Correlates and Infant Mortality: Sudden Infant Death Syndrome among Black Women in the United States

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CORRELATES AND INFANT MORTALITY: SUDDEN INFANT DEATH SYNDROME AMONG BLACK WOMEN IN THE UNITED STATES

by

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CORRELATES AND INFANT MORTALITY: SUDDEN INFANT DEATH SYNDROME AMONG BLACK WOMEN IN THE UNITED STATES

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Western Michigan University, 1993

Often referred to as "cot death" or "crib death," sudden infant death syndrome (SIDS) is the single leading cause of infant death in infants aged 28 days to 1 year of life. Although the exact etiology of SIDS remains unknown, epidemiological studies have identified risk factors associated with higher rates of SIDS. In this study, the relationship between sudden infant death syndrome and maternal education among black women who gave birth in the United States during 1983 was examined.

The population for this study consisted of black infants who were born in 1983 and died before their first birthday. Among the 11,088 black infants who died during this period, 1,480 of the deaths were attributed to SIDS. Although this study controlled for race by examining SIDS cases among black women, the results confirmed the findings of previous research which found low maternal education to be significantly related with higher rates of SIDS.
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Paulette Aubrey
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CHAPTER I

INTRODUCTION

Approximately 10,000 infants die annually in the United States from what is known as Sudden Infant Syndrome (SIDS) (Buschbacher & Delcampo, 1987; Viedma, 1987). These infants are apparently healthy; thus, their deaths are unexpected and remain unexplained after a postmortem examination (Buschbacher & Delcampo, 1987). As victims of SIDS, death is sudden, without warning—and invariably silent. Indeed, SIDS is said to be a "disease" in which the first symptom is death (Cleveland, 1975).

Held in 1969, the Second International Conference on Causes of Sudden Infant Death provided the following definition of SIDS:

Formerly called a "crib death" or "cot death" SIDS is now defined as the sudden death of any infant or young child which is unexpected by history, and in which case a thorough post mortem examination fails to demonstrate an adequate cause of death. ("Sudden Infant Death," 1988, p. 3,255)

Sudden infant death syndrome is the single leading cause of infant death in infants aged 28 days to 1 year of life (Cotton, 1990; Smialek, 1986). In the United States, SIDS occurs in about 2.3 deaths per 1,000 live births (Buschbacher & Delcampo, 1987). Among black infants, however, the rate of SIDS is two to three times that of white infants ("Premature Mortality," 1986) and regardless of race, the risk of SIDS death is higher among those of lower
socioeconomic backgrounds (Favorito, Pernice, & Ruggiero, 1979; Peterson, 1980).

Although the exact etiology of SIDS is unclear (Kraus, Greenland, & Bulterys, 1989; "Premature Mortality," 1986) epidemiological studies have identified risk factors which may predispose the infant as being at a higher risk (Shaddy & McIntire, 1982). Approximately 90% of SIDS deaths occur within the first 6 months of life, with a peak incidence at 2-4 months (Bell, Sexton, & Conradi, 1975; Buschbacher & Delcampo, 1987; Grether & Schulman, 1989). In addition, more deaths have been found to occur during the winter months, and 50-80% of the infants die between midnight and 6 a.m. (Bell et al., 1975). SIDS also occurs more often among males, and within families in the lower socioeconomic groups (Buschbacher & Delcampo, 1987). Additional risk factors (which provide the basis for the secondary hypotheses in this study) associated with the incidence of SIDS include: single mothers, mothers who receive no prenatal care, very young mothers, low birth weight infants, and race (Shaddy & McIntire, 1982; Miller, 1985). Subsequent siblings of SIDS victims are also at higher risk for SIDS death, whereas firstborn are less likely than subsequent siblings to die from SIDS (Kaplan, Bauman, & Krous, 1984).

Research has produced many theories for the occurrence of SIDS, and the proposed theories have been refuted as often as they have been supported (Coleman, 1977). By 1976, there were over 100 hypotheses attempting to explain SIDS, and "not one of them was supported by convincing evidence"
(Viedma, 1987, p. 46). Although many theories have been proposed, the cause or causes of SIDS remain unknown (Kraus et al., 1989). Moreover, the search for causes of SIDS continues to be frustrating, as SIDS can neither be prevented nor predicted (Buschbacher & Delcampo, 1987; Coleman, 1977; Viedma, 1987). At present, SIDS remains an enigma wrapped in swaddling clothing (Peterson, 1980).

**Purpose and Significance of Study**

The disproportionate number of SIDS cases occurring among the lower socioeconomic groups, and the racial disparities in the incidence of SIDS have both been well documented in the literature (Favorito et al., 1979; Peterson, 1980; "Premature Mortality," 1986). However, little research exists which specifically examines maternal education among black women vis-a-vis the incidence of SIDS. As a result, the purpose of this study is to examine the relationship between maternal education and the incidence of SIDS. Moreover, this research is also an attempt to move away from using whites as a standard against which to compare a minority group in the direction of establishing a standard for comparison within a particular minority group. This is accomplished by examining only the 11,088 black infants who died during 1983, and using differentials in maternal education as the basis for analyzing the 1,480 SIDS cases that occurred within this group.
The significance of the sociological study of infant mortality has been succinctly and aptly stated by Goldscheider (1971) who asserts,

Mortality variation within and between societies is significant for sociological inquiry not only because mortality is an analytic component of population processes that, in turn, may be interrelated with social processes, but also because mortality, as an independent process, may be viewed as a consequence, correlate, and indicator of social inequality (p. 241).
CHAPTER II

LITERATURE REVIEW

Neonatal and Postneonatal Mortality

The term "infant" has its origins in the Latin words in which means "not" and fans, which means "speaking" (Poston & Rogers, 1983). As such, it originally denoted a person not old enough to speak. In vital statistics research, an infant is a person less than 1 year old (Poston & Rogers, 1983). The mortality of infants is generally divided into two intervals: the first 27 days of life, which is referred to as the neonatal period, and the reminder of the first year, which is the postneonatal period (Combs-Orme, 1987; Poston & Rogers, 1983; Wagner, 1988). This division was advocated over 100 years ago by William Farr, because the causes of infant death during the two periods were different ("Infant Mortality," 1988).

