the prevailing socioeconomic conditions of the surrounding society. The study aims to assess the effect of poverty and social inequity on infant mortality rate in Nicaragua from 1988 to 1993. The sample consists of 10,867 women aged 15-49 years in Leon, Nicaragua and 7,073 infants studied. The sampling method used was cluster sampling. From 208 geographical clusters, fifty were randomly selected with probability proportional to number of inhabitants in each cluster. All households (n=7840) in

selected clusters were included; 51 (0.6%) refused to take part. A total of 10,867 women of reproductive age (15-49) were interviewed. The following reproductive events were recorded from each interviewee: date of end of each pregnancy (births, stillbirths, and abortions), sex of child, date of child's death (if applicable). The variables considered in this study were mother's age and parity, mother's position in the household, mother's education, distance to health services and residence. The interviewee's socioeconomic status estimated via unsatisfied basic needs (UBN) assessment, based on the following factors: housing quality, school enrollment among minors, dependency ratio, and availability of sanitary services (water supply and type of toilet). Results show an infant mortality rate of 50 per 1000 live births. Poverty, expressed as the UBN of household, increased risk of infant death. Social inequity, expressed as contrast between household UBN and predominant UBN of neighborhood, increased risk. The data also shows that infant mortality rate is associated with mother's education, but not associated with mother's position in household, distance to health services, urban versus rural residency and the study period. Infants in poor households (higher scores for UBN) had higher mortality risks than those in nonpoor households, and infants living in poor environment had higher mortality rates. The results of this study are shown as follow:

Background Factors	Cases	Person-Years	IMR	RR_{mh}	95% CI
Mother's characteristics					
Age, y					
15–19	111	1471	68.9	1	
20–34	191	4499	99.9	0.57	0.45, 0.72
35–44	40	424	84.7	1.25	0.87, 1.80
Parity					
1 child	91	1819	46.3	1	
2–4 children	149	3288	42.6	0.91	0.71, 1.17
>4 children	102	1287	72.4	1.57	1.19, 2.08
Education					
Secondary school and above	52	1636	29.7	1	
Primary school	127	2451	48.1	1.62	1.18, 2.23
No formal education	163	2307	65.5	2.20	1.62, 2.99
Position in household					
Head	64	1420	54.8	1	
Wife of household head	144	2790	48.4	0.87	0.66, 1.15
Daughter of household head	75	1430	48.3	0.87	0.63, 1.20
Other relative of household head	39	754	48.2	0.86	0.59, 1.25
Child's Sex					
Female	144	3118	43.2	1	
Male	198	3276	55.9	1.30	1.05, 1.61
Household and environment					
UBN, household[a]					
0	27	929	27.3	1	
1	60	1424	39.3	1.45	0.92, 2.29
2+	255	4041	58.5	2.15	1.46, 3.16
UBN, neighborhood[b]					
0	30	762	36.5	1	
1	54	1128	44.7	1.22	0.78, 1.90
2+	259	4504	59.2	1.46	1.00, 2.13
Walking distance to nearest health unit					
30 min or less	266	5092	48.7	1	
More than 30 min	76	1302	54.1	1.11	0.87, 1.42
Location					
Urban	283	5490	47.9	1	
Rural	59	904	60.7	1.26	0.95, 1.67
Study period					
1988–1989	127	2219	55.1	1	
1990–1991	110	2374	44.9	0.81	0.62, 1.05
1992–1993	105	1801	50.1	0.90	0.70, 1.16
Total	342	6394	50.1		

This study links mother's education to infant mortality rate, where mortality risks tend to be lower among infants of educated mother. There is a gradual decrease in infant mortality rate from 65 per 1000 in groups without formal education to 30 per 1000 among infants of women with secondary education or more. However, when stratified according to socioeconomic status, the protective effect of mother's education on infant mortality was demonstrated only in poor households. Low maternal education (primary school or less) in nonpoor households accounted

for 4% of infant mortality rate, and low maternal education in poor households accounted for 35% of infant mortality rate. Infants of mothers without any formal education in poor households in a predominantly nonpoor neighborhood had highest risk of infant mortality, with 130 deaths per 1000 newborns, as shown in the graph below (the tallest column).



Note. IMR = infant mortality rate.

FIGURE 1—Combined effect of mother's education and relative levels of unsatisfied basic needs in households vs neighborhoods on infant mortality rates (deaths per 1000 live births): León, Nicaragua, 1988–1993.

REDUCING YOUR RISK

Some strategies to reduce infant mortality rate would be focusing on modifying the behaviors, lifestyles, and conditions that affect birth outcomes, such as smoking, substance abuse, poor nutrition, lack of prenatal care, medical problems, and chronic illness. Furthermore, a network should form between health care experts and communities to encourage healthy behaviors by pregnant women and parents of infants.

Health Care Providers should advise their patients about factors that affect birth outcomes, such as maternal smoking, drug and alcohol abuse, poor nutrition, stress, insufficient prenatal care, chronic illness or other medical problems. Communities and individuals can also play an important role in this effort by encouraging pregnant women to seek prenatal care in the first trimester, which will ensure a better birth outcome than little or no prenatal care.

FOR MORE INFORMATION

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