7818390

WITTEN, MARY DURHAM
AN ANALYSIS OF SOCIAL FACTORS ASSOCIATED WITH
LOW BIRTHWEIGHT AND SURVIVORSHIP.

THE UNIVERSITY OF OKLAHOMA, PH.D., 1977

University
Microfilms
International 300 N. ZEEB ROAD, ANN ARBOR, MI 48106

THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

# AN ANALYSIS OF SOCIAL FACTORS ASSOCIATED WITH LOW BIRTHWEIGHT AND SURVIVORSHIP

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY


BY

MARY DURHAM WITTEN


Norman, Oklahoma

1977

AN ANALYSIS OF SOCIAL FACTORS ASSOCIATED WITH

LOW BIRTHWEIGHT AND SURVIVORSHIP

APPROVED BY

DISSERTATION COMMITTEE

ACKNOWLEDGEMENTS

My obligations to individuals who contributed to this dissertation and the experiences leading to its completion are numerous and only nominally expressed by this brief note of appreciation. My gratitude goes far beyond what is written on these pages.

I am grateful to W.G. Steglich, my major professor, for his careful direction and high standard of work. As dissertation director, he has been a creative force and supportive critic thoughout. Special thanks must be given to Wilbur Scott for his help during every phase of the work. Without his technical assistance and professional encouragement, the task of data analysis would have been overwhelming. Thanks also goes to Ivan Chapman and Marilyn Affleck for their time and interest in both the dissertation and my completion of the doctoral degree. For another member of the committee, J. Thomas May, I must reserve a special thanks. Dr. May served as the friend, teacher, and counselor whose intellectual and professional model stimulated my original and continuing interest in medical sociology.

The cooperation of the Oklahoma State Department of Public Health has been greatly appreciated. Don Ransom and Randy Little were most generous with their time and patience throughout the entire data collection process.

In addition to professional contributors, thanks must also be extended to a number of people whose personal support allowed the completion of this work. Barbara Mandel, Judi Hammer, and Orin Solloway have shown a commitment to my career that seems only matched by their commitment to their own careers. I shall greatly depend upon their colleagueship in future years. I am also grateful to my parents and to my husband for their emotional and financial support throughout the work culminating in this dissertation.

TABLE OF CONTENTS

| | | Page |
|---|---|---|
| LIST OF FIGURES | | vii |
| LIST OF TABLES | | viii |
| Chapter | | |
| I. | INTRODUCTION | 1 |
| | Statement of the Problem | 1 |
| | Statement of Purpose | 3 |
| | Kinds of Data | 5 |
| | Division of the Study | 6 |
| II. | REVIEW OF THE LITERATURE | 8 |
| | Introduction | 8 |
| | Overview of the Literature | 8 |
| | Plan of the Chapter | 11 |
| | Infant Mortality | 11 |
| | Birthweight | 23 |
| | Prenatal Health Care | 30 |
| | Legal Status | 35 |
| | Age of Mother and Parity | 37 |
| | Conclusion | 40 |
| III. | THEORY | 43 |
| | Introduction | 43 |
| | Mortality | 45 |
| | Infant Mortality | 48 |
| | Birthweight | 51 |
| | Elaboration of the Model | 55 |
| | Theoretical Propositions | 64 |
| IV. | METHODOLOGY | 68 |
| | Introduction | 68 |
| | Operationalization of Terms | 68 |
| | Statement of Hypotheses | 76 |
| | Data of the Investigation | 86 |
| | Techniques of the Analysis | 89 |
| | Linking of Birth and Death Records | 91 |

Page

Index Construction . . . . . . . . . . . . . . . . . . . . . . 91
Statistical Techniques for Analysis . . . . . . . . . . . . . 99
Conclusion . . . . . . . . . . . . . . . . . . . . . . . . . . 102

V. FINDINGS. . . . . . . . . . . . . . . . . . . . . . . . . . . . 104

Introduction . . . . . . . . . . . . . . . . . . . . . . . . 104
Description of the Sample . . . . . . . . . . . . . . . . . . 104
Analysis of the Model . . . . . . . . . . . . . . . . . . . . 114
Conclusion . . . . . . . . . . . . . . . . . . . . . . . . . . 155

VI. ANALYSIS . . . . . . . . . . . . . . . . . . . . . . . . . . 159

Introduction . . . . . . . . . . . . . . . . . . . . . . . . 159
Interpretation of the Findings . . . . . . . . . . . . . . . 159
The Revised Model . . . . . . . . . . . . . . . . . . . . . . 187
Conclusion . . . . . . . . . . . . . . . . . . . . . . . . . . 189

VII. SUMMARY AND CONCLUSIONS . . . . . . . . . . . . . . . . . . . 192

Introduction . . . . . . . . . . . . . . . . . . . . . . . . 192
Principal Findings . . . . . . . . . . . . . . . . . . . . . 193
Theoretical Implications . . . . . . . . . . . . . . . . . . 195
Limitations of the Study . . . . . . . . . . . . . . . . . . 196
Suggestions for Further Research . . . . . . . . . . . . . . 197

APPENDICES . . . . . . . . . . . . . . . . . . . . . . . . . . . 201

BIBLIOGRAPHY . . . . . . . . . . . . . . . . . . . . . . . . . . 204

## LIST OF FIGURES

FIGURE | Page

1. Diagrammatic Representation of the Theoretical Model . . . . . . . . . . . . . . . . . . . . . . . . . . 67
2. The Hypothesized Relationships . . . . . . . . . . . . . . . . . 78
3. Diagrammatic Representation of the Revised Theoretical Model . . . . . . . . . . . . . . . . . . . . . . . 190

LIST OF TABLES

TABLE Page

1. Socioeconomic Index SESOE: Mother's Education and Age . . . . . . . . . . . . . . . . . . . . . . . . . . . 93

2. Zero-order Correlations, Means, Standard Deviations of All Variables . . . . . . . . . . . . . . . . . . . . . 95

3. Stepwise Regression of Birthweight on SESINT and on SESOE . . . . . . . . . . . . . . . . . . . . . . . . . . 98

4. Stepwise Regression of Birthweight on Age and on AGEMTRAN . . 109

5. Stepwise Regression of Birthweight on Prenatal Visits and PRVSTRAN . . . . . . . . . . . . . . . . . . . . . . . 113

6. Effects of Prenatal Visits on Birthweight: Unadjusted Means and Analysis of Variance of Birthweight . . . . . . . 115

7. Stepwise Regression of Age of Mother on SESINT and Race . . . 117

8. Effects of Race on SESINT: Unadjusted Means and Analysis of Variance of SESINT. . . . . . . . . . . . . . . . . 118

9. Effects of Race and SESINT on Age of Mother: Unadjusted Means and Analysis of Variance on Age of Mother . . . . . . . 119

10. Stepwise Regression of Parity on Independent Variables . . . 122

11. Effects of SESINT on Parity: Unadjusted Means and Means of Parity Adjusted for Age of Mother, Analysis of Covariance of Parity . . . . . . . . . . . . . . . . . . . . 124

12. Effects of Race on Parity: Unadjusted Means and Means of Parity Adjusted for Age of Mother, Analysis of Covariance of Parity . . . . . . . . . . . . . . . . . . . . . . . . 125

13. Effects of Age of Mother on Parity: Analysis of Variance of Parity . . . . . . . . . . . . . . . . . . . . . . . . 126

14. Legal Status by Age of Mother: Chi Square Test . . . . . . . 128

15. Legal Status by Race: Chi Square Test . . . . . . . . . . . 130

16. Legal Status by Parity: Chi Square Test . . . . . . . . . . 131

TABLE | Page

17. Legal Status and Age of Mother Controlling for Parity: Chi Square Test . . . . . . . . . . . . . . . . . . . . 132

18. Legal Status by SESINT: Chi Square Test . . . . . . . . . . . 134

19. Legal Status by SESINT Controlling for Age of Mother: Chi Square Test. . . . . . . . . . . . . . . . . . . . . 135

20. Legal Status by Race and SES (RASES): Chi Square Test . . . . . . . . . . . . . . . . . . . . . . . . 136

21. Stepwise Regression of Prenatal Month on Independent Variables . . . . . . . . . . . . . . . . . . . . . . . . . . 137

22. Effects of Independent Variables on Prenatal Month: Analysis of Covariance of Prenatal Month . . . . . . . . . . . 139

23. Effects of Race and Legal Status (Race-Legal) on Prenatal Month: Unadjusted Means and Analysis of Variance of Prenatal Month. . . . . . . . . . . . . . . . . . . 140

24. Effects of Parity on Prenatal Month: Unadjusted Means and Analysis of Variance of Prenatal Month . . . . . . . . . 142

25. Effects of Age of Mother on Prenatal Month: Unadjusted Means and Means of Prenatal Month Adjusted for Parity, Analysis of Variance of Parity . . . . . . . . . . . . . . . 143

26. Stepwise Regression of Prenatal Visits on Independent Variables . . . . . . . . . . . . . . . . . . . . . . . . . . 146

27. Effects of Race and Legal Status on Prenatal Visits: Unadjusted Means, Analysis of Variance of Prenatal Visits . . . . . . . . . . . . . . . . . . . . . . . . . . 148

28. Effects of Independent Variables on Prenatal Visits, Analysis of Covariance of Prenatal Visits . . . . . . . . . . . 149

29. Stepwise Regression of Birthweight on Independent Variables . . . . . . . . . . . . . . . . . . . . . . . . . . 152

30. Stepwise Regression of Infant Mortality on Independent Variables . . . . . . . . . . . . . . . . . . . . . . . . . . 156

31. Effects of Independent Variables on Dependent Variable, Infant Mortality: Unadjusted Means of Infant Mortality by Race, Analysis of Covariance of Infant Mortality . . . . . 157

AN ANALYSIS OF SOCIAL FACTORS ASSOCIATED WITH
LOW BIRTHWEIGHT AND SURVIVORSHIP

# CHAPTER I

# INTRODUCTION

## Statement of the Problem

The vast majority of children born in the United States today weigh over 2,500 grams (5 lbs., 8 oz.) at birth. In fact, during 1975, only 7.5 percent, or approximately 237,675 infants, weighed 2,500 grams or less at birth. Although low birthweight infants represent only a small portion of live births that occur every year, they present special problems to both medical professionals and scientists who study their incidence, significance, and implications. Although infant mortality rates in 1900 of 97.3 deaths per 1,000 live births have now declined to a rate of 16.5 per 1,000 live births (1975), early infancy is still a hazardous period. Approximately 60 percent of all infant deaths are attributed to low birthweight infants. Two-thirds of the infants who die succumb within four weeks after birth. Shapiro and Unger (1965) report that "immaturity" (defined by them as low birthweight) is most often cited by the attending physician as a factor in causing the child's death.

The risk of death for a low birthweight infant is enormous. Very few infants weighing 1,000 grams or less at birth live through the first 28 days of life (the neonatal period). With each 500 gram increment in birthweight, the chance of an infant's survival improves considerably. While over half of those infants weighing 1,001 to 1,500 grams die neonatally, the death rate in the heaviest low birthweight group (2,001 to 2,500 grams) is approximately 50 per 1,000 infants. Results of a 1950 linked record study done by the National Center for Health Statistics (1965) indicate that the neonatal death rate (deaths in the first 28 days of life) was 173.7 per 1,000 for low birthweight infants, compared with 7.8 among all other infants. An infant who is born at a weight just above 2,500 grams (2,501 to 3,000 grams) finds the risk of death reduced from 50.4 per 1,000 (2,001 to 2,500 grams) to 12.6 per 1,000.

Mortality is only one outcome of low birthweight. Evidence strongly suggests that low birthweight is also associated with mental retardation, Down's Syndrome (mongoloidism), a low general level of health, opthalmological disorders, and numerous other conditions. We also know that the cost of hospitalization for the newborn weighing less than 2,500 grams is six times greater than the expense for larger infants (NCHS, 1965).

Although many studies have documented the association between birthweight and the capability of a newborn to survive infancy (Chase, 1962; Fraccaro, 1956; Montgomery, 1963, and numerous others), identification of factors which influence the weight of a child at the time of its birth has been less precise. Identifying some of the factors which predict the occurence of low birthweight might provide those responsible for care with the ability to prepare for the special needs of infants and their families. Exploring the social factors which are associated with low birthweight and survivorship provides an important elaboration of constructs such as social differentiation or social and economic deprivation on physiological processes.

## Statement of Purpose

### Relationships Which Are Sought

Although hundreds of studies have addressed the question of the relationship between low birthweight and infant mortality and the identification of variables which are related to low birthweight, this researcher has been unable to locate a single study which systematically formulates a causal model which might be used to explicate these complex relationships. If research results cite the importance of factors such as socioeconomic status or race on low birthweight, they most generally fail to speculate as to what other social factors, if any, might intervene between those independent variables and the dependent variable, "birthweight." In other words, they do not tell us what it is about low socioeconomic status which accounts for its marked influence on the birthweight of a child. Are there identifiable social factors which link race to low birthweight? Even some of the most sophisticated studies in the area employing multiple regression techniques for predicting the incidence of low birthweight fail to go beyond a presentation of the proportion of variance explained by the linear combination of selected variables. Few attempts have been made to elaborate further the two variable relationships and provide what might result in a more meaningful analysis.

This dissertation will present a causal model which has been constructed to explain the influence of social factors on the incidence of low birthweight and the infant's ability to survive the first year of life. The analysis will be limited to variables which are of a social nature (e.g., race, socioeconomic status, health care) rather than physiological variants (e.g., heart size, placental anomalies, toxemia in pregnancy). Although the latter undoubtedly play a critical role in the incidence of low birthweight, they are beyond the scope and intention of this investigation. Indeed, it is our intention to demonstrate the impact of social factors which influence a child's weight at birth.