Neonatal mortality is thought to be more directly attributable to the physiological process of gestation and the birthing process. As a result, congenital anomalies, birth injuries, and immaturity predominate as causes of death during this period. In contrast, postneonatal mortality is more likely to be influenced by environmental factors that contribute to accidents and infectious diseases (e.g., pneumonia and influenza). Infant mortality is also
higher among those of lower socioeconomic status (Spurlock, Hinds, Skaggs, & Hernandez, 1987; United States Department of Health and Human Services, 1986; Wicks & Stockwell, 1984).

During the neonatal period, low birth weight is the single leading cause of infant death (Hutchins, Kessel, & Placek, 1983; Miller, 1985). Low birth weight is officially defined as weight less than 2,500 grams, and it accounts for more than two-thirds of all neonatal mortality (Combs-Orme, 1987; Hutchins et al., 1983; Johnson & Zaki, 1988; Miller, 1985). Low birth weight is also associated with a greater risk for SIDS (Grether & Schulman, 1989; Hasselmeyer & Hunter, 1975; Valdes-Dapena, 1986). In a 1989 study, Grether and Schulman found as birth weight increased, the rate of SIDS decreased in a significant linear fashion. The study involved 2,962 cases of SIDS and the rate of SIDS among infants weighing between under 1,500 grams was 7.5 per 1000. Among infants weighing between 1,501-2,000 grams, the rate of SIDS was 6.4 per 1,000. Among the infants weighing between 2,001 and 2,500 grams, the rate of SIDS decreased to 3.8 per 1,000. For infants weighing between 3,501-4,000 grams, the rate of SIDS was only 1.0 per 1,000.

Postneonatal mortality is important because of its relationship with both lower socioeconomic status and higher SIDS rates. Research indicates that postneonatal mortality is high in households where the mother has little education, there is poor sanitation, the housing is not safe, and where there is
a limited water supply (Miller, 1985). All of these factors are also prevalent among those of lower socioeconomic status. SIDS, infections, accidents, and homicide predominate as causes of deaths during the neonatal period.

Furthermore,

The prevalence and severity of these conditions are related to socioeconomic status, and because many of these conditions can be readily treated with current medical techniques, changes in postneonatal mortality rates are sensitive indicators of the health problems of poor families and their access to basic medical service. (Daniel, Cornely, & McCormick, 1986, p. 1,155)

Research also substantiates the inverse relationship between income and infant mortality (due to SIDS as well as other causes) during the postneonatal period, as compared with the neonatal period (Johnson, 1987; Spurlock et al., 1987). In a study conducted among metropolitan Ohio residents between 1960 and 1980, Johnson (1987) found the number of infants dying during the postneonatal period increased as the economic levels declined. The greater number of postneonatal deaths (when compared with the neonatal deaths) were "due to causes that public health specialists believed to be associated with external environment, such as poor and overcrowded housing, lack of sanitation and nutritionally inadequate diets" (Johnson, 1987, p. 230).

In a study conducted in 1987 to determine if there were differences between poor and nonpoor infants born in Kentucky during 1982 and 1983, Spurlock et al. (1987) found infant mortality rates to be associated with socioeconomic levels only during the postneonatal period. Moreover, they found that the higher risk for infant death during this period was due primarily to higher rates of SIDS and
infections. They also found the rate of low birth weight infants among black women to be similar regardless of socioeconomic status (Spurlock et al., 1987).

Spurlock et al. (1987) used computer-matched food stamp files and Aid for Families With Dependent Children (AFDC) records to define poor and nonpoor Kentucky residents for their study. Infants were classified as poor if a parent or other family member living at the same address received AFDC or other public assistance during the year in which the child was born. Using this approach, the total number of infants (104,837) were categorized into four groups: (1) poor with infant deaths, (2) nonpoor with infant deaths, (3) poor without infant deaths, and (4) nonpoor without infant deaths.

In examining the incidence of low birth weight infants among black women, Spurlock et al. (1987) found that both poor and nonpoor blacks had similar rates of low birth weight babies. Over 12% (12.5%) of poor, black infants were of low birth weight, compared with 13.1% of the nonpoor, black infants. The researchers further reported that, during the neonatal period, the total risk for poor and nonpoor neonatal deaths were only slightly different. They suggest this may be the result of programs designed to provide equal access to neonatal care technology, which improves the initial life expectancy of low birth weight infants. However, during the postneonatal period, poor infants were found to be at a significantly greater risk of death than nonpoor infants. The higher risk for postneonatal deaths among the poor was primarily the result of higher incidence of SIDS and infections.
Several hypotheses were advanced to explain why the infant deaths were associated with socioeconomic level only during the postneonatal period. First, during the postneonatal period, the environmental conditions associated with poverty increase the risk for illnesses that are common causes of death among the poor. Second, the stress of living in poverty can make it more difficult for parents to address the needs of ill children. Therefore, minor, easily treatable illnesses may be ignored until complications develop. According to the third hypothesis, the poor may have more trouble gaining access to medical treatment because many doctors do not accept medicaid patients (Spurlock et al., 1987).

Infant Mortality

Before examining the epidemiological and historical background of SIDS, this section will provide some information about infant mortality in general, as well as take a look at some of the factors associated with higher infant mortality rates. This will help provide a framework for understanding, and possibly viewing the similarities, and/or contrasting SIDS as a specific cause of death with factors associated with infant mortality in general.

The infant mortality rate (IMR) is defined "as the number of deaths per 1,000 live births for children one year of age" (Howze, 1985, p. 20). The IMR is considered one index of the general health and welfare of a given population (Howze, 1985; Johnson & Zaki, 1988; Miller et al., 1985). "The
sensitivity of this index is that it provides clues to the nutritional status of the mother and the family, the housing condition, the health care situation, the income level and the overall socioeconomic conditions" (Reed, 1981, p. 315).

Class differences in the rate of infant mortality have been repeatedly documented both in the United States and in other countries (Gortmaker, 1979; Valdes-Dapena & Steinschneider, 1983; Wise, Kotelchuck, & Wilson, 1985). In 1867, Marx described the infant mortality in England as ranging from a low of 70 per 1,000, to a high of 250 per 1,000 live births (Gortmaker, 1979). The differences were believed to be the result of inadequate nutrition and health care, in addition to the adverse conditions of poverty and inadequate sanitation in which the exploited working classes were forced to live (Gortmaker, 1979).

In the United States, differentials in infant mortality rates have been linked to poverty since the beginning of the century (Gortmaker, 1979). Established in 1912 by an act of Congress, the Federal Children’s Bureau was "charged to investigate and report upon all matters pertaining to the welfare of children and child life among all people" (Bremner, Marks, Schmidt, & Standford, 1974, p. 1). The results of their early study indicated a high infant mortality rate among those families with large numbers of children, low earnings, and poor housing (Bremner et al., 1974). The study also revealed that variations in infant mortality existed in different parts of the United States as well as in different parts of the same state. These differences were said to be
caused by "widely varying social and economic conditions and differences in the appreciation of good prenatal and infant care facilities available for such care" (Miller, 1985, p. 32).

Racial Disparities

In 1912, approximately 124 of every 1000 American infants died before reaching their first birthday (Combs-Orme, 1987). By 1988 the IMR had decreased to 10.1 deaths per 1,000 (U. S. Department of Health and Human Services, 1990). However, despite this dramatic reduction in infant mortality, racial disparities persist (Combs-Orme, 1987; Miller, 1985). For example, in 1940 there were 72.9 black infant deaths per 1,000 live births compared with 43.2 per 1,000 for whites. By 1987, the black infant mortality rate had decreased to 17.6 per 1,000 in comparison to 8.5 per 1,000 for whites (Hughes, Butler, Johnson, Rosenbaum, & Simons, 1987).

Some health care analysts suggest that the differences in the health status of blacks and whites are maintained by patterns of racial oppression which have resulted in blacks being the recipients of "second class" medicine (Rice, 1985). Reed (1981), for example, analyzed infant mortality rates in the United States for the years 1964-1969. He reported the IMR among black infants was not only higher than that of whites, regardless of the socioeconomic index used (i.e., father's education, mother's education, or...
income), but that whites with only an 8th grade education had lower infant mortality rates than blacks who attended college.

Reed (1981) further contends that differentials in socioeconomic status is not a sufficient explanation for racial differences in infant mortality rates. He suggests that race is a more important factor than social class in explaining differentials in infant mortality. His thesis is that institutional racism (i.e., racial discrimination in economic and social institutions) is responsible for higher black infant mortality because it places black infants in "triple jeopardy" for mortality. His position is that blacks are more susceptible to (a) processes "that develop conditions conducive to poor infant health, (b) processes that affect acquisition of requisite health care services, and (c) processes constituting the response of the medical system to the problem of poor infant health" (Reed, 1981, p. 317).

Social Class and Marital Status

There is some research that suggests that the effect of socioeconomic status on infant mortality rates may not be the same for black infants when compared with that of white infants. For instance, Spurlock et al. (1987) analyzed infant mortality rates among poor and nonpoor Kentucky residents during 1982-1983. Their research indicated that regardless of socioeconomic levels, the infant mortality rates among black women was similar. They reported finding "the total infant mortality for poor black families was only
slightly greater than for nonpoor black families (21.5 vs 19.3/1,000 births)" (Spurlock et al., 1987, p. 268). However, the mortality risk for poor white infants was significantly higher than that of nonpoor whites (Spurlock, 1987).

Marital status is another variable which research suggests may have a different impact on the mortality of black infants than on white infants (Johnson, 1987). In a statewide sample of 289,232 infants from California, the IMR among single white women was higher than that of married white women, but the IMR among black women remained the same, regardless of marital status (Johnson, 1987). The researchers speculated "this is because black women are more likely than whites to have spouses who are unemployed or have low incomes, and married women do not receive public or family assistance to the same extent that single mothers do" (Johnson, 1987, p. 231).

**Teenage Pregnancy**

Black teenagers have a birth rate twice that of white teenagers. According to Davis (1998), this has led to an assumption that the difference in mortality rates between the two groups are a direct result. However, Davis (1988) asserts that this is not only an untested assumption, but one for which he has found only partial support in a study using data from North Carolina. North Carolina was selected because it ranks sixth in the nation in infant mortality, and it is one of only seven states in which 20% or more of the population is black. In addition, the teenage pregnancy rate in North Carolina
is 19.2% and its poverty rate of 14.8% is one of the highest in the nation (Davis, 1988).

The results of the study indicated that less than 5% of all black births occurred to women under 16. According to Davis (1988), if all births to women under this age were prevented, less than 10% of the racial difference would have been eliminated. He also found the mortality risk was not significantly higher for women aged 17-20 years of age than it was for women 20-35 years of age. For this reason alone, Davis (1988) believes that the higher rate of black teenage pregnancies could not be responsible for the infant mortality differences between blacks and whites.

Davis (1988) concluded: "While teenage pregnancy remains a significant problem (especially in the black community), it cannot be held responsible for the tide of infant mortalities that continues to sweep this country each year" (p. 907).

Historical Background of SIDS

SIDS is considered both an ancient and mysterious disease (Bell et al., 1975; Coleman, 1977; Shaddy & McIntire, 1982). The Biblical reference found in 1 Kings 3:19 "and this woman's child died in the night because she overlaid it" is believed to be the earliest written reference of SIDS (Barnett & Hunter, 1981).
Prior to the 1900s, the sudden and unexpected death of a healthy infant was primarily attributed to pneumonia, suffocation, or neglect (Barnett & Hunter, 1981). However, during the mid-1800s attributing SIDS to an enlarged thymus became popular. As a result, there was a shift from attributing the sudden, and unexpected death of a healthy infant to suffocation or neglect, to attributing it to a purported pathologic condition that could be detected with an autopsy (Barnett & Hunter, 1981; Shaddy & McIntire, 1982). This theory was eventually refuted after careful study of the size of thymuses, and SIDS was again attributed to overlaying, suffocation or neglect (Barnett & Hunter, 1981; Shaddy & McIntire, 1982).

The first major article on SIDS was written by a Scottish medical examiner, C. Templeman, in 1892 (Bell et al., 1975). Templeman provided a description of 258 cases of "suffocation" of infants. He attributed the deaths in the 258 cases to ignorance, carelessness, and overcrowding among the lower classes. He also reported that the majority of the deaths occurred between October and March, between the ages of 1 month and 6 months, and among those from lower socioeconomic circumstances (Bell et al., 1975).

The systematic study of SIDS began with the work of Werne and Garrow in the 1940s. They produced a series of papers from 1942-1953, with evidence that SIDS was not the result of suffocation. They suggested instead, that the cause of death appeared to be from natural causes, and in some cases an inflammatory mechanism (Barnett & Hunter, 1981; Hasselmeyer & Hunter,
This body of work notwithstanding, knowledge of the epidemiology of SIDS was virtually nonexistent prior to the 1960s (Peterson, 1980). Suffocation, overlaying, aspiration, and various forms of pneumonia or neglect were some of the many names ascribed to the death of an apparently healthy infant, depending on the family's social status (Bergman, 1988; Hasselmeyer & Hunter, 1975). In an attempt to circumvent the embarrassment of reporting that one did not know the cause of death (and at the same time comply with legal expectations), many postmortem examiners certified the sudden, unexpected, and inexplicable death of an infant to a death category based on the examiner's personal inclination (Barnett & Hunter, 1981; Peterson, 1980).

**Apnea and SIDS**

Apnea is the "unexplained interruption of breathing, especially when it lasts longer than 15 seconds and requires mouth to mouth resuscitation" (Viedma, 1987, p. 46). If successfully resuscitated, these infants are referred to as "near miss" cases for SIDS (Barnett & Hunter, 1981; Peterson, 1980; Valdes-Dapena, 1980). Infants with the tendency for apnea are considered at a higher risk for SIDS. Approximately 20% of these infants subsequently succumb to SIDS (Deal & Bordeaux, 1980; Viedma, 1987).

The idea that "there must be a reversible point in the pathologic spectrum of SIDS" (Steinschneider, 1976, p. 6) emerged during 1963. This
idea was based on observations of the number of healthy infants brought into emergency rooms who had developed sudden apnea and bradycardia (i.e., heart rate less than 20), but were subsequently and successfully resuscitated. According to the sleep-related apnea theory, SIDS takes place when an infant fails to restart breathing after apnea. This hypothesis is the basis for the pneumocardiogram and home monitors which are currently popular preventive measures for SIDS in the United States (Deal & Bordeaux, 1980). Because the cause (or causes) of SIDS remains unknown, however, a consistent, reliable screening test for SIDS does not exist. The pneumocardiogram is used as an evaluation tool to determine if an infant has apnea, but it does not provide definitive information as to whether or not the infant will become a SIDS victim (Buschbacher & Delcampo, 1987; Favorito et al., 1979).

Home monitors are available for "near miss" and other infants found to be at risk for SIDS deaths. The apnea home monitor is attached to the infant's bed, and electrodes are placed on the infant's diaphragm. If the infant stops breathing, an alarm will sound. The home monitors are used whenever the child is not under constant surveillance, and allows the parent 10 seconds to respond to the alarm. If the parent is delayed, resuscitation may be necessary, and irreversible damage may occur (Favorito et al., 1979). Although the efficacy of this intervention has not been formally evaluated, the number of potentially preventable deaths is believed to be small ("Premature Mortality," 1986).
Epidemiology of SIDS

Incidence of SIDS

Most research reports the incidence of SIDS to be in the range of 2-3 per 1,000. Applying the mean figure of 2.5 per 1,000 to the current annual birth rate of about approximately 3.5 million, the result is a calculation of nearly 10,000 SIDS deaths annually in the United States (Beckwith, 1973).

Age and Time of Death

Very few SIDS cases occur before the first month of life, and only an occasional case is reported after the 12th month. The peak incidence of SIDS is consistently reported between 2-4 months of life (Buschbacher & Delcampo, 1987; Hasselmeyer & Hunter, 1975; Shaddy & McIntire, 1982; Valdes-Dapena & Steinschneider, 1983). During this time, SIDS accounts for more than half of all postneonatal mortality (Hasselmeyer & Hunter, 1975). In a study of 425 SIDS cases in King County, Washington, only 5 cases (1%) of the SIDS cases occurred during the first 2 weeks of life, over half of the SIDS cases occurred by 3 months of age, and 91% occurred in the first 6 months (Beckwith, 1973).

SIDS cases have also been observed to occur more often during normal sleep hours (Hasselmeyer & Hunter, 1975). More specifically, studies have indicated an increase in SIDS cases between midnight and 6 a.m. (Barnett & Hunter, 1981; Buschbacher & Delcampo, 1987; Shaddy & McIntire, 1982).
Some researchers suggest this may be a function of the amount of total sleep time and not necessarily a characteristic of SIDS (Peterson, 1980).

State of Health and Nature of Death

The victims of SIDS usually die quietly during their sleep. Even when parents are in close proximity with the infant, they fail to report hearing the child cry out (Hasselmeyer & Hunt, 1975; Shaddy & McIntire, 1982). The infants are generally in good health prior to death. However, sometimes a stuffy nose is reported, or recovery from a cold so minor that medical attention was not sought (Barnett & Hunter, 1981; Hasselmeyer & Hunter, 1975; Shaddy & McIntire, 1982).

Seasonal Variation

Seasonal variations have also been shown to exist in the incidence of SIDS (Barnett, 1981; Buschbacher & Delcampo, 1987; Hasselmeyer & Hunter, 1975; Valdes-Dapena & Steinschneider, 1983). For example, Grether and Schulman (1989) found that 33% of the 2,962 SIDS cases in their study occurred during the winter months compared to only 17% during summer and 25% during the spring and fall, respectively. The least amount of seasonal variation occurred among black infants. Twenty percent of the black SIDS cases occurred during the summer, 26% during the spring, 27% during the fall, and 28% during the winter (Grether & Schulman, 1989). Some
researchers suggest the seasonal variation may be a reflection of a higher infection rate in the general population, rather than a particular characteristic of SIDS (Helmut, 1980; Peterson, 1980).

Sex, Race, and Socioeconomic Factors

Gender, race, and socioeconomic differentials have been identified in the incidence of SIDS. Virtually every published report has indicated that SIDS occurs more often among male infants than females (Hasselmeyer & Hunter, 1975; Shaddy & McIntire, 1982; Valdes-Dapena & Steinschneider, 1983). However, according to Valdes-Dapena and Steinschneider (1983), this may reveal little or nothing about SIDS because "male predominance is typical of most of the diseases of infants and children" (Valdes-Dapena & Steinschneider, 1983, p. 28).

Ethnic differences in the incidence of SIDS also exist. Among Asians the rate of SIDS is .5 per 1,000, 1.3 per 1,000 among whites, 2.9 per 1,000 among blacks, and 5.9 per 1,000 among American Indians (Shaddy & McIntire, 1982).

Although SIDS occurs among households of all social economic backgrounds, it occurs predominately among infants from a poor socioeconomic environment (Bell et al., 1975; Deal & Bordeaux, 1980; Shaddy & McIntire, 1982). Theories vary in their attempts to explain the association of SIDS with socioeconomic status. Naeye (1990) believes the higher risk of SIDS deaths
among lower socioeconomic groups is due, in part, to the spread of infections and overheating. According to Helmut (1980), the higher prevalence of SIDS cases reported among socioeconomically deprived families has to do with the fact that unexplained deaths of children in these situations are subjected to more intense official scrutiny. As a result, those that are registered under different headings are more thoroughly and quickly investigated than those deaths occurring in well-to-do families. Hasselmeyer and Hunter (1975) further contend that socioeconomic status is not specifically a characteristic of SIDS. Rather, it is a reflection of the epidemiology of infant mortality in general.

Maternal and Obstetric Factors

Some studies report finding a higher incidence of SIDS among younger mothers (Hasselmeyer & Hunter, 1975; Shaddy & McIntire, 1982). In a study described by Hasselmeyer and Hunter (1975) the data indicated the risk for SIDS decreased with increasing maternal age. In addition, the study also reported the number of deaths among infants whose mothers received little or no prenatal care "was significantly in excess of that expected on the basis of the distribution of live births" (Hasselmeyer & Hunter, p. 220).

In another study described by Hasselmeyer and Hunter (1975), mothers of SIDS victims were found to be less likely to attend prenatal clinics, than mothers of the control cases, as well as to have experienced the flu during the
pregnancy. These investigators believe these observations are manifestations of lower socioeconomic status (Hasselmeyer & Hunter, 1975).

To date, the etiology of SIDS remains unclear (Bergman, 1988; Shaddy & McIntire, 1982). Nevertheless, there appears to be consensus that multiple factors (rather than a single common factor) are responsible for the phenomenon (Barnett & Hunter, 1981; Naeye, 1990).
CHAPTER III

METHODS

Data

The data used in this study were compiled in 1989, by the United States Department of Health and Human Services using linked birth and death records. The national file is comprised of the deaths of all infants who were born in 1983, and died during 1983 or 1984 before reaching age 1. Two sources were used to create the file: linked birth and infant death records from each state, and natality and mortality statistical files created by the National Center for Health Statistics (NCHS). As a result, the Linked Birth/Infant Death Data Set used in this study consists of two separate files prepared as numerator and denominator file which allows for the computation of infant mortality rates.

Operationalization of Variables

Independent Variables

Education

Maternal education was defined by the Department of Health and Human Services (1989) as "the number of years of school completed" (p. 6).
When a partial year of school or college was completed, the highest preceding year was recorded.

Categories used to record educational levels were limited to years completed in a "regular" school system (i.e., a formal educational system) or the equivalent in an accredited private or parochial school. Therefore, trade schools such as beauty, barber, or business schools were not counted. Instead, they were coded as a "not stated" or as a missing response. The Department of Health and Human Services also made no attempts to convert years completed in a foreign school or ungraded systems to equivalent grades in the United States school system. Such responses were also recorded as "not stated" or as a missing response.

Maternal Age

Maternal age was obtained from the infant's birth certificate. It was defined as the mother's age at the time of the child's birth.

Marital Status

All but nine states reported marital status on the birth certificate during 1983. For the non-reporting states, marital status was inferred by comparing the infant's name with the parent's surnames.
Prenatal Visits

The number of prenatal visits was obtained from the birth certificates. It was defined as the total number of prenatal visits.

Birth Weight

The Department of Health and Human Service's definitions of very low birth weight, low birth weight, and high birth weight are consistent with the recommendations of the Ninth Revision of the International Classification of Diseases (ICD-9). "Very low" birth weight was defined as weight less than 1,500 grams. "Low" birth weight was defined as weight less than 2,500 grams, and "high" (or normal) birth weight was defined as weight of 2,500 grams or more.

Dependent Variable

Sudden Infant Death Syndrome

SIDS is specified as the cause of death on the death certificate. It is also a diagnosis that is contingent upon a postmortem examination. Deaths were attributed to SIDS if the underlying cause of death was classified as category 798.0 in the International Classification of Diseases (9th revision).
Data Analysis

The major independent variable in this study was maternal education. In addition, secondary independent variables (i.e., marital status, maternal age, number of prenatal visits, and birth weight) were also examined as previous research has identified each as a risk factor for higher SIDS rates (Shaddy & McIntire, 1982). The dependent variable was the incidence of SIDS.

Based on the review of the literature, the following research hypotheses were formulated in an attempt to examine the relationship between maternal education and other sociodemographic variables, relative to the incidence of SIDS among black women.

Hypothesis 1: The rate of SIDS will vary inversely with maternal education.

Hypothesis 2: Single mothers will have a higher rate of SIDS than married mothers.

Hypothesis 3: The rate of SIDS will vary inversely with maternal age.

Hypothesis 4: The rate of SIDS will vary inversely with the number of prenatal visits.

Hypothesis 5: The rate of SIDS will vary inversely with birth weight.
CHAPTER IV

RESULTS

Education was the major independent variable in this study. It was chosen because of its association with income and occupation (Hagedorn, 1983; Johnson, 1989). The underlying premise is that differentials in educational attainment should be related to differences in SIDS rates. This was based on the idea that education is often used as an indicator of socioeconomic status because of its association with both income and occupation (Hagedorn, 1983; Department of Health and Human Services, 1989). Previous research provides some support for this contention. For example, "Census data show that those in high-ranking occupations--professional, managerial, and administrative--have the highest median yearly income and the highest median education. The higher the average education, the higher the average income" (Hagedorn, 1983, pp. 228-229). Moreover, the Census Bureau reported the average income for a professional degree was $45,000, compared with $39,200 for those with a doctorate degree. Those with a masters and bachelors degrees had average incomes of $27,000 and $22,100 respectively. The average income for those with an associates degree was $16,200, compared with $12,300 for those with a high school diploma, while individuals with less than a high school diploma earned less than $8,300.
The secondary independent variables (maternal age, marital status, prenatal visits, and birth weight) were examined because they have also been identified as risk factors for higher SIDS rates (Shaddy & McIntire, 1982).

Population

The population for this study was comprised of virtually all black infants who were born in the United States during 1983. During this time 574,522 black infants were born. Of this total, 11,088 died during 1983 or 1984 before reaching their first birthday. Among the total number of dead infants, 1,480 of the deaths were attributed to SIDS.

As expected from the literature, the vast majority of the SIDS cases (92%) occurred during the postneonatal period, the remaining 8% occurred during the neonatal period.

Marital Status and Education of Population

When compared with married mothers (20.3%), twice as many single mothers (44.4%) completed only the 11th grade or less (see Table 1). The percentage of high school graduates in this population was roughly similar for both married (42.9%) and single mothers (37.4%); however, married mothers were twice as likely as single mothers to attend college and almost six times more likely to graduate from college than single mothers.
### Table 1

**Education and Marital Status of Population**

<table>
<thead>
<tr>
<th>Education</th>
<th>Single Mothers</th>
<th>Married Mothers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent</td>
<td>N</td>
</tr>
<tr>
<td>≥ 8th Grade</td>
<td>6.7</td>
<td>383</td>
</tr>
<tr>
<td>11th Grade</td>
<td>44.4</td>
<td>2,536</td>
</tr>
<tr>
<td>12th Grade</td>
<td>37.4</td>
<td>2,138</td>
</tr>
<tr>
<td>Some College</td>
<td>9.9</td>
<td>566</td>
</tr>
<tr>
<td>College Graduate</td>
<td>1.6</td>
<td>94</td>
</tr>
<tr>
<td>Missing Cases</td>
<td></td>
<td>2,381</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>5,717</td>
<td></td>
</tr>
</tbody>
</table>

### Research Hypotheses

**Hypothesis 1:** The rate of SIDS will vary inversely with maternal education.

Maternal education was found to be related with SIDS. The rate of SIDS ranged from a high of 4.2 per 1,000 among those with less than a high school education to a low of .7 per 1,000 among college graduates.
Eighty-nine percent of the SIDS cases occurred among mothers with a high school education or less, compared with only 2% among college graduates (see Table 2). With a SIDS death rate of 2.1 per 1,000, high school graduates were twice as likely to have an infant die of SIDS as those who had attended some college and three times as likely as college graduates.

Table 2
The Rate of SIDS and Maternal Education

<table>
<thead>
<tr>
<th>Mother's Education</th>
<th>Live Births</th>
<th>SIDS Deaths</th>
<th>SIDS Rate Per 1,000</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 11 Grade</td>
<td>164,023</td>
<td>699</td>
<td>4.2</td>
<td>55</td>
</tr>
<tr>
<td>High School</td>
<td>204,219</td>
<td>439</td>
<td>2.1</td>
<td>34</td>
</tr>
<tr>
<td>Some College</td>
<td>80,320</td>
<td>114</td>
<td>1.4</td>
<td>9</td>
</tr>
<tr>
<td>College Degree</td>
<td>32,900</td>
<td>23</td>
<td>.7</td>
<td>2</td>
</tr>
<tr>
<td>Missing Live Births</td>
<td>93,060</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing SIDS Cases</td>
<td>205</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>574,522</td>
<td>1,275</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Those mothers who attended some college had double the rate of SIDS deaths as those who graduated from college.

Hypothesis 2: Single mothers will have higher rates of SIDS when compared with married mothers.
Marital status was found to be related with SIDS. Over 70% of the SIDS cases occurred among unmarried mothers (see Table 3). Indeed, the rate of SIDS among single women (3.2 per 1,000) was almost double that of married mothers (1.7 per 1,000).

Table 3

The Rate of SIDS and Marital Status

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Live Births</th>
<th>SIDS Deaths</th>
<th>SIDS Rate Per 1,000</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>333,570</td>
<td>1,069</td>
<td>3.2</td>
<td>72</td>
</tr>
<tr>
<td>Married</td>
<td>240,952</td>
<td>411</td>
<td>1.7</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>574,522</td>
<td>1,480</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Hypothesis 3: The rate of SIDS will vary inversely with maternal age.

The rate of SIDS was related with maternal age. Seventy percent of the SIDS cases occurred among women under 24 years old; only 10% of the SIDS cases among mothers who were 30 years old or older (see Table 4). Women who were under 20 years of age had the highest rate of SIDS (3.3 per 1,000), followed by mothers between the ages of 20-24 years of age (2.9 per 1,000). The lowest rate of SIDS (1.6 per 1,000) occurred among women who were 30 years old or older.
Table 4
The Rate of SIDS and Maternal Age

<table>
<thead>
<tr>
<th>Maternal Age In Years</th>
<th>Live Births</th>
<th>SIDS Cases</th>
<th>Rate Per 1,000</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 20</td>
<td>139,022</td>
<td>457</td>
<td>3.3</td>
<td>31</td>
</tr>
<tr>
<td>20-24</td>
<td>199,045</td>
<td>574</td>
<td>2.9</td>
<td>39</td>
</tr>
<tr>
<td>25-29</td>
<td>140,974</td>
<td>299</td>
<td>2.1</td>
<td>20</td>
</tr>
<tr>
<td>30+</td>
<td>95,508</td>
<td>150</td>
<td>1.6</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>574,522</td>
<td>1,480</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Hypothesis 4: The rate of SIDS will vary inversely with the number of prenatal visits.

The rate of SIDS was found to be related with the number of prenatal visits (see Table 5). Mothers who received no prenatal care clearly had the highest rate of SIDS death (5.7 per 1,000). Those who received 1-3 prenatal visits also experienced a rate of SIDS (4.7 per 1,000) that was higher than the national average of 2.3 per 1,000. The lowest rates of SIDS occurred among women who had 10 or more prenatal visits.
Table 5
The Rate of SIDS and Prenatal Visits

<table>
<thead>
<tr>
<th>Prenatal Visits</th>
<th>Live Births</th>
<th>SIDS Cases</th>
<th>Rate Per 1,000</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>17,512</td>
<td>100</td>
<td>5.7</td>
<td>8.0</td>
</tr>
<tr>
<td>1-3</td>
<td>33,989</td>
<td>163</td>
<td>4.7</td>
<td>12.6</td>
</tr>
<tr>
<td>4-5</td>
<td>77,148</td>
<td>292</td>
<td>3.7</td>
<td>22.7</td>
</tr>
<tr>
<td>7-9</td>
<td>114,159</td>
<td>268</td>
<td>2.3</td>
<td>20.8</td>
</tr>
<tr>
<td>10-12</td>
<td>173,432</td>
<td>285</td>
<td>1.6</td>
<td>22.1</td>
</tr>
<tr>
<td>13 +</td>
<td>96,431</td>
<td>178</td>
<td>1.8</td>
<td>13.8</td>
</tr>
<tr>
<td>Missing Cases</td>
<td>61,851</td>
<td>194</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>574,522</td>
<td>1,480</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Hypothesis 5: The rate of SIDS will vary inversely with birth weight.

Although the vast majority of the SIDS cases (82%) occurred among normal weight infants (see Table 6), these infants experienced the lowest rate of SIDS (2.3 per 1,000). Very low birth weight infants comprised only 8% of the total SIDS population; however, they experienced the highest rate of SIDS (5.7 per 1,000). Among low birth weight infants, the rate of SIDS was also high (4.7 per 1,000) although they comprised only 11% of the SIDS population.
Table 6

The Rate of SIDS and Birth Weight

<table>
<thead>
<tr>
<th>Birth Weight In Grams</th>
<th>Live Births</th>
<th>SIDS Cases</th>
<th>Rate Per 1,000</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLBW &gt; 1,500</td>
<td>17,512</td>
<td>100</td>
<td>5.7</td>
<td>8.0</td>
</tr>
<tr>
<td>LBW 1,500-2,499</td>
<td>33,989</td>
<td>163</td>
<td>4.7</td>
<td>11.0</td>
</tr>
<tr>
<td>HBW 2,500 over</td>
<td>523,021</td>
<td>1,217</td>
<td>2.3</td>
<td>82.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>574,522</strong></td>
<td><strong>1,480</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>

Chi square was the statistic used to determine if differences between observed frequencies and expected frequencies were beyond what would be expected by chance. Because chi square is sensitive to the number of cases, undoubtedly the result of the degree of freedom, and in every case highly significant, they were not reported in the tables.
CHAPTER V

SUMMARY AND CONCLUSION

The purpose of this study was to examine the relationship between maternal education and the incidence of SIDS among black women who gave birth in the United States during 1983. The underlying premise was that socioeconomic differentials should be related to significant differences in infant mortality rates due to SIDS. The secondary independent variables (i.e., marital status, maternal age, prenatal visits, and birth weight) were included because previous research identified them as risk factors for SIDS (Miller, 1985; Shaddy & McIntire, 1982; U. S. Department of Health and Human Services, 1986). Based on the review of the literature five hypotheses were formulated. Their findings are summarized below.

**Hypothesis 1:** The rate of SIDS will vary inversely with maternal education.

This hypothesis was supported. Previous research has identified maternal education as an important risk factor for SIDS (Shaddy & McIntire, 1982). This study confirmed that finding. The rate of SIDS among mothers with an 11th grade education or less was six times higher than the rate of SIDS among college graduates. These results, however, are inconsistent with those of Spurlock et al. (1987) who reported the infant mortality rate among
poor and nonpoor black women as similar. One possible explanation for the inconsistency might be the differences in the measurement of socioeconomic status. Spurlock et al. (1987) used AID for Families With Dependent Children and food stamp files to define categories of poor and nonpoor. In the present study, maternal education was used as an indicator of socioeconomic status.

A more plausible explanation for this seemingly inconsistent result may be that Spurlock et al. (1987) examined the overall infant mortality among the black residents of Kentucky while the present study only examined SIDS as one specific cause of death among infants born to black women. In this study, SIDS accounted for only 13% of the total deaths among black infants during 1983. Therefore, 87% of the infant mortality among black women in that year was not included.

Hypothesis 2: Single mothers will have higher rates of SIDS when compared with married mothers.

This hypothesis was supported. The majority of the SIDS cases (70%) occurred among single women. The rate of SIDS among single mothers was 3.2 per 1,000 compared with a rate of 1.7 per 1,000 among married mothers. This finding was consistent with other studies which have also identified marital status as a risk factor for SIDS (Hasselmeyer & Hunter, 1975; Miller, 1985; Shaddy & McIntire, 1982). However, it is inconsistent with the finding of the California study which found that black women had similar rates of
infant mortality regardless of marital status (Johnson, 1987). Again, one possible explanation is the use of total infant mortality among black women as opposed to a single cause. Johnson (1987) argued that marital status was not associated with overall infant mortality among black women because married women do not receive public assistance to the same extent as single women and because the spouses of black women are likely to be unemployed or men with low incomes.

**Hypothesis 3:** The rate of SIDS will vary inversely with maternal age.

This hypothesis was supported. The highest rate of SIDS (3.3 per 1,000) occurred among mothers who were under 20 years old and the lowest rate of SIDS (1.6 per 1,000) occurred among mothers who were 30 years old or older. This study confirmed findings of Shaddy and McIntire (1982) and the Department of Health and Human Services (1990). According to Davis (1988), maternal age is an important variable because younger mothers tend to be physically, educationally, and financially unprepared to begin a family.

**Hypothesis 4:** The rate of SIDS will vary inversely with the number of prenatal visits.

This hypothesis was supported. The highest rate of SIDS (5.7 per 1,000) occurred among mothers who received no prenatal care. The rate of SIDS among mothers who received 1-3 prenatal visits was also relatively high (4.7 per 1,000). The lowest rate of SIDS (1.6 per 1,000) occurred among mothers who received 10 or more prenatal visits. This finding confirms
previous research which indicates the number of prenatal visits are positively associated with higher SIDS rates (Shaddy & McIntire, 1982; Shah & Abbey, 1971; U. S. Department of Health & Human Services, 1990).

Although most women in the United States received adequate prenatal care (i.e., they begin care in the first 3 months and receive at least 80% of the recommended visits) according to a 1989 Alan Guttmacher Institute report, women most in need of adequate care (those who are under 20, single, those with less than 12 years of education, women who are black, hispanic or native American) are not receiving it because of low income, lack of insurance, limited access to care, or for social reasons (Witwer, 1990).

Hypothesis 5: The rate of SIDS will vary inversely with birth weight.

This hypothesis was supported. Although most SIDS cases (82%) occurred among normal weight infants, the lowest rate of SIDS (2.3 per 1,000) also occurred among these infants. Very low birth weight infants, in contrast, comprised only 8% of the total SIDS population but experienced the highest rate of SIDS (5.7 per 1,000). These findings confirmed those reported by Schulman and Grether (1989) who found more SIDS cases among normal weight infants (partly as a result of most live birth are of normal weight), but the highest rate of SIDS occurred among very low birth weight infants. Thus, although there are fewer low birth weight infants born, their rate of SIDS was more than twice as high as normal weight infants in this study.
Conclusion

In the United States more children die during their first year of life than at any other single year of age, up to age 65 (Arehart-Treichel, 1982; Miller, 1985). There are, however, enormous regional and racial variations. For example, if you happen to be a black infant born in our nation's capital, you will be more likely to die during your first year than an infant born in a third world country such as Trinidad ("Born in the USA," 1987).

SIDS is just one contributor to the mortality of infants in the United States. Although the exact etiology of SIDS remains unknown, many of the risk factors associated with higher SIDS (e.g., single, young, nonwhite, low education, birth weight and inadequate prenatal care) are also related to a higher risk of overall infant mortality (Shah & Abbey, 1971). These same factors also tend to be interrelated, in that infants born into lower socioeconomic groups not only have a higher risk of dying than those of the upper socioeconomic groups. At the same time, this group tend to have higher proportions of low birth weight infants, young mothers, single mothers, mothers with low education, and mothers who receive inadequate prenatal care. (Johnson, 1987; Shah & Abbey, 1971).

In examining the incidence of SIDS among black women who gave birth in the United States during 1983, the incidence of SIDS was significantly related with maternal education and other sociodemographic variables.
However, the ultimate question should be whether differentials by maternal education (or any other indicator of socioeconomic status) provide a satisfactory explanation of the differences.

Researchers have documented the inverse relationship between socioeconomic status of individuals and their risk of death in the industrialized world. Those with less income, less education, and lower occupational status all tend to experience higher rates of mortality than persons of higher socioeconomic status (Gortmaker, 1979). One way of conceptualizing these differentials has been to view them as a possible consequence of the stratification process which results in the unequal distribution of, and access to valued resources, thereby affecting one's opportunities, and experiences, including the chances of living beyond the first year of life (Gortmaker, 1979; Thio, 1986). This research suggests a need to move beyond the mere acknowledgement of an association between mortality differentials and socioeconomic status in the direction of a more precise explication of the relative impact of variables identified as risk factors in the death of an infant. This would appear to be a more rational step in beginning to understand why there is a disproportionate number of infants dying among lower social economic groups. If successful, it would ultimately provide each infant with a more equitable chance to celebrate their first year of life.
BIBLIOGRAPHY


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