## Area of the Dissertation

This dissertation is applicable to the field of medical sociology. One area of medical sociology which has made outstanding contributions to the understanding of disease and disease processes is concerned with demographic studies. In this field, factors affecting the epidemiology and etiology of mortality and morbidity have been analyzed at length. A pattern emerging from these studies points to substantial differences in mortality and morbidity among different socioeconomic groups. For example, it has been observed that infant mortality is 80 to 90 percent higher for nonwhites than for whites (NCHS, 1965). Medical sociologists have been among those seeking to explain the differential mortality rates by analyzing a complex of factors, including the health and pregnancy experience of the mother, the adequacy of medical care and cultural patterns of child-rearing. In this respect, medical sociology addresses the larger sociological area of social differentiation. Research findings which illustrate the impact of socioeconomic deprivation and health and survival dramatically demonstrate the impact of social stratification or differentiation on human life.

## Kinds of Data

Data for this dissertation are from vital records from the Oklahoma State Department of Public Health. All birth and death certificates from 1975 were made available to the researcher. A sample of 430 infants was drawn from the microfilmed registry of all infants born alive in 1975. Death certificate numbers were then linked with a cross-classified birth certificate listing to ascertain if the child died within its first year of life. It should be noted here that linked records (linked death and live birth certificates for infants born in 1975 and who died before their first birthday) are a fairly rare data source for a state vital records agency to have on hand. This linked record series has just been completed in Oklahoma, existing only for years 1975 and 1976. Since the period of infancy extends one year from the date of birth, all subjects for our sample were born in 1975. In this manner, the incidence of mortality for babies born during 1975 could be traced till their first birthday (1976) when the period of infancy was over. Since the available linked record series ends with December of 1976, analysis of birth records for 1976 and death records (which would extend into 1977) was impossible. Births only during 1975 were included in our sample. The importance of having a linked record series as a source of data is obvious for the problem at hand. From information collected from existing vital records, a causal model has been tested to explore the sequence of social factors that influence birthweight and a child's chances of surviving infancy.

## Division of the Study

The format of the study follows a developmental sequence which begins with a survey of the literature ("Review of the Literature," Chapter II). Chapter II reviews research which has been done on birthweight and infant mortality and social factors. These include race and socioeconomic status, age of the mother, prenatal health care (both its timing and its frequency), parity of the mother, and legal status of the child. Chapter III employs the knowledge of the field in the development and presentation of a theoretical scheme, displaying the manner in which social factors influence birthweight and survivorship. Chapter IV, "Methodology," translates the model into a logical sequence of research propositions and hypotheses which will later be tested and analyzed. Chapter IV describes the sample, the data of the investigation, the techniques of the analysis and other pertinent methodological information. Chapter V, "Findings," describes the findings of the research and provides the reader with data essential for their interpretation. Chapter VI, "Analysis," analyzes the findings in detail and assesses the power and utility of the theoretical model and its resultant empirical design. The final chapter presents a summary of the findings with conclusions and suggestions for further research in the problem area.

## CHAPTER II

## REVIEW OF THE LITERATURE

### Introduction

An immense volume of literature on infant mortality and birthweight has accumulated over the years. In this chapter some of the major themes of the literature indicating the contribution of social factors to birthweight and infant mortality will be surveyed. First, however, some of the shortcomings of research that has been published in the area will be noted.

### Overview of the Literature

Although there is a relatively large volume of literature on infant mortality and low birthweight, the quality of the research is strikingly uneven. The widely different kinds of samples that have been employed often make the comparison of results difficult or unfeasible. More often than not, samples upon which research is based come from hospital or clinic records, or from patients who attend prenatal clinics. While selection of patients or patient records from hospital or clinic files may be systematic, the self-selection of patients into such care facilities most often produces a biased sample. Results are often published with little or no mention of possible sample bias resulting from patient self-selection into ongoing care programs or hospital maternity wards.

One excellent source of comparative data based on more representative samples is the National Center for Health Statistics. This research agency samples vital records and other pertinent sources of data from every state in addition to commissioning projects of its own. However, in the NCHS's data from the national vital statistics system ("Vital and Health Statistics"), analysis is often delayed because of the immense scope of the data. Provisional statistics which monitor changes in infant death rates, fertility ratios and other pertinent data are published monthly. However, analyses of birth certificate data, such as birthweight, prenatal care, and trends in legitimacy, are provided only at intervals. Current natality analyses (1977) involve data no more recent than the early 1970's. More recent analysis is delayed until considerable time has passed.

In addition, many of the studies published by the NCHS in the past have been concerned with all legitimate U.S. births as their population universe. This limitation is also found in a large proportion of medical and social science literature on birthweight and its relationship to other social variables. The reason researchers omit out-of-wedlock births from their population universe is seldom explained in published accounts of their results. An assumption may be made that either they do not have access to this information, that they feel that recording such information is an invasion of the privacy of the respondents, that birthweight and related variables operate differently for married vs. unmarried women, or that legal status is unimportant in explaining the variables in question. Regardless of their motives, the literature existing on birthweight is found to be inadequate because it often fails to take legal status into account as a key variable.

Although standard operational definitions of infant mortality and low birthweight have been used in nearly all studies presented in the literature, the operationalization of independent variables and the procedures of data collection vary extensively. It is not surprising that variables identified as correlates of infant mortality and low birthweight vary considerably from one study to the next.

For purposes of classification, infants weighing 2,500 grams (5 lbs., 8 oz.) or less at birth are referred to as "low birthweight." This weight criterion was recommended by the American Academy of Pediatrics in 1935 and later adopted in the Sixth Revision of the International List of Diseases and Causes of Death (1948). It is still the criterion used by that International listing (now in its eighth revision) and is also the standard recommended by the World Health Organization (1950, 1957). The standard of 2,500 grams has become a convention in classifying a child as low weight or above. This refers only to the weight of the child at birth with no implications as to length of gestation or any other means of maturity. Because of its use as a solitary measure of maturity of an infant at birth, this criterion has been met with criticism from researchers such as Yerushalmy et. al. (1965) who claim that the standard of 2,500 grams obscures medically important differences between like-size infants of dissimilar gestational ages. For purposes of this research, we acknowledge this limitation but argue that birthweight in itself has a unique relationship to an infant's ability to survive and to the social variables that are associated with an infant's weight at birth. The criterion of 2,500 grams or less is useful for classifying infants at birth because of its standard usage in medicine and in the literature. The most important justification of its use is that a child's ability to survive infancy appears to be significantly related to birthweight; thus its chances of survival at birth are greatly enhanced with every gram in weight over 2,500.

## Plan of the Chapter

In order to summarize systematically the literature pertinent to the research problem, we will begin by discussing how social variables influence infant mortality and birthweight. As the variables which appear to be important predictors of these dependent variables are identified, their relationship to one another will be discussed.

## Infant Mortality

### Birthweight

Infants who weigh 2,500 grams or less at birth have a mortality rate over twenty times greater than the rate for other infants. The only set of national data available on the relationship between birthweight and infant mortality is a special NCHS study which reports trends in the U.S. during the first three months of 1950 (Shapiro and

Unger, 1965). Ample evidence suggests that the associations have not changed since that early study. An overview of the literature also reveals dozens of studies documenting higher mortality rates for low birthweight infants, with risks multiplying with every gram below 2,500 (Chase, 1962; Steiner and Pomerance, 1950; Montgomery, 1963; Schneider, 1968, to name a few). While the relationship between low birthweight and mental retardation (Katz et. al., 1967; Benton, 1940; McDonald, 1963; Kantero, 1965), cerebral palsy (Alberman, 1963; McDonald, 1963), opthalmological disorders (Howard, 1952; McDonald, 1962), morbidity (Butler, 1965; Drillien, 1958, 1970; Dunn, 1965; James, 1958), Down's Syndrome (Smith and McKeown, 1955), and other illnesses is still debated and explored, there seems to be no question that low birthweight infants have far higher rates of mortality in infancy than heavier babies. In 1975, of the infants who had birthweights of 2,500 grams or less, very small babies (1,500 grams or less) represented only about 1.1 percent of all live births. Two-thirds of all low weight infants fall into the 2,001 to 2,500 gram category (NCHS, 1976). Plural births are more likely to produce low birthweight babies than single births. While only 2 percent of all live births are members of plural sets, 14 percent of all infants weighing 2,500 grams or less at birth are plural births. Over half (54 percent) of the children born in multiple deliveries, as compared to 6.8 percent of single births, are low weight infants. However, mortality risk is lower among plural births whose weights range from 1,001 to 3,000 grams than single births of the same weight. Above 3,000 grams, however, single births have a major advantage (NCHS, 1965).

One of the most important themes of the literature on infant mortality is the critical role of an infant's "maturity" at birth. As a measure of maturity, birthweight has been continuously employed because of the ease of collection and its greater reliability. Other anthropometric measures of maturity frequently referred to in the literature are gestational age, crown-heel length, and head circumference. They have often been used independently or in conjunction with birthweight and other measures as better predictors of infant mortality than birthweight alone (Yerushalmy, 1938, 1965, 1967). However, the purpose of this research is to look at the unique contribution of birthweight and a number of important social variables on infant mortality.

In sum, most observers agree that low birthweight is highly associated with survivorship in infants. However, less agreement exists concerning the relationship between socioeconomic status (SES), race, and infant mortality.

## Socioeconomic Status

It has been recognized for a long time that socioeconomic status is related to the opportunity and risk associated with an individual's life situation. Socioeconomic status is a construct denoting a style of life within which an individual has been socialized, the likelihood of access to opportunities, experiences, and life demands. It has served as one of the most prominent variables used by social scientists in recent decades (Mechanic, 1968). This study must of necessity limit its measurement of SES to the educational level of the mother since no other suitable SES indicator is recorded on the birth certificate. However, a brief survey of the relationship between SES--measured in a variety of ways--and survivorship will be presented so the consistency of this association may be examined.

According to The U.S. President's Commission on Population Growth and the American Future (1972), mortality varies inversely with the level of education for adults (individuals 25 years and over). This pattern is found for both whites and nonwhites in the U.S. and for males and females. However, the inverse relationship between education and mortality is stronger for females than for males. At age 25, for example, white females with at least one year of college can expect to live almost ten years longer, on the average, than females who complete less than five years of schooling. The differences in income level are similar to those found in educational level. The National Survey of Natality and Mortality conducted by NCHS in 1964-1966 found an inverse relationship between family income, education of both parents, and infant mortality with 34.8 deaths per 1,000 infants born to mothers having an elementary school education or less compared to a rate of 19.7 per 1,000 for mothers with four or more years of college (Wunderlich, 1972). Stockwell (1963) uses two different measures of SES (social area analysis and Shevky and Williams' Five Characteristics Index) and finds that, although the manner in which SES is measured makes a marked difference, there is a consistent relationship between SES and mortality. Not only is SES inversely related to mortality, but there is no indication that the relationship is changing. Antonovsky (1967) points out that in the lowest socioeconomic groups no relative improvement has been made over recent decades. The decrease in mortality due to the reduction of infectious disease in earlier decades benefited both lowest socioeconomic groups and the more privileged. However, Antonovsky believes that the benefits which came to low socioeconomic groups due to this increased control have not contributed to reducing chronic disease. Management of chronic disease requires continuous medical care which is unavailable to (or utilized by) the lowest SES groups.

Just as SES has been shown to be associated with mortality, so does it also influence rates of infant mortality. A National Academy of Science study (1972) finds a consistent association between social class, as measured by mother's education, and infant birthweight and survival. Although the findings are undoubtedly contaminated (the study failed to account for the confounding effects of age of mother on education), infants of mothers with one year or more of college have a death rate less than one-half that of infants whose mothers did not finish high school. Daly _et_. _al_. (1955), using the occupation of the father as a measure of SES in England and Wales, find the two variables to be inversely related. In a study in Syracuse, New York (Stockwell, 1962), family income is found to be significantly associated with neonatal and postneonatal mortality rates, but SES, based on education and occupation, is only associated with postneonatal mortality (deaths which occur between 28 days of birth and the end of the first year of life).

Further research is needed to explore and clarify the exact relationship between SES and infant mortality. Although this research will use only one dimension of SES, the education of the mother, it is undoubtedly one dimension that deserves attention. Duncan (1961) argues that there is no such thing as a single index of SES suitable for all research purposes. He recommends that indicators such as occupation, income, and education be used as separate dimensions of social stratification rather than in combined form. Although our data do not allow us to probe the impact of income, occupation or other socioeconomic indicators on our dependent variables, educational level is undoubtedly an important dimension to analyze.

## Race

Mortality rates in the U.S. vary according to race, nonwhite groups having rates that are generally higher than those of whites. The gap between the two groups is narrowing, however. In 1900 a white person's life expectancy at birth was 47.6 years compared to 33.6 for nonwhites. The difference now is 5.7 years, with whites living an average of 72.7 years and nonwhites, 67 years (NCHS, 1977). Nonwhites in the U.S. today have higher rates of heart disease, malignant neoplasms, and cirrhosis of the liver than whites. Nonwhites also have two times as many fatal accidents and 8 to 10 times more deaths from homicide than whites in corresponding age categories. Nonwhites have a higher death rate from each of the ten leading causes of death in the U.S., suicide being the one exception (calculated from Vital Statistics of the U.S., Mortality, 1968).

Since nonwhites in the U.S. are far more likely than whites to be poor, white and nonwhite distinctions are, at least to some extent, a result of living under different socioeconomic circumstances. While the number of blacks earning more than $10,000 per year is increasing, in 1977 almost one-third of all black families are still below the poverty line of $5,500 for an urban family of four. Only 8.9 percent of all white families fall below the poverty line. The unemployment rate among blacks is 13.3 percent while for whites it is 6.1 percent. We find that 39 percent of black teenagers were unemployed during the summer of 1977 compared to 14.3 percent of all white teenagers. Figures for 1977 show that 55 percent of the nation's blacks and 49 percent of Hispanic minorities live in the most depressed areas of central cities (Russell, 1977).

The survival of infants of different ethnic groups varies widely. Fetal and infant mortality rates among nonwhite infants have been consistently higher than those for white infants for as long as national vital statistics have been kept (National Academy of Sciences, 1973). Infant death rates for nonwhites are almost twice as great as the rate for white infants. In the first 24 hours following birth, the differential between whites and nonwhites is approximately 50 percent. At ages of two to three days, the difference drops to about 30 percent. But with every successive day to the end of the semanatal period, the differential increases sharply until at the end of six days the rate for nonwhite infants is more than twice the rate of whites. This differential between nonwhite and white infants continues to widen after the first week of life. By age three to eight months, the rate for nonwhites is three times greater than for whites. During the remainder of the postneonatal period, the margin narrows only moderately between the two groups (NCHS, 1965).

The neonatal mortality rates (deaths from birth to age 28 days) for white and nonwhite infants declined at about the same rate between 1935 and 1949 at a rate of three percent per year (NCHS, 1965). But between 1945 and 1968, the decline was more rapid among white than nonwhite infants, except in the category of fetal mortality in which nonwhites had greater declines. An increase in mortality may also be observed among nonwhite infants during the first 24 hours of life. However, this may be associated with the increasing proportion of nonwhite infants being born in hospitals where more complete and accurate recording of births and deaths is likely to occur (National Academy of Science, 1973).

While there is a clear pattern of higher infant mortality for nonwhites than for whites, deaths are curiously related to birthweight for racial groups. It is known that more nonwhite infants have low weights (under 2,500 grams) at birth. Chase (1969), Baumgartner (1962), Duffield (1940), Anderson (1943), and Kovar (1968) all report statistically significant differences in birthweight between white and nonwhite infants. In Oklahoma in 1975 (OHS, 1975), 6.9 percent of all white live births weighed less than 2,500 grams compared to 13.3 percent for all black births.

At the very lowest birthweights, most studies show that nonwhite infants have a somewhat better chance of surviving the neonatal period than white very low birthweight infants (NCHS, 1965; Taback, 1951; Stevenson, 1957; Chase, 1969; Baumgartner, 1962; Duffield, 1940). However, greater neonatal risk at higher weights and greater postneonatal rates for nonwhite infants make their mortality rate greater than that of white infants.

A number of hypotheses--all of which are inconclusive--have been forwarded to explain the nonwhite low birthweight infant's advantage during the neonatal period. Stevenson et. al. (1957) and Baumgartner (1962) suggest that lower nonwhite mortality rates during the neonatal period are due to the greater number of white deaths from congenital malformations. Baumgartner finds that 13.6 per 1,000 white infants, but only 6.3 per 1,000 nonwhite infants have their deaths attributed to congenital malformations. Neither study suggests what factors might precede the greater number of malformations in white low weight infants.

An explanation often given for lower neonatal mortality at low birthweights among nonwhite infants is that fetal death rates at these weights are higher among nonwhites. Erhardt et. al. (1964) claim that excess fetal deaths cannot explain the difference. They claim that fetal death rates for babies born before term and at low birthweights are lower for both whites and nonwhites than at higher weights. They claim that nonwhite infants at every weight group have a shorter duration of gestation than whites. Nonwhites, however, tend to be slightly heavier, on the average, when delivered early (under 30 weeks gestation). Taback (1951) and Anderson also claim that the duration of pregnancy is shorter for black mothers. Taback goes on to claim that the logical limit for a nonwhite infant to be classified as low birthweight is at 2,350 grams rather than 2,500 grams. Anderson opts for 2,300 grams for black infants and 2,500 grams for whites. Some researchers (Shapiro and Unger, 1965) suggest that nonwhite infants of low birthweight are more fully developed at birth and, therefore, are better able to survive. They attribute higher mortality in the postneonatal period to environmental factors. They also claim that the nonwhite advantage disappears after four to five days--a time after which the infant leaves the hospital and goes home into a new and more hazardous environment. However, Chase and Byrnes (1972) refute the claim that more nonwhite infants are born preterm. They present data from a national sample showing shorter gestational periods for whites than nonwhites.

Clearly, the findings concerning race and low birthweight are inconsistent and inconclusive. This dissertation will analyze this relationship carefully and clarify the trends in Oklahoma during 1975.

## Age of Mother

Since the age of mother appears on live birth certificates, numerous studies have documented a relationship between a mother's age at the time of her infant's birth and pregnancy loss. They most often show that a curvilinear relationship exists between a mother's age and infant mortality: infants of youngest and oldest mothers have the highest infant death rates. Although the results are generally in the same curvilinear pattern the age parameters may be different from one study to the next. Bundesen _et_. _al_. (1951) find the highest number of deaths occurring among infants whose mothers are 15 or less or 45 or older. Heady, Daly, and Morris (1955) combine parity[1] and age of

---

[1]Parity is defined here as the number of pregnancies resulting in a live birth.

mother to identify three groups extremely vulnerable to stillbirths and infant death. Mothers over 35 bearing their first babies have high stillbirth risk and mothers over 40 of any parity have a high risk of stillbirth. Babies of young mothers with high parity for their age have a high risk of postneonatal death. This is true for very young mothers having the second or later child and for women aged 20 to 24 having a third or later child. A National Center for Health Statistics publication reported by Shapiro, Schlesinger, and Nesbit (1965) states that neonatal infant loss among first births for women aged 15 to 19 is moderately high. Neonatal mortality for first births is lowest at ages 20 to 24 but climbs rapidly as age increases beyond 30. Second order births among 25 to 29 year olds are the highest of any age-birth order category. The risk for mortality also increases after age 30 regardless of birth order.

## Prenatal Health Care

Very few studies which directly relate prenatal care to infant mortality are available in the literature. Although the reason for this gap is unknown, the results of two studies will be mentioned here. Buetow (1961) attributes the increasing rate of neonatal mortality in Baltimore, in part, to a decreased number of women seeking prenatal care. This trend is also associated with an increase in the number of deaths during the first 48 hours after birth. Shapiro, Schlesinger, and Nesbitt (1965) do not link prenatal care directly to infant mortality but do claim that higher risk pregnancies are least likely to get prenatal care. High risk groups are identified as low socioeconomic groups including both rural and urban poor and nonwhites. They argue that, since the 1950's, the proportion of people residing in low socioeconomic, rural areas without medical facilities and highly trained physicians has been reduced, but that infant mortality has not declined as expected. In the 1940's, when similar conditions prevailed, infant mortality declined sharply. The authors claim that the marked difference between the 1940's and the 1950's is due to a number of factors. First, during the 1940's, maternal and child health programs at state and local levels were greatly strengthened, and infant mortality was a prime target of health department activities. Programs were designed to meet the immediate needs of wives and infants of men in the military during World War II. Second, a large part of the reduction in the infant death rate was due to the control of infectious diseases whose toll was still substantial at the beginning of the 1940's. Third, in the 1950's, the general direction in reducing infant mortality was through "new insights into basic biological processes." This focus tended to dampen interest in action programs. In the 1950's, significant innovations in medicine and action programs also failed to materialize. Finally, the authors link the migration of nonwhites to metropolitan areas in the 1950's to a lack of community facilities for health care. The migration and lag in health care facilities contributed to high infant mortality rates.

## Legal Status

Substantial evidence in the literature suggests that infants born out-of-wedlock have a higher risk of infant death than those born to married women (Griswold and Cavanagh, 1966; Stevenson, Garnee, and

Siegel, 1957; Packter *et*. *al*., 1961). Each study points to higher illegitimacy rates among nonwhites as a major factor in the relationship between illegitimacy and infant mortality. Packter *et*. *al*. studied medical aspects of out-of-wedlock births in New York City and found that, even within specific ethnic groups, unmarried women have more complications of pregnancy and their children have higher death rates than married women. However, they found that married nonwhite women have a higher risk of pregnancy complication and loss than unmarried white females. Single females, as a group, are two times more likely to lose their newborn child than married mothers. Packter and her colleagues claim that the higher number of premature infants among out-of-wedlock births is a major factor in pregnancy complication and infant deaths. Clague and Ventura (1968) claim that the fetal death ratio (fetal deaths per 1,000 live births) is 50 percent higher for unmarried than for married white women. For nonwhite women, the fetal death ratio shows about a 10 percent difference between single and married mothers.

Just as each of the independent variable discussed here has an effect on infant mortality, these variables also influence another negative pregnancy outcome, low birthweight.

## Birthweight

Over 92 percent of the babies born in the U.S. in 1975 were mature in terms of birthweight, weighing over 2,500 grams (5 lbs., 8 oz.). While 7.5 percent of all live births were low weight in the U.S., a slightly lower proportion (7.4 percent) were low weight at birth in Oklahoma during that same year. Studies reported in the literature emphasize considerable variability in birthweight by socioeconomic status, race, age of mother, legal status, and timing and frequency of prenatal care.

## Socioeconomic Status

Using a variety of indices for the measurement of SES, numerous studies find an inverse relationship between socioeconomic status and an infant's weight at birth. With similar results, Drillien (1958, 1974), Chase (1962), Douglas (1950), Grundy (1957), and Martin (1954) all use the father's occupation as an index of SES. These studies all indicate that "premature" (under 2,500 grams) births are more common among wives of semiskilled and unskilled workers than among professional classes. On the other hand, Chase (1962) finds that in her Upstate New York sample, there is no increase in fetal and neonatal mortality among lower socioeconomic groups. However, SES is highly associated with low birthweight, and low birthweight provides the necessary link between SES and infant mortality. Kovar (1968) reports that in the National Natality Survey of 1963, family income is inversely related to low birthweight. Rosen _et_. _al_. (1968) find indigent patients to be far more likely to deliver low birthweight infants, while Hendricks (1967) suggests that SES and birthweight may be predicted from whether a mother is a private or a clinic patient. A number of studies (Armstrong, 1972; Rosenwaike, 1971) describe lower birthweights among first and fifth or higher order births. Rosenwaike asks if this adverse experience of the higher birth order infant is due to the higher parity or due to the fact that higher birth orders are more often found in low socioeconomic families. His findings suggest that there is an inverse relationship between SES and low birthweight at every parity. Using the mother's education as his measure of SES, he finds SES as the critical variable in predicting low birthweight.

Although the literature presents a large volume of data concerning the socioeconomic status of a mother and pregnancy outcome (low birthweight, infant mortality, or both), unresolved questions still remain. Although low SES is frequently associated with infant mortality and low birthweight, considerable variation may be found to exist. Anderson (1959) found that during 1911-1916, native-born Americans had a much lower rate of infant mortality than foreign born. However, Jewish immigrants, who lived under conditions as crowded as other foreign born residents, bore as many children, and had much lower incomes than the native-born Americans, nevertheless, experienced the lowest infant mortality rates of any group. It may be argued that low SES is not in itself a sufficient condition for high infant mortality rates. Anderson suggests that patterns of infant care may play an important role in explaining infant mortality rates between socioeconomic groups.

## Race

As early as 1904, T.F. Riggs published an article in The Bulletin of Johns Hopkins Hospital documenting differences in birthweight between white and nonwhite infants. Numerous studies later yielded conclusions similar to those of Riggs (Shapiro, 1954; Duffield, Parker, and Baumgartner, 1940; Packter, 1961; Erhardt *et. al.*, 1964;

Conner, 1957; Chase, 1969; Bennett and Louis, 1959). Authors such as Anderson, Brown, and Lyon (1943) claim that the differences between whites and blacks are so dramatic and consistent that separate weight categories should be established for each group. They believe that low birthweight should be delineated by 2,500 grams for whites, but at only 2,300 grams for blacks.

Kovar (1968), Scott (1950), and Wiener and Milton (1970) each consider the effects of SES (as measured by income) on race and pregnancy outcome with similar results. Kovar and Scott each find that within income classes, the average birthweight of babies born to white women is higher than that of nonwhite women. The decreased proportion of nonwhite births in each succeeding income class accounts for part of the increase in birthweight, but variations in birthweight according to income are found among both black and white populations. Kovar finds that at incomes above $7,000 per year (in 1962), 5.4 percent of births to white mothers and 9.6 percent of births to nonwhite mothers are low weight. At incomes below $3,000 per year, 8.8 percent white and 14.0 percent of births to nonwhites are low weight. A 1973 National Academy of Science study finds that, when black and white mothers receive adequate care and have comparable medical risks, their infants' chances of survival are similar. On the other hand, Weiner and Milton, using median rental by census tract as their measure of SES, find that, relative to race and trimester that prenatal care began, SES is much less important in predicting birthweight. Baumgartner (1962) sees socioeconomic status as an intervening variable between race and birthweight. He claims that when medical care is standardized for whites and nonwhites, differences in weight are minimal. He also notes that high postneonatal death rates among blacks are due to environmental factors, such as housing and poor health care, which work to their disadvantage. Salber and Bradshaw (1951) concur with Baumgartner in their South African study. Non-European infants in South Africa tend to weigh less than European babies. They believe that a family's economic level contributes to the difference. Their premise is that the lower economic level reflects itself in the health and nutrition of the mother. However, they lack evidence to give this notion any empirical support.

## Age of Mother

As in the case of age and infant mortality, age is reported in much of the literature as having a curvilinear relationship with birthweight (Armstrong, 1972; Weiner and Milton, 1970; Rosen, 1968; Baird, 1964). According to NCHS reports (1970), the proportion of low birthweight infants varies considerably with age of mother. In 1967, mothers who were less than 20 years of age and, to a lesser extent, mothers 35 to 44 had the greatest incidence of low weight births. Rosen et. al. (1968) find the same age categories to be critical in their sample of low socioeconomic status black women. In a study of juvenile pregnancy, Battaglia (1963) finds that, regardless of marital status, girls who are under 15 years of age have a high risk in pregnancy and those 14 or younger are especially vulnerable to complications in pregnancy.

## Legal Status

Low birthweight is more characteristic of illegitimate births than of infants born in-wedlock. In 1964, the median weight for legitimate infants was 3,310 grams while the median weight for illegitimate infants was 3,110 grams. Moreover, 14.6 percent of illegitimate, compared to 7.7 percent of legitimate, births were low weight (Clague and Ventura, 1968). Clague and Ventura point out that more nonwhite legitimate babies (13 percent) are immature than white illegitimate births (11.3 percent), but the gap between legitimate and illegitimate births is wider for white infants. In other words, nonwhite infants have higher rates of immaturity than white infants regardless of their legal status; whereas legal status makes a substantial difference in the weight of white infants. For whites, 6.8 percent of legitimate babies and 11.3 percent of out-of-wedlock babies are low birthweight. Packter and her associates find unmarried women who are pregnant are two times more likely to have low weight infants than married women. However, more low weight births occur among nonwhite married mothers than among whites whose children are born out-of-wedlock.

We know from the literature that higher birth order children have a higher average weight than lower order births (Battaglia, 1963; Von Der Ahe, 1967; Wiener and Milton, 1970; Gibson, 1951; Douglas, 1953; Duffield, 1940). During the period of 1940 to 1965, fewer second and higher order births were low weight (8.0 percent) than were first births (8.5 percent). This was true regardless of legal status or racial classification with one striking difference. Among white out-of-wedlock births, 13.2 percent of the second and higher order births were immature but only 10.4 percent of the first births. Clague and Ventura claim that this difference may reflect a difference in socioeconomic environment and medical care between mothers of first out-of-wedlock births and those who have second and higher order out-of-wedlock births.

## Prenatal Health Care

Some question arises in the literature as to whether prenatal health care is a critical factor in pregnancy outcome. Shah and Abbey (1971), Montgomery (1963), Eastman (1947), Shwartz (1962), Kovar (1968), Wiener and Milton (1970), and Buetow (1970) all claim a significant association between prenatal care, birthweight and survivorship. Wiener and Milton stress the importance of beginning care early in pregnancy and claim that women who begin care in the third trimester of pregnancy have about the same rate of low birthweight infants as those who have no prenatal care. While Eastman claims that lower rates of low birthweight infants may be found among women having more frequent visits to their physician during pregnancy, Kane (1964) points out that it is mothers having difficulties in pregnancy who have a high number of prenatal visits. Kane claims that, except for the first pregnancy, there is no relationship between the number of prenatal visits and outcome. Terris and Gold (1969) and Schneider (1968) also present data showing prenatal care does not significantly decrease the incidence of low birthweight. However, they acknowledge that these findings are opposed to what is most often suggested in the literature.

Rosenwaike (1971) claims that SES plays a critical role in predicting low birthweight. When the effect of prenatal care is controlled, socioeconomic status (as measured by education of the mother) is the critical variable. College graduates are less likely to have a low birthweight infant regardless of when prenatal care begins. He concludes that the relationship between SES and birthweight is not explained by age of mother. Even older mothers who are college graduates have lower rates of low birthweight infants than high school graduates in the most favorable age categories. He points out, however, that in all SES (education) categories other than college graduates, when care begins does make a difference in terms of pregnancy outcome. He goes on to explain that higher education is associated with higher intelligence, better health care judgment, increased self discipline, and a greater ability to follow doctor's orders. Baird (1964), in a study conducted in a European city in a setting where all social classes are believed to receive a "good and uniform standard of obstetrical care," finds that higher SES mothers have fewer children and are older at the birth of their first child. As lower SES mothers have more children (four or greater pregnancies), their risk of a negative outcome also increases. Daly _et_. _al_. (1955) use the same indicator of SES--the occupation of the father--as does Baird and find that SES, age, and parity vary together.

## Prenatal Health Care

The month in which prenatal care first begins is one important means of assessing the adequacy of care received during pregnancy. In 1973, about 99 percent of all pregnancies terminating in a live birth received some prenatal medical care. The Health Interview Survey of 1973 reports that, in 59.1 percent of all pregnancies which terminate in a live birth, mothers receive medical care during the first two months of pregnancy. The national survey also reveals that an average of 11.3 prenatal visits are made for each pregnancy resulting in a live birth. However, according to the literature, the timing, frequency, and quality of prenatal care varies according to the SES, race, age, and marital status of the mother.

## Socioeconomic Status

Mothers who may be classified as having low SES are also more likely to delay or forego seeking prenatal health care. In addition to prohibitive costs, the mother may find a forbidding atmosphere in a hurried, crowded public clinic, care which lacks continuity, and which may be offered at only inconvenient times and in inaccessible places (Herzog and Bernstein, 1964). Rashbaum (1963) finds that many Hispanic patients delay seeking prenatal care because of language barriers. Patients are sometimes expected to take the initiative to provide their own interpreters in order to communicate with clinic staff. The Health Interview Survey of 1973 also indicates that family income and educational level are directly related to the proportion of mothers who seek prenatal care. Pregnant women with family incomes below $5,000, or without a high school degree are less likely to receive prenatal care during the first trimester of their pregnancy than women with greater income and education. Education appears to be the most significant variable in predicting whether or not a woman receives prenatal care. The percentage of women receiving care is somewhat lower for women without a high school diploma (97.4 percent) than for those with a higher educational level (99.8 percent).

Studies attempting to measure the quality of prenatal care find that "quality" varies widely and may be inadequate in overcrowded, understaffed clinics where mothers on public assistance are likely to go (California State Department of Public Health, 1957). Packter (1961) claims "with the exception of the married whites, all expectant mothers depend primarily upon public services for their maternity care" (p. 693). She concludes that low income families have less "quality" care.

## Race

The utilization of health services is based on both the availability of care and the willingness of individuals to use it (Mechanic, 1968). A number of studies reported above show whites and nonwhites differ substantially in the number of visits to physicians. In 1960, the average number of physician visits by whites was 5.2 while the nonwhite average was 3.5 visits (U.S. National Health Survey, reported by Kovar, 1968). These differences are also likely to exist for white and nonwhite mothers in seeking prenatal care. Schneider (1968) points out that patients from poor socioeconomic groups are at a greater risk but are the least motivated to seek health care. Since nonwhite families are more likely to be economically disadvantaged, they are often a medically indigent group with a high risk of negative outcomes during illness and pregnancy. In a study of all live births in New York City in 1968 (National Academy of Science, 1973), less than 2 percent of the nonwhite mothers who were classified as a social risk[1] received adequate prenatal health services while more than 50 percent had inadequate care. Among mothers with inadequate care, 70 percent were classified as social or medical risks or both. Among women with adequate care, more than 60 percent were classified as without risk. The study concludes that there is a serious and obvious misallocation of prenatal care.

## Age of Mother and Parity

Herzog and Bernstein (1964), National Academy of Science (1973), Battaglia, Frazier, and Hellegers (1963), and Bernstein and Sauber (1960) all report the age of mother as an important factor related to the timing of prenatal health care. Regardless of a woman's marital status, she is less likely to seek prenatal care if she is young. Mothers under 15 are especially vulnerable to complications in pregnancy and are a high risk in obstetrical care (Battaglia, Frazier, and Hellegers). They are more likely to deliver low birthweight infants (Baird, 1958, 1964; Schneider, 1968; Rosenwaike, 1971; Von Der Ahe, 1967; Douglas, 1953; Rosen, 1968) and more likely to experience infant loss (Bundesen, 1951). In contrast with these findings, Bernstein and Sauber (1960) find little significant difference between a mother's age and prenatal care except for young mothers. They report that 89 percent of pregnant teenagers eventually receive care once the pregnancy becomes known to parents or community agencies. They also report that a relatively high proportion of mothers in their

---

[1] "Social risk" is defined as, "mother's education, age, parity and marital status may have had an adverse effect on pregnancy outcome."

early twenties did not seek any prenatal care.

Very little information is available on the relationship between parity and prenatal health care. Kane (1964) claims that at high parities (third or higher), mothers are less likely to seek and receive prenatal care. However, he does not take SES into account in interpreting this relationship.

## Legal Status

The legal status of a child is another critical factor which may influence pregnancy outcome as well as whether the mother seeks prenatal care. Herzog and Bernstein (1964), Packter et. al. (1961), Yankauer, Goss and Romeo (1953) and Bernstein and Sauber (1960) report that unmarried pregnant women are less likely than married women to begin regular prenatal care early. In a New York City study, Bernstein and Sauber found that, while 40 percent of pregnant women began prenatal care during the first trimester, approximately only 25 percent of unmarried pregnant women did so. While 17 percent of the unmarried mothers received no care, only 3.7 percent of all New York City mothers did not receive care. In addition, they report that over three-fourths (79 percent) of the unmarried mothers received an inadequate amount of prenatal care (defined as beginning later than the third month of pregnancy with fewer than seven visits). Yankauer, Goss and Romeo also claim that the quality of services to unwed mothers is generally lower due to their low income level. Herzog and Bernstein claim that factors such as attitudes toward prenatal care, a wish to conceal pregnancy, and problems concerning making arrangements for care (ineligibility, finances, inadequate referral, lack of information, etc.) keep unwed mothers away from care facilities. They suggest that in comparing those who seek care with those who do not, the prosperous and the poor are actually being compared. These groups include white and nonwhite, married and unmarried, those who receive regular care and those with no prenatal care. Herzog and Bernstein conclude that a more extensive analysis of SES is crucial to understanding the relationship between legal status and health care.

## Legal Status

In 1975, 4,933 births were reported as out-of-wedlock in Oklahoma. The out-of-wedlock ratio was 115.5 per 1,000 live births, or 11.1 percent of all live births in Oklahoma that year. However, not all conceptions occurring before marriage result in an out-of-wedlock birth. In many cases the couple marries before the birth and the child is registered as an in-wedlock birth. A NCHS study published in 1968 surveys trends in illegitimacy over the period from 1940 to 1965 and reports some inferential data concerning the estimated percent of women married whose first child was born within eight months of marriage. They report that the proportion of premaritally pregnant women has risen for white women married since 1945. Among white women who first married during 1955 to 1959, 16.0 percent had a first birth within eight months of marriage, twice the proportion of white women who first married during 1940 to 1944. There has also been a steady increase in the proportion of premaritally pregnant nonwhite women in every marriage cohort since 1900. They conclude that the proportion of legitimate births conceived before marriage has increased substantially since 1940.

Socioeconomic Status and Race

A critical factor associated with SES and pregnancy outcome is the legal status of the child. While illegitimacy rates are much higher among lower SES females, the relationship between SES and legal status is undoubtedly confounded by race. The incidence of illegitimacy differs greatly between white and nonwhite mothers, the rate of illegitimacy being about 12 times greater for nonwhites than whites in 1950. Although the differences in illegitimacy rates between whites and nonwhites has been decreasing since 1950, the gap is still considerable. In 1965, 9.8 percent of married nonwhite women and 1.2 percent of unmarried white women had a child out-of-wedlock, an eight to one ratio. While the rate for nonwhite women declined during the 1960s, the rate for white women increased (Clague and Ventura, 1968).

The U.S. President's Commission on Population Growth and the American Future (1972) estimates that 60 percent of white and 80 percent of nonwhite illegitimate births are to women classified as below the poverty line. Berkov (1967) surveyed births in California which were paid for by public funds. A means test was used by the state to determine that all the cost-free deliveries were to women who were poor. Berkov found that 52 percent of all white and 76 percent of all black illegitimate births were paid for by the state. She concludes that unwed mothers are more likely to be poor than mothers who are married. Only 10 percent of all white and 40 percent of all black legitimate births in her study had all costs charged to the state due to their inability to pay. Among white groups of all ages, the illegitimacy rate was eight times higher for poor than for nonpoor mothers.

## Age of Mother

In 1968, more than 600,00 infants (17 percent of all live births) were born to women under twenty. Over 200,000 of the mothers were under 17 years of age. Out-of-wedlock births run high among young age groups. In 1970, 180,000 children were born to unwed teenage mothers--half of all mothers delivering infants out-of-wedlock. A slight decrease has been noted in the rate of illegitimate births among all age groups of women except for the 15 to 19 year old group. However, teenage mothers do not have the highest illegitimacy rate of any group. Single women aged 20 to 34 have the highest rate. Since the number of teenage mothers has increased and since these women are most often single, their numbers are large and increasing. In 1968, the births of 40 percent of 15 to 17 year old mothers and 20 percent of 18 to 19 year old mothers were illegitimate. Rates are even greater for nonwhite mothers, with fertility differences between whites and nonwhites greatest for mothers under 20 (President's Commission, 1972). As might be expected, highest illegitimacy rates are for first births. For white births in 1964, the first birth illegitimacy ratio was 76 per 1,000 while for all other births it was 20 or less. For nonwhite births, 487 per 1,000 first births were illegitimate, while between 163 and 276 per 1,000 second and higher order births were born out-of-wedlock (Clague and Ventura, 1968).

## Age of Mother and Parity

The median age of a mother in Oklahoma in 1975 was 23 years. However, the age at which a woman bears a child is greatly influenced by social factors, such as her race and socioeconomic status. The number of children she has had is integrally related to her age. Social factors such as race and SES seem to be related to the age of the mother and her parity in much the same manner.

## Socioeconomic Status

Wunderlich (1968), reporting findings from the 1963 National Natality Survey, finds evidence supporting the notion that less educated women generally have higher birth rates than more highly educated women. The data relate to the fertility experience of women aged 35 and over and fertility through the birth of the present child for younger mothers. The 1960 Census shows a similar pattern for the average number of children born to married white women, aged 35 to 44. Similar trends between educational attainment and the number of children ever born are found among younger mothers. Wunderlich also reports an inverse relationship between education of the mother and the number of children ever born in a specified age group. Women with an elementary school education or less have more children than women completing high school and substantially more than mothers whose formal education extended beyond high school. The 1963 National Natality Survey also collected data on family income (all money received during 1962 by all persons living in the household when the baby was born) from its sample of 3,218 white legitimate births. For white married women in 1963, no strong inverse relationship between family income and the number of children born was found. The differences between the number of children in each income group were not large enough to be statistically significant. However, the Survey does report that women from higher income families are older than low income females. When wives of the same age group are compared, an inverse relationship may be observed between family income and the number of children born during the period studied. Baird (1964) finds similar patterns in age and parity in his European sample. High SES women are older at the birth of their first child and tend to have fewer children. The result of a "poor environment during the growing years" is not only higher parity and a younger age of first birth but also higher infant mortality rates among this high risk group. In addressing the same question, Daly et. al. (1955) suspect that age and parity serve as a link between SES and infant mortality. However, they conclude that although SES, age of mother, and parity vary together, infant death is not explained by age and parity differences in their sample from England and Wales. Social class, as measured by occupation of the father, is more highly associated with infant mortality than age and parity.

## Race

Race is also an important factor in predicting the age of a mother and the number of children she will bear. Fertility rates for whites and nonwhites have followed the same pattern since 1950 but rates for nonwhites have been consistently higher. Between 1960 and 1965, white fertility declined at a more rapid rate than the rate for nonwhites so that by 1965 the rate for nonwhites in the U.S. was 46 percent higher. By 1967, however, nonwhite rates had declined more rapidly than white rates; a difference of 44 percent was observed. At all age levels, fertility of nonwhite women is higher than that of white women. By age of the mother, the differences are relatively larger for younger and older women with the most similar rates being found among mothers aged 25 to 29. The largest differences are at ages 15 to 19 (136 percent) and 40 to 44 (71 percent). Nonwhite mothers are more likely to have their first child at 15 to 19 years of age; white mothers are more likely to be 20 to 24 at the time of their first birth. With the larger nonwhite family, mothers are more likely to continue childbearing later into their reproductive years (Heuser, Ventura and Godley, 1970).

## Conclusion

Although the literature contains ample evidence to document the association between low birthweight and infant mortality, the relationship between socioeconomic status and infant mortality is less conclusive. Through a variety of measures of SES (such as education, occupation, income, census tract of residence), some researchers find that SES and infant mortality are inversely associated. Others conclude that SES is only associated with postneonatal mortality.

While nonwhites in the U.S. have higher rates of infant mortality than whites, during the first week of life low birthweight nonwhite infants have a greater chance of survival than low birthweight white infants. Even though a number of explanations for this trend are offered in the literature, the exact reason for the nonwhite advantage is unknown.

Infants of mothers under 15 or over 35 years of age have a greater risk of death, especially when the mother's parity is high for her age. A number of studies also cite evidence of a greater risk of fetal or infant death for children of mothers who are unmarried.

Although there is some indication that the relative absence of prenatal care is related to infant mortality, this association is largely ignored in the literature.

A great volume of literature has been devoted to the examination of biological and social correlates of birthweight; however, the results of many of the published works are inconsistent and inconclusive. A number of studies claim that SES is directly associated with birthweight; the others speculate that patterns of infant care or other related factors may link SES with birthweight. The studies generally find great difficulty in calculating the contributions to birthweight unique to SES or race. Most conclude that race and SES are associated to such a degree that neither can be evaluated independently with much success.

As in the case of infant mortality, very young, very old, and single mothers are reported to be a greater risk of bearing low birthweight infants. However, references to the importance of SES in the relationship of these independent variables with birthweight are often suggested.

Considerable disagreement exists in the literature as to the importance of prenatal care in predicting pregnancy outcome. While numerous authors cite the importance of beginning care early, several studies claim that prenatal care does not decrease the incidence of low birthweight. In studies accounting for the SES of the mother, SES is found to be an important factor in the relationship between prenatal care and birthweight. Since nonwhite, very young, and unmarried mothers appear to be least likely to seek prenatal care and also run a greater risk of bearing low birthweight infants, clarification of the relationship between prenatal care and birthweight is needed.

The knowledge accumulated in the analysis of low birthweight and survivorship is extensive but very uneven in its quality and scope. The present research is directed toward the clarification of a number of descriptive issues and the presentation of a model for the elaboration of the relationship among socioeconomic status, race, parity, age of mother, legal status, prenatal care and birthweight and survivorship. These variables will provide the substance of the causal model and its hypotheses presented in the following chapters.

# CHAPTER III

# THEORY

## Introduction

The purpose of this chapter is to explain the theoretical foundations of the current research. Since the theory which is presented in this chapter provides a base for the investigation which follows, only part of the research story is presented. Labovitz and Hagedorn (1976) claim that,

> A scientist is not likely to carry out meaningful research without the guidance of a relevant and clearly stated theory, and a scientist is not likely to develop a relevant and clearly stated theory without the guidance of reliable research findings. (p. 15)

The relationship between theory and research is one of mutual dependence. Without the meaningful interpretation of theory, impressions or facts about social life are isolated and incomprehensible. For any body of knowledge to develop, there must be a "feedback connection" which goes both ways from theory to research and from research to theory (Labovitz and Hagedorn). Without this critical interplay, the study of social phenomena (or any kind of scientific phenomena) becomes little more than a stockpile of descriptive information and a fact-finding exercise.

We have seen from the review of the literature (Chapter II) that a great volume of research has been conducted to assess the relationship between infant mortality, birthweight and numerous independent variables of both a social and a biological nature. An examination of the literature reveals the absence of a theoretical framework for interpreting what empirical findings tell us about recurring relationships among variables.

The concern of Chapter III will be the development of theoretical propositions later to be translated into working hypotheses. This approach stresses neither the importance of theory over research nor of research over theory. It describes a dialectical process which moves back and forth from theory to research during an investigation into the relationship between key variables identified in the literature. Research enables us to test the validity of the theory and the research findings enable us to modify a theory which is shown to be untenable, outdated, or inappropriate. By working through an exchange between research and theory, theory should become more valid and refined, and research should become more relevant and specific (Labovitz and Hagedorn).

Although much research has already been directed toward describing and explaining the etiology of low birthweight and its relationship to infant mortality, a great deal of work has yet to be done to formalize a model which might specify the impact of social factors on birthweight and survivorship. Such a model is being offered in this study.

Self-imposed limits on the variables will be considered in this model due to the nature of its data source. Vital statistics collected by the state of Oklahoma, will provide the data. From vital statistics information, only variables of sociological interest were chosen. For example, the social setting within which a mother and her child are located may influence the age at which she has her child and the number of children previously born, but it cannot determine the child's sex or the date of its birth.

Also, it should be noted that the model proposed in this research is designed to account for social factors operating in single live births. Although plural births show an interesting relationship to birthweight and survival[1], the proposed model does not account for their outcome.

The theoretical model will be described below; the working hypotheses generated from the theory will be presented in Chapter IV, "Methodology." In Chapter V, the research findings will be presented; and in Chapter VI, an analysis and re-evaluation of the original model will be carried out. Each of these steps is necessary if we are to follow the "feedback connection" between theory and research and from research back to theory.

## Mortality

Although death is the inevitable fate of all human beings, the timing of one's death is often related to factors which may be

---

[1]The average infant in a plural birth is lighter in weight but experiences less risk in terms of survival than other infants who weigh 2,500 grams or less at birth.

either ascribed to or achieved by individuals. Life expectancy is undoubtedly related to such factors as one's sex, geographical location, race, and socioeconomic status. Although the influences of one's sex and geographical location is beyond the scope of this research, race and socioeconomic status will play a key role in our model. What is it about race and SES that account for their marked influence on birthweight and infant mortality? What identifiable social factors link race and SES to the negative outcomes of pregnancy which are of concern to us here?

## Socioeconomic Status

In his historical survey of social class and life expectancy, Antonovsky (1967) reports that, in historical and contemporary settings where a society manages to survive at a very low level of life expectancy, there is not a great difference in the average length of life between various social strata. His data indicate that a significant gap between the life expectancy of different social classes is a phenomenon characteristic of the most recent periods in history, specifically, the nineteenth century and later. Prior to this time, class differences in life expectancy were relatively limited. After his review of over 30 studies, Antonovsky concludes that social class influences one's chances of staying alive.

The exact mechanisms operating to raise mortality rates for individuals with low socioeconomic status are ambiguous and, most often, vaguely defined. However, socioeconomic indicators provide clues revealing both risks and opportunities to individuals who come from a variety of social settings. It is known that diseases shortening life expectancy (such as hypertension, diabetes, heart disease) are more prevalent in lower income groups and among those who rank low in terms of their educational and occupational achievement. But low SES in itself does not "cause" death at an early age.

The use of a concept such as social class or socioeconomic status is based on the assumption that the social setting in which an individual lives has a pervasive influence on life experience. Mechanic (1968) claims that socioeconomic indices are

> ...gross ways of denoting the style of life describing contexts within which people are reared and within which they develop, their likely access to opportunities and experiences, and the kinds of life demands with which they must cope. (p. 242)

Varying life styles, in turn, expose socioeconomic groups to different environmental risks. These risks influence longevity and the health status of the individual during his or her lifetime.

## Race

Although the gap in life expectancy between whites and nonwhites has narrowed during the twentieth century, significant differences in life expectancy remain between the two groups. Nonwhites are far more likely to be poor. They tend to be concentrated in inner cities where basic educational, occupational, or vocational opportunities which might help them to get out are unavailable. Nonwhites continue to live in areas where discrimination and a myriad of other socially constructed handicaps make job opportunities practically nonexistent, where health care is scarce or unavailable, and where life expectancy is appreciably reduced.

The construct "race" combines several other factors in addition to socioeconomic ones. It is impossible, at this time, to measure possible biological differences between racial and ethnic groups, although they may exist. Differential treatment of individuals on the basis of their race undoubtedly has an effect on health status and life expectancy. However, the consequences of differential treatment are difficult to evaluate. In summary, there are empirically sound and theoretically meaningful reasons to argue that nonwhite and/or low SES individuals run a greater risk of dying at an earlier age than more privileged individuals in the U.S. today.

## Infant Mortality

### Socioeconomic Status

Although all segments of the population have experienced dramatic declines in infant mortality rates since the turn of the century, socioeconomic differences in these rates are still very apparent. Factors linking SES to general level of mortality undoubtedly influence the differences in infant mortality among socioeconomic groups. Hunger, illness, and physical deprivation take their toll on women of child-bearing age whose offspring are born into an unfavorable environment. Mechanic (1968) and Guerrin and Borgotta (1965) describe a deprivation syndrome in which mortality is correlated with patterns of living in a "deprived" setting. In a study done in Northern France, Guerrin and Borgotta find that even after controlling for income differences, infant mortality is higher in certain families. These include those not taking summer holidays, having poorer parental care, not taking daily baths, not taking infants out daily, having poor diets, and having little concern for the importance of sanitation. Mechanic claims these same features are characteristic of ghettos in the U.S. where infant mortality is extremely high. Infant mortality, therefore, may actually be part of a deprivation syndrome.

Most infant deaths occur during the semanatal period--before the child leaves the protective environment of the hospital. During this early period the differences in mortality between lower and upper income groups are most nearly the same. Social influences are at their strongest during later periods of infancy. It is in the later periods when the differences in death rates become more divergent. Infant mortality increases in lower income groups, in large families, among single mothers, and among mothers who are either very young or very old. All of these characteristics may be associated with the life style described by Mechanic and others as "deprived." In other words, infant mortality is related to a complex of living conditions in which deprivation is a key feature. Poor health, inadequate diet, high birth rate, and inadequate health care are among the concrete realitites of the construct "low socioeconomic status." This style of life, or life circumstance, increases the risk of death for infants born to low socioeconomic status women.

## Race

Mortality rates for nonwhite infants follow the same pattern as the relationship between race and overall mortality. Nonwhite infants have a far greater risk of death than white infants from birth through the end of the postneonatal period. Between 1935 and 1950, the decline in the infant mortality rate was at least as great for nonwhite as for white infants. Since that time, the slowdown in the mortality decline has been most severe among nonwhite infants. In fact, since the 1950's, there has been a substantial increase in the rate of loss for nonwhites under one day.[1] The decline in mortality occurring between 1939 and 1950 resulted from advances in the control and cure of infective and parasitic diseases, influenza, pneumonia, and infections of the digestive system. After World War II, antibiotics became increasingly available and medical technology made remarkable strides in preventing infant death. Maternal and child care, as well as improved medical facilities, benefited veterans and their families. Economic and sanitary conditions in the U.S. contributed to a healthier physical environment. For both whites and nonwhites, loss rates from infective and parasitic diseases dropped sharply. However, relative gains were most notable among whites. For example, the death rate due to pneumonia and influenza leveled off among white children several years before it did so for nonwhite children (NCHS, 1965).

Conditions most conducive to infant death such as poor sanitation, malnutrition, overcrowding, and risk of accidents, are more likely to occur among low income, nonwhite, inner city residents.

---

[1]This may be due to more complete registration of early infancy deaths among nonwhites. With increasing numbers of nonwhites being born in hospitals, registration completeness and accuracy has improved. Another possible explanation is that, with improved medical care, a shift in the timing of death has occurred so that some infants now die postneonatally instead of prenatally. Both of the explanations presented here are highly speculative, but the exact cause of the increase in infant mortality among nonwhite newborns (under one day) is unknown.

While medical innovation and the control of infectious and parasitic disease have lowered infant death rates throughout the world, environmental hazards and a lack of adequate health care still stake their toll on infants in city slums, deteriorated neighborhoods, and housing projects where many nonwhite Americans live.

Socioeconomic and racial factors influence infant mortality both in combination with one another and in their own unique way. Being so closely interrelated, they will be presented in the model as operating simultaneously with one another rather than in a precise causal order (where one precedes and "causes" the other). Therefore, the model allows us to use them individually or in conjunction with one another. This strategy is important in exploring their association with infant mortality and birthweight.

## Birthweight

### Socioeconomic Status

We have assembled a set of social and economic circumstances assumed to be associated with low socioeconomic status in the U.S. today. This set of life circumstances is a complex of living conditions in which the key feature is deprivation.

Recent research on the socioeconomic determinants of health in the U.S. has indicated a strong positive correlation between health and the amount of schooling that one receives. In studies using several types of health indices, ranging from mortality rates to self-evaluation of health status, education appears as a key factor. Fuchs (1974) reports that even when controlling for the effects of such variables as income, intelligence, and parental levels of education, the relationship between education and health status remains strong. According to Fuchs, the relationship between the two variables may reflect a chain of events in which good health precedes length of schooling in its causal order. However, Michael Grossman (cited in Fuchs) cites reasons why he believes that higher educational levels lead to better health. In a study of males having completed their education, Grossman found that educational attainment had more predictive value than income, intelligence, or any other variable under study. Although his findings minimize the possibility that education and health status are constantly influencing one another during early years when an individual's education is in progress, the notion that education contributes to an individual's health status is undoubtedly theoretically meaningful. While no one is sure why or how educational level affects health, a higher educational level may contribute to a more effective use of medical care or a greater willingness (or capacity) to absorb new information about health and medical care more quickly and effectively.

The general level of a mother's health before and during her pregnancy is known to be a critical factor in the birthweight and survivorship of a child. It is also known that poor people tend to be sicker than individuals in higher socioeconomic groups. This circumstance may stem from either one or both of the following reasons. First, poor people may delay seeking health care, since care may be unavailable or economically out of reach. With the delay, patients may be sicker when they finally see a physician. Less preventive and more emergency medicine must be provided with an urgency which might not have been necessary if the patient had arrived for care sooner. Second, unsanitary living conditions, poor diet, and previous acute and chronic illness may predispose poor people to greater risk of illness. When they finally see a physician, the quality of care may be low; physicians may be unsympathetic, and patients uncooperative.

The low socioeconomic status woman brings a poor medical and environmental history with her to her pregnancy. Her health status, not only during pregnancy but throughout her childhood, adolescence and childbearing years, increases risk for her child and herself. During her pregnancy, she is more likely than her higher SES counterpart to work at a physically taxing job, have a poorer diet, and delay seeking prenatal care, if she receives any at all. She is more likely than a more affluent woman to be at either age extreme of her childbearing years, to be single, and to have a higher parity. Each of these factors increases her risk of bearing a low birthweight infant.

## Race

Race adds another dimension to the variance of birthweight. Aside from biological differences (which, if they exist, cannot be measured), race and SES are so closely intertwined that calculating the unique effects of race on birthweight is a very difficult task. Conceptually, race combines with socioeconomic status because of the concentration of nonwhites into low socioeconomic segments of society. But even upper SES nonwhites may respond to illness differently than middle or upper SES whites. Higher SES nonwhites may live in less affluent, nonwhite communities where health care is absent or third rate. Even if well educated, more affluent nonwhites tend to live in areas where care is not readily available, and where racial prejudice and subcultural responses to illness may keep them away from care facilities.

Nonwhite infants in the United States have a lower median birthweight than white infants. Whether this is a function of race or of minority status is unknown. For example, in their native country, Hawaiians tend to have higher birthweights than minority residents, such as Chinese, Korean, Filipino, or Puerto Rican infants (Bennett and Louis, 1959; Conner, Bennett and Louis, 1957). Studies in other countries have also noted that the median birthweight for minority residents is lower than that of the dominant population.

The most curious part of the relationship between race and birthweight is the consistent finding in the literature that, among low birthweight infants, nonwhite newborns have a lower mortality rate than low weight white infants. Although several reasons for this finding are suggested in the literature and summarized in Chapter II, no satisfactory answer is available to this puzzling finding. Biological differences seem to be an unlikely explanation due to the fact that minority populations around the world have been found to have lower semanatal infant mortality rates among low weight infants. Other explanations such as congenital malformation, lower fetal death rates, and shorter gestational periods are equally unsatisfying or contradictory when empirically scrutinized.

The theoretical assumption of this study is that birthweight among nonwhites is lower due to the influence of socioeconomic conditions associated with being a minority group member in the U.S. In addition, nonwhites are more likely to develop different patterns of health care utilization as a result of previous unpleasant encounters with the health care delivery system. In sum, subcultural and economic differences influence birthweight in a manner which keeps median weights lower for nonwhites than for whites.

## Elaboration of the Model

### Introduction

The distinctive feature of the model presented in this dissertation is the extension of two-variable relationships into a causal model through the analytic procedures of elaboration. Most research begins by hypothesizing the relationship between two variables. In most of the literature concerned with low birthweight, the analysis stops at the point where a relationship is found to exist. Researchers report the strength and direction of the association but rarely ask "why" or "under what conditions" the relationship exists. Elaboration not only allows one to ask these two important questions but also permits one to expose such speculation to systematic tests (Rosenberg, 1968). We can, therefore, test our reasoning and discover underlying meaning in relationships found among the variables.

There are four key variables in our theoretical model, two independents and two dependents. The dependent variables, birthweight and infant mortality, are the phenomena we are trying to "explain." The variance of the two are thought to "depend on" the value of the independent variables, race and SES. However, the question of concern here is not only _if_ they are related to the dependent variables, but "why" and "under what conditions." In other words, what is it about race and SES which accounts for their influence on a child's birthweight or ability to survive infancy? What social factors may be identified that link the independent and dependent variables in our model? Using vital statistics data, five variables, which may intervene between race and SES and pregnancy outcome in a theoretically meaningful way have been identified. These are age of mother at the time of the infant's birth, her parity[1], legal status, and the timing and frequency of prenatal health care. A causal model will be constructed, linking race and SES with birthweight and infant mortality by using the five intervening variables as the links.

The following discussion will specify the proposed manner in which race and SES influence birthweight and survivorship. The model will be discussed by identifying each link, in turn, as a dependent variable. In this manner, we will move across the model from race and SES to infant mortality in a sequence of intervening steps. At the end of the discussion, a summary of the theoretical propositions will be presented and a diagrammatic presentation of the model will be displayed.

## Age of Mother

The age of a mother at the time of her infant's birth is dependent upon both her socioeconomic status and her race. Mothers at

---

[1]By parity, we mean the number of live births the mother has had, including the present birth.

either extreme of their childbearing years are more likely to be nonwhite, low SES women. Indeed, we can assume that being nonwhite and having a low SES significantly increases a woman's chance of having a baby before she is 18 years old and/or after she is 40. The reason behind this assumption is not a simple or straightforward one. In fact, at least two quite different explanations are possible.

When we ask ourselves why more births occur among nonwhite, low SES young women than among other young women, the assumption might be that it is because more of the former actually become pregnant. We may even go so far as to assume that nonwhite, low SES young women are more sexually active than other young women. Both of these assumptions are visible in the literature and have been used to explain the lower median age of mothers among nonwhite and low SES women. However, Ryan (1971) strongly disagrees with these assumptions. His discussion of illegitimacy rates among poor, nonwhite females provides an alternative explanation which will be extended here to explain the curvilinear relationship between race, SES, and age of mother. Ryan claims that the traditional explanation of "cultural" (or "subcultural") differences between illegitimacy rates for white and nonwhite, poor and nonpoor women is patently false. He acknowledges a real, statistical difference between the number of illegitimate infants born to nonwhite, poor women and white, more affluent women, but he claims that these differences do not tell the whole story.

Following Ryan, we can begin with the assumption that sexual activity is known to be prevalent among both poor, nonwhite young women and white, nonpoor young women. As early as 1953, Kinsey _et_. _al_.

had published findings indicating that no fewer than 83 percent of the 5,300 white males and 50 percent of the 5,940 white females interviewed for the "Kinsey Reports" had had intercourse before marriage. Although marital status is not the concern of the discussion at this point, we are certain that unmarried women are more likely to be younger--18 or under--than married women. If young women, regardless of their race or SES, are sexually active, the greater likelihood of a nonwhite, low SES woman giving birth is less likely to be explained as entirely due to the occurrence of different patterns of sexual activity.

When a woman of any age is sexually active, she can (at least theoretically) make a number of choices concerning pregnancy. She can use contraceptive measures to avoid pregnancy; if she becomes pregnant she can either get an abortion or she can have the baby. Ryan argues that if a woman is poor and/or nonwhite, she is often denied the possibility of making these choices. Because she is poor, she is less likely to receive accurate and effective contraceptive information. Lacking money, she is less able to buy contraceptives or obtain an abortion if she becomes pregnant. She is more likely to have the baby because of the economic barriers against a full range of choices to either prevent conception or receive an abortion. If a young white middle or upper SES woman is sexually active, the chances are greater that she has alternatives available to ther other than becoming pregnant and giving birth.

The two alternative explanations presented here--subcultural differences and choice versus nonchoice for parenthood--are not mutually exclusive. It is possible that both mechanisms operate simultaneously if the "subcultural" explanation is somewhat modified. A white, higher SES woman may delay childbearing to a later age so she may go to college, work, or live without the responsibilities of parenthood. A nonwhite, lower SES woman is less likely to "prolong her adolescence" by staying in school beyond high school graduation. Although today most young women graduate from high school, there is a direct association between SES and race of parents on the one hand, and the number of years of education completed by a child on the other hand. Even if we could assume that all women had control over the time in their lives when their children were born, we might still expect low SES women to be younger at the time of the child's birth. Rather than a "subcultural" influence of greater sexual activity among lower SES and nonwhite women, however, the younger mothers may have fewer economic options open to them which might delay parenthood. They may even see marriage and/or parenthood as a "way out" of a home life in which poverty is a source of tension and disruption. Rather than accepting one explanation or the other, it is most likely that both "subcultural" and "choice versus nonchoice for parenthood" factors operate together so that nonwhite and low SES women are more likely to be young at the time of the birth of their children than white, more affluent women.

The curvilinear relationship of age of a mother with SES and race is actually a function of parity. We will argue that nonwhite and lower SES women have a higher parity. Since they bear more children during their lifetime, it follows that their pregnancies will occur, on the average, over a greater span of their lives. Hence, lower SES and nonwhite women are more likely than other women to continue bearing children until their late 30's and 40's. The relationship between parity and age of mother will be examined in more detail below.

## Parity

There is a direct relationship between SES and parity so that lower SES women tend to have larger families than higher SES women. Likewise, nonwhites are more likely to have a high parity, four or greater, than whites. The reasoning used in the preceding section to explain the younger age of mother for nonwhites and low SES women can be extended to explain similar differences in parity.

Although average family size and the number of children young women wish to have during their lifetime has declined dramatically over the past decades, the actual number of children born to nonwhite low SES mothers has been consistently higher. For example, in 1967 there was a 44 percent difference in fertility rates[1] between whites and nonwhites. By the age of the mother, the differences are relatively larger for younger (15 to 19) and older (40 to 44) women. The rates for whites and nonwhites are most similar in the 25 to 29 year old age bracket. Here the nonwhite rate is only 11 percent higher than the white rate. The largest difference in fertility by race is at ages 15 through 19 (136 percent) and 40 through 44 (71 percent) (Kovar, 1968).

---

[1]Fertility rates are aggregate data calculated by

$$\frac{\text{number of live births}}{\text{total female population (15-44)}} \times 1{,}000$$

while parity is the total number of live births for one woman. The unit of analysis is different for the two figures but their joint use is appropriate for descriptive purposes.

Choice versus nonchoice for parenthood is an important means of explaining differences in parity. Economic barriers may inhibit a woman's ability or desire to choose alternatives other than childbirth. In addition to her inability to obtain contraceptive information and an appropriate birth control device, she may be further discouraged from seeking family planning information if she is met with threats of sterilization or stern reprimands from health care personnel. If she is very young or poorly educated, her willingness to use contraceptives (if they are available), may be lessened by a vague understanding of the manner in which the birth control mechanism works and the importance of its consistent and proper use. She may be denied an abortion because of her inability to pay, and she may find that welfare payments do not cover such medical procedures. Hence, her reproductive choices are limited due to the economic realities of her life circumstances.

There are very few theoretical reasons to assume that "subcultural differences" exist between SES and racial groups concerning family size. Differences in family size may be due to the desire of a woman who came from a large family to have a large family of her own, or to religious or ethnic beliefs forbidding the use of contraceptive devices. However, these explanations are unsatisfactory in explaining differences in parity between SES and racial groups. Choice versus nonchoice in parenthood is more theoretically satisfying in explaining the differences in parity.

## Legal Status

Striking differences in illegitimacy rates exist between whites and nonwhites in the U.S. Since 1965, the color differential has declined slightly, but nonwhites still have an out-of-wedlock birth rate that is over eight times higher than the rate for whites.

The choices related to childbirth theoretically available to sexually active women to avoid an out-of-wedlock birth are contraception, abortion, or marriage before the child is born. We have previously argued that economic limitations placed on nonwhite, poor women greatly restrict their chances of receiving contraceptive information or abortions. In the case of out-of-wedlock births, "forced marriage" is another alternative which may (theoretically) be taken by the mother. According to Ryan, the incidence of "forced marriage" among white, nonpoor females who become pregnant accounts for a substantial portion of the difference in illegitimacy rates. The father of the out-of-wedlock child is most likely to have life circumstances similar to those of the mother. If he is nonwhite, poor, and without a job, he will be less able to offer the women and their child financial support or security in marriage. On the other hand, white, more affluent couples may be urged to marry and offered support from parents willing and able to provide security.

Ryan rejects the notion of subcultural differences in attitudes toward out-of-wedlock births. He claims that parents of poor, nonwhite daughters who become pregnant are upset, angry, and ashamed. But they also have a realistic knowledge of the chances of successfully resolving the consequences of illegitimacy through marriage. Parents accept the illegitimate birth but they do not value its occurance as the most desirable way to start or add to a family. At this point, Ryan's reasoning has revealed a factor pointing to a subcultural difference in attitudes toward an out-of-wedlock pregnancy. If a nonwhite, poor woman lives in a social setting where children are frequently born out-of-wedlock and where parents, though anxious and upset over the pregnancy, are supportive and sympathetic, and out-of-wedlock pregnancy may be less stigmatizing and socially disruptive than it might be for other women. This factor may influence the sexually active female's decision in choosing between contraception, abortion, or giving birth. If she wants to have a child but her chances of marriage are lessened due to economic reasons, such as those cited above, a single parent family would be a rational means of achieving that goal.

## Prenatal Care

The utilization of health services depends on the availability of care facilities and the willingness of people to use the services which are available. The first fact--availability--is dependent upon the financing of care, availability of health care personnel to operate the facilities, and other political and economic exigencies of planning and sustaining health care services. The second component--willingness to use the facilities--depends upon illness attitudes and behavior, health knowledge, and the ability to recognize symptoms, and a variety of economic factors (Mechanic, 1968). It is clear that availability of, and willingness to use existing services are critical factors in predicting whether a woman receives prenatal care. However, both factors are dependent upon economic realities which put nonwhite, low SES women at a disadvantage. If those women are also young and unmarried, their reluctance to use care facilities--if they are available--may be even greater. Poor, nonwhite women are more likely to live in neighborhoods where care facilities are poor or nonexistent. If facilities do exist, they may be financially out of reach. Even if welfare payments cover prenatal costs, facilities may be physically distant and socially unfamiliar. If the mother has other children at home, she may find it difficult to leave them in competent hands or to take them with her when she goes to the doctor.

Studies have indicated that very young, unmarried mothers often do not seek prenatal care for fear of disclosing their pregnancy to their parents or others. Mothers, of any age, who are unmarried may delay seeking care not only for financial reasons, but also because they are ashamed or hesitant to reveal their pregnancy to others.

Because of these factors, a low SES mother is less capable, financially, of receiving prenatal care. Her chances are further complicated by her lower median age, the greater likelihood that she is unmarried, and the increased probability that she has other children that she must care for. If the woman is nonwhite, she is likely to be more apprehensive about the predominantly white medical establishment in addition to the economic barriers she will face. The result is a set of circumstances diminishing the likelihood that a nonwhite, low SES mother will seek care early in her pregnancy or on a regular basis.

## Theoretical Propositions

The following set of propositions may be derived from the theoretical scheme developed in this chapter. Since it is our intention to examine the influence of both SES and race on birthweight and infant survivorship, two sets of theoretical propositions will be presented here. The first set of propositions begins with race and follows a logical sequence ending with survivorship; the second set traces the influence of SES on infant mortality and survivorship.

The set of propositions concerned with race include:

1. If a mother is nonwhite, she is more likely to have a low socioeconomic status.
2. If a mother is nonwhite, she is more likely to bear a child at an age when she is at either extreme of her childbearing years.
3. If a mother is very young, she is more likely to have a child out-of-wedlock.
4. If a mother has a child out-of-wedlock, she is more likely to have begun prenatal care at a later month in her pregnancy.
5. If a mother has a high parity, she is more likely to have begun prenatal care at a later month in her pregnancy.
6. If a mother began prenatal care late in her pregnancy, she is more likely to have fewer prenatal visits.
7. If a mother has a low number of prenatal visits, she is more likely to have a low birthweight infant.
8. If a child has a low birthweight, its chances of surviving the first year of life are lessened.

The propositions concerned with SES include:

1. If a mother has a low socioeconomic status, she is more likely to bear a child at an age when she is at either extreme of her childbearing years.
2. If a mother has a low socioeconomic status, she is more likely to have a high parity.

3. If a mother is very young, she is more likely to have a child out-of-wedlock.

4. If a mother has a child out-of-wedlock, she is more likely to have begun prenatal care at a later month in her pregnancy.

5. If a mother has a high parity, she is more likely to have begun prenatal care at a later month in her pregnancy.

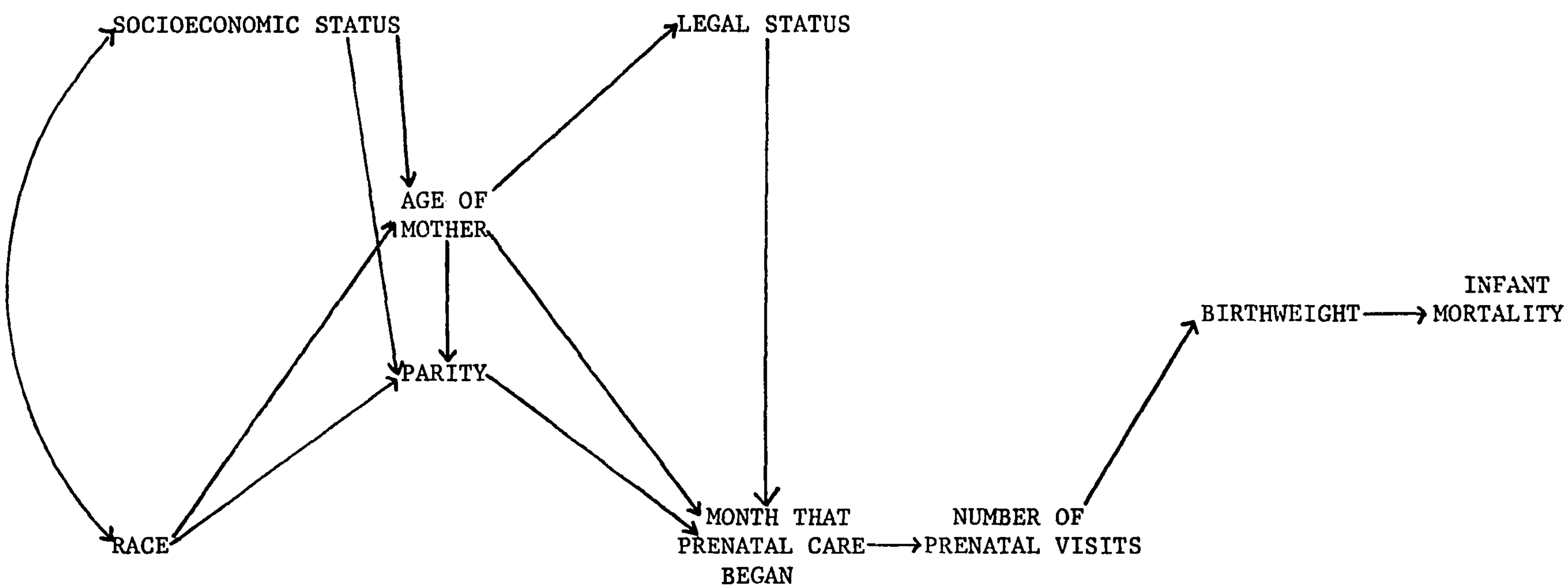
6. If a mother began prenatal care later in her pregnancy, she is more likely to have fewer prenatal visits.

7. If a mother has a low number of prenatal visits, she is more likely to have a low birthweight infant.

8. If a child has a low birthweight, its chances of surviving the first year of life are lessened.

Both sets of propositions may be diagrammed simultaneously. A diagrammatic representation of the theoretical model is presented on the following page.

FIGURE 1: DIAGRAMMATIC REPRESENTATION OF THE THEORETICAL MODEL



# CHAPTER IV

# METHODOLOGY

## Introduction

In Chapter III the theoretical propositions which provide the substance of this research were specified. The critical importance of a theoretical framework in providing a meaningful foundation for description, analysis, and interpretation in social research was acknowledged. This chapter is designed to link the theoretical propositions outlined in Chapter III to the empirical findings of later chapters. Here we will detail the manner in which the theoretical propositions will be tested and analyzed. The exact manner in which each variable has been operationalized, the hypotheses, the data of the investigation, and the techniques of analysis will be precisely defined for the reader in the discussion of the research methodology.

## Operationalization of Terms

The variables included in the theoretical model have been operationalized in the following manner.

## Infant Mortality

In addition to noting if a child died within its first year of life, three important time periods have been distinguished for infant mortality: semanatal (death occurring in the first seven days of life), neonatal (death occurring within the period between the eighth and the twenty-eighth day), and postneonatal (death occurring between the twenty-ninth day and the end of the first year).

In this study, information on the death of an infant comes from the linked record series provided by the Oklahoma State Department of Public Health. When vital statistics are used as the data source for infant deaths, certain caveats should be noted. A major hazard facing a researcher, who attempts to measure infant mortality through the use of vital statistics records, is an unknown amount of underreporting that undoubtedly occurs, which may be greater in some groups than others. Deaths of some infants who die very soon after birth are registered as fetal deaths rather than infant (semanatal) deaths. Such circumstances result in an understatement of mortality rates. This understatement would be most pronounced among the very lowest weight infants whose death rate is many times greater than heavier babies. Since this study deals with infants whose weight fall below the median weight of 3,317 grams (7 lbs., 5 oz.), this pecularity of death registration completeness and accuracy must be noted. However, we have no means by which to estimate its extent nor to control for it.

## Birthweight

As mentioned previously, an infant who weighs 2,500 grams or less at birth is classified as low birthweight. Birthweight is generally reported in terms of pounds and ounces on birth certificates, but it has been converted into grams for this study. Oklahoma's standard birth certificate specifies that the pounds and ounces be recorded by the attendant at birth who completes the birth document. The gram conversion has been used in this research in order to facilitate comparison with other studies in the field. The reader may consult Appendix A for the table and formula used to convert pounds and ounces into grams.

In a later section devoted to sampling, we will justify the use of a truncated range of birthweights (from the lowest to 3,000 grams) for our sample. Since all infants of concern in this study are below the median weight range of 3,317 grams, any reference to "heavier" or "higher birthweight infants" in the sample will refer to those with weight falling between 2,501 and 3,000 grams.

## Race

Race has been determined by the "race of mother" entry on the live birth certificate. Although Oklahoma uses numerous racial categories in its coding system, low weight nonwhite births of specific racial categories (other than Negro) are too small to sample. For example, of the 7,671 nonwhite births in Oklahoma in 1975, only 181 low birthweight infants were born to Indian women. Since such a small number of births is not large enough to sample, the variable "race" will be divided into two categories, white and nonwhite.

It should be noted that the Certificate of Live Birth in Oklahoma does not include a category specifying the race of the infant. However, the race of both father and mother are indicated. The mother as the race identifier has been chosen for two reasons. First, due to the large number of out-of-wedlock births in the sample, especially among nonwhites, racial identity may almost always be assured by using the mother's race. Second, most of the variables within the model pertain to the status of the mother prior to or at the time of the child's birth (for example, timing and frequency of prenatal care, age of the mother, race and socioeconomic status). In short, both theoretical and practical reasons determine the choice of race of mother as the basis of the child's racial grouping.

The obvious drawback to this method is it cannot be assumed that the child of a "white" father and an "Indian" or "Oriental" mother is born into a social setting comparable to that of an infant born to parents who are both black. In both cases, however, our classification would categorize them as nonwhite. Although defining race of the mother in this manner has the limitation cited here, the assumption is that it will not distort the measurement of race to a degree which would impair its usefulness. However, the reader should be advised of this limitation.

## Socioeconomic Status

The means for measuring socioeconomic status available on a standard birth certificate are clearly limited. In Oklahoma, as in most states, occupation may be stated only on the standard death certificate. Even on the fetal death (stillbirth) certificate, parental occupation is not recorded. Of the traditional and feasible indicators often used by social scientists to measure SES, only the education of the mother and the father are recorded on the certificate of live birth. For this study, an indicator based on mother's education as a measure of SES has been developed.

It was shown earlier that the mother's education has been used in a number of studies as a measure of SES. National Academy of Science (1973), Wunderlich (1968), Herzog and Bernstein (1964), Rosenwaike (1971) all use such a measure based on the assumption that the educational level of the mother is associated with factors such as higher intelligence, better health care judgment, and life style--which includes greater access to opportunities and social advantages. Numerous social scientists have also cited a strong direct association between education and income. Duncan (1961) claims that education qualifies the individual for participation in occupational life and that occupation becomes an intervening link between education and income. Well educated individuals are far more likely to have high income occupations and vice versa. Duncan also points out that no such thing as a single index of SES suitable for all research purposes exists. He found, for example, that variation between occupational levels accounts for only about one-third of the total variation in occupational SES, and occupational SES accounts for only a small fraction of the individual variation in income. It may be concluded, then, that education of the mother is, by itself, highly limited as a measure of SES. Although it is the only available indicator, its severe limitations are recognized.

In addition to its limited scope as an indicator of SES, the mother's education has another serious complication. The youthfulness of a mother may determine the number of years of education she has completed. Although the median age of mothers in Oklahoma during 1975 was 23 years, many mothers fell into the age category 13 to 18, an age level at which one would expect to find her education still in progress. Since there is reason to believe that very young mothers often have babies whose birthweight is lower than might otherwise be expected. the concern with accounting for an unusually youthful group of women seems especially important. Our socioeconomic index will, therefore, combine both number of years of education completed by the mother and her age. The actual construction of the index, its utility, and its limitations will be discussed in a later section. (See Index Construction, page 91.)

## Prenatal Health Care

Two distinct aspects of prenatal health care are identified in our model: timing, and frequency of care. Although the two are closely related to one another, they are assumed to measure different aspects of the more inclusive "prenatal health care." Although highly intercorrelated, they operate independently with other variables in the model. Other aspects of care, such as quality of care, may also be useful in examining prenatal care, birthweight, and infant mortality. However, vital statistics records provide access only to its timing and frequency.

Timing of Care. The month of pregnancy in which prenatal care begins, located on the birth certificate, will serve as the indicator of the timing of prenatal care. It may easily be employed in the form of an ordinal scale or used as a set of descriptive categories denoting the trimester in which care began. The latter form allows us to make our findings comparable to other studies in the literature which refer to trimester of care.

Frequency of Care. Although timing of care is an important variable, it is important that it appear in a model with the variable "frequency of care." The limitation of timing as a solitary variable is that a woman may see a physician early in her pregnancy to determine if she is pregnant, but she may not return for follow-up care until a more advanced stage of pregnancy. In some cases, early onset of care—reported on the birth certificate as occurring in month one or two—may be followed by a lapse of seven or eight months before seeing a physician in the delivery room. To be aware of such an occurrence, the number of physican visits as another important aspect of prenatal health care have been included. The total number of prenatal visits is stated on the live birth certificate.

It should be noted here that we anticipate that the frequency of care, as measured by the number of prenatal visits made by the expectant mother, may have a non-linear relationship to other variables in the model, such as birthweight. We saw in Chapter II that studies have shown a curvilinear relationship in which mothers with very few visits and those who make a very large number of visits have low birthweight infants. Data transformations performed on the number of physician visits will be described in Chapter V.

## Age of Mother

While age itself may not be considered as a sociological variable, the age of the mother at the time of the infant's birth may be considered as such. Our model specifies that the mother's age at the time of the birth may be a product of such social factors as her race or her socioeconomic status. Oklahoma's birth certificate specifies age of mother "at time of this birth" for its vital records. In our model, age of mother also refers to the mother's age at the time of the infant's birth.

We noted in Chapter II that low birthweight is more frequently associated with both very young mothers and oldest mothers. This indicates the potential for a non-linear relationship between age of mother and variables, such as birthweight. Data transformations made to adjust for quadratic trends in the data will be described in Chapter V when the sample is described and the findings are analyzed in detail.

## Legal Status

The legal status of the child has been determined and coded by the State Department of Public Health on the basis of three criteria. A birth is recorded as out-of-wedlock (1) if no information is given on the father, (2) when the name of the child is the same as the maiden name of the mother, and/or if (3) a paternity statement is found on the back of the birth certificate. In a later section, the reliability of such information will be discussed.

## Parity

The number of previous pregnancies resulting in a live birth ("parity") undoubtedly influence a mother's biological capacity for childbirth. Since this factor is also influenced by the social exigencies of a mother's social milieu, parity is considered to be a biosocial property. A sizeable volume of the literature mentions the importance of parity on birthweight and infant mortality (Battaglia, 1963; Von Der Ahe, 1967; Wiener and Milton, 1970; Douglas, 1963; Gibson, 1951; Duffield, 1940; Rosenwaike, 1971; Salber, 1951). A decline in the fertility rate in the U.S. which reached its lowest point in 1971 and following has been seen. For 1975, the seasonally adjusted fertility rate per 1,000 women aged 15 to 44 was 65.3 (December, 1975) compared with 65.1 and 68.3 for January of 1976 and 1977, respectively. As a result, 95 percent of the women in our sample have three children or fewer and 75 percent have two children or fewer. Although parity in this sample of women ranges from one to twelve children, the mean parity for women in the sample is quite low.

Parity has been operationalized by recording the number of previous pregnancies resulting in a live birth from the birth certificate. A parity of "one" was recorded for the current birth if the mother was primiparous (that is, her first live birth).

It should be emphasized again that the model which is constructed from the variables operationalized here is designed to account for social factors operating in single live births. Although plural births show an interesting relationship to birthweight and survival, the model does not account for their outcome.

## Statement of Hypotheses

The theoretical propositions outlined and discussed in Chapter III have been used to formalize the following research questions. Each will be considered here along with the hypotheses that have been generated by them. (See Figure 2.)

1. To what extent is the age of the mother influenced by race and socioeconomic status which are part of the infant's social milieu?

2. To what extent is parity infleunced by race, socioeconomic status, and age of mother which are part of the infant's social milieu?

3. To what extent is the legal status of a child influenced by race, socioeconomic status, age of mother, and parity which are part of the infant's social milieu?

4. To what extent are the timing and frequency of prenatal health care of the mother influenced by her race, socioeconomic status, age, parity, and the infant's legal status which are part of the infant's social milieu?

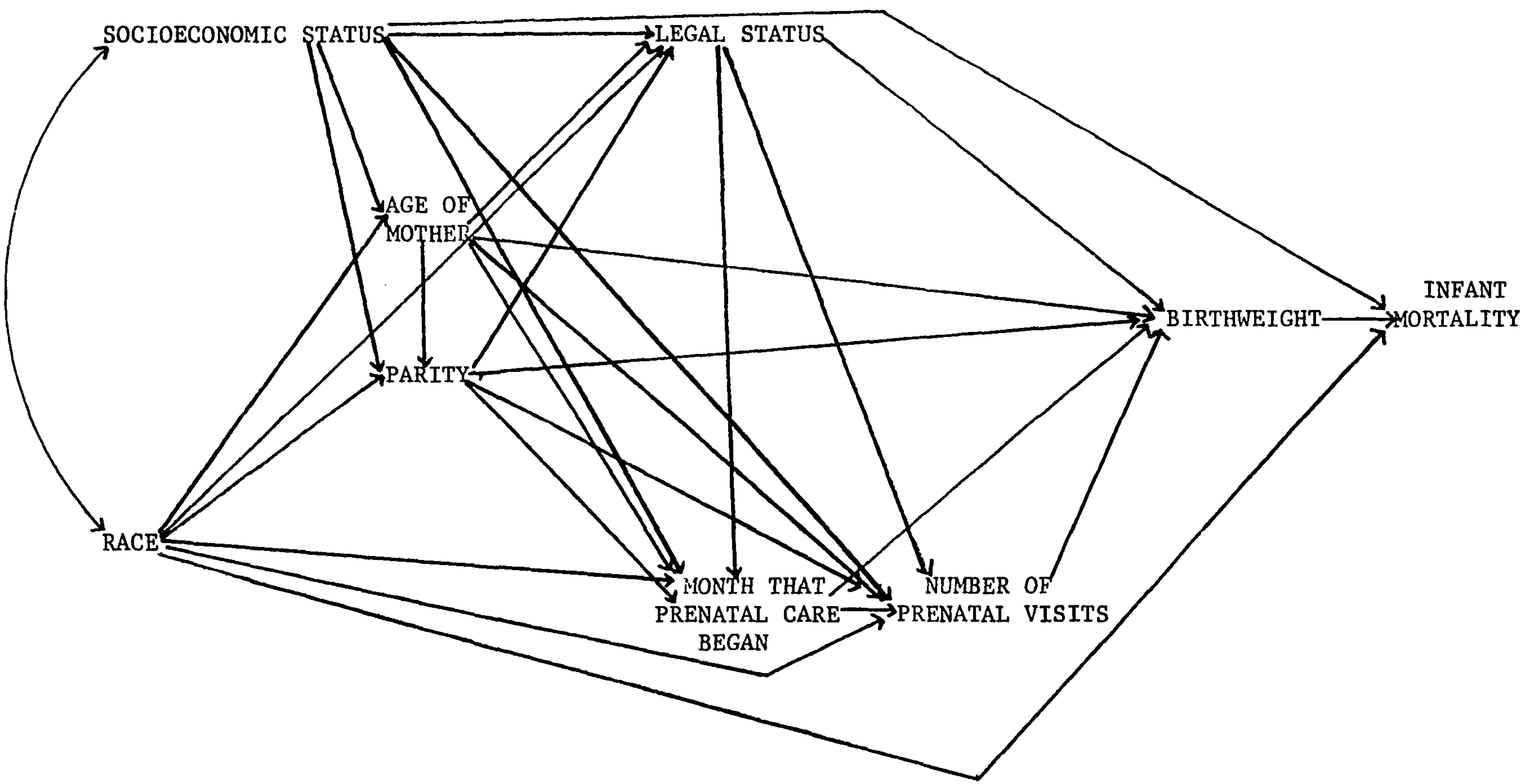
5. To what extent is birthweight the consequence of race, socioeconomic status, age of mother, parity, legal status, timing and frequency of prenatal health care which are part of the infant's social milieu?

6. To what extent is infant mortality the consequence of birthweight, socioeconomic status, and race which are part of the infant's social milieu?

Each of the research questions (or subpropositions) summarized above will now be discussed. Along with the discussion, the research hypotheses associated with each will be presented.

1. The relationship between SES, race, and age of the mother is the first important component in our model. A mother's SES and race locate her in a social milieu which will influence the age at which she will bear a child.

FIGURE 2: THE HYPOTHESIZED RELATIONSHIPS



a. There is curvilinear relationship between race and age of mother so the nonwhite mother has a greater likelihood of being at either age extreme of her childbearing years at the time of the birth of her infant than the white mother.

b. There is a curvilinear relationship between SES and age of mother so the lower the SES of the mother, the greater the likelihood of her being at either age extreme of her childbearing years at the time of her infant's birth.

In other words, nonwhite and low SES women are more likely to bear a child before they are 18 and/or after they are 35 years old. This prolonged period of childbearing has a direct effect on parity, as we will see in subproposition 2.

2. The second subproposition looks at the relationship between SES, race, age of mother, and parity of the mother. A mother's SES and race locate her in a social milieu which will influence patterns of childbearing.

a. The nonwhite mother has a greater likelihood of having a higher parity than the white mother.

b. The lower the SES of the mother, the higher her parity.

Age of mother and parity are directly related because of the biological given in the human period of gestation (nine months). Therefore, women just beginning their childbearing years will have a lower parity due to their prior biological incapacity to have a child. Women who are older will generally have a higher parity than younger women. However, the factors of race and SES add a biosocial dimension to the relationship between age and parity. A woman who bears a child at a very young age may have more children during her lifetime than a woman who began bearing her children at a later age. It is factors that influence a mother's age at the time of the births (for example, SES, race) that exercise a biosocial influence on parity.

At a later point in the analysis, as we look at the relationship between age and prenatal care, the interpretive effects of age of mother on parity will illuminate the importance of the social qualities of a seemingly "biological" relationship between age and parity. The hypothesis generated from our theory and its resultant subpropositions is:

c. The higher the age of the mother, the higher her parity.

Having examined the impact of SES and race on a mother's age and parity, we can specify the manner in which each of these variables influences a child's legal status.

3. There is substantial evidence to support the notion that a child's legal status is highly associated with its SES, race, age of the mother, and parity. Poor, nonwhite mothers have rates of illegitimacy far greater than more affluent white mothers. Considerable evidence exists showing SES to be an important factor contributing to the white-nonwhite differential in illegitimacy. Data compiled by The U.S. President's Commission on Population Growth and the American Future (1972) suggests that about 45 percent of the difference in legitimacy rates between white and nonwhites during 1964 to 1966 was due to a higher proportion of nonwhites who live in poverty. In addition, young, primiparous mothers are more likely to bear children out-of-wedlock, thus compounding the risk of death for themselves and

their offspring.

a. The lower the SES of the mother, the greater the likelihood that she will have an infant born out-of-wedlock.

b. The nonwhite mother has a greater likelihood of having an infant born out-of-wedlock than the white mother.

c. The lower the age of the mother, the greater the likelihood that the infant was born out-of-wedlock.

d. The lower the parity of the mother, the greater her likelihood of bearing an infant out-of-wedlock.

In sum, young, primiparous, nonwhite and low SES mothers are most likely to be unmarried at the time of their child's birth. The fact that they are single during their pregnancy is one factor influencing the timing and frequency of the prenatal care they receive.

4. A mother's choice to seek prenatal care and the frequency with which she receives care will be influenced by her race, SES, age, parity, and the legal status of the child. The impact of each of these factors will influence the availability of services and her willingness to seek care.

a. (1.) The nonwhite mother has a greater likelihood of beginning care at a later month of her pregnancy than the white mother.

(2.) The nonwhite mother has a greater likelihood of having fewer physician visits during her pregnancy than the white mother.

b. (1.) The lower the SES of the mother, the longer she will wait before seeking prenatal care.

(2.) The lower the SES of the mother, the fewer physician visits she will have during her pregnancy.

c. (1.) A mother who is very young will seek prenatal care later than other mothers.

(2.) A mother who is very young will have fewer physician visits during her pregnancy than other mothers.

d. (1.) A mother who is primiparous or whose parity is four or greater will seek care later than other mothers.

(2.) A mother who is primiparous or whose parity is four or greater will have fewer prenatal visits than other mothers.

e. (1.) The mother of the infant born out-of-wedlock has a greater likelihood of beginning her prenatal care at a later month of her pregnancy than the mother of a child born in-wedlock.

(2.) The mother of the infant born out-of-wedlock has a greater likelihood of having fewer physician visits during her pregnancy than the mother of a child born in-wedlock.

f. The longer a mother waits to begin prenatal care, the fewer the number of prenatal visits she will have.

In other words, young, primiparous, low SES, single nonwhite mothers tend to have a lower level of prenatal care than other mothers. They are more likely than other mothers to begin care late and/or have fewer physician visits during their pregnancy. Because of the relative lack of prenatal care, the mother has a greater risk of a negative pregnancy outcome.

5. Since it has been hypothesized that low birthweight is a key link to infant mortality, what social factors may precede birthweight in the model? We have proposed that SES, race, age of

mother, parity, legal status, and frequency and timing of prenatal health care may be important variables. Infants of mothers whose pregnancy is their first or fourth or greater may be disproportionately represented in the low birthweight category. Infants whose mother's age is at either extreme of their childbearing years also run an additional risk of being low weight at birth. Women who put off seeking prenatal care until trimester two or three, or who go for care only infrequently during pregnancy may also run a higher risk of giving birth to a low birthweight infant. Patterns of childbearing and seeking prenatal health care are the result of the socioeconomic status of the mother. Her social milieu acts to influence her chances of having more children and of bearing them at an age when the risk to her and her infant is increased. The inaccessibility of, and/or her unwillingness to use, prenatal care facilities leads her to a greater chance of delivering a low birthweight infant. If the pregnancy is out-of-wedlock, she runs an added risk of a negative outcome. In the same manner, nonwhite mothers are more likely to follow the pattern described above. In addition, prenatal care facilities may be unavailable or, at best, represent an unpleasant experience in a predominantly white middle class medical establishment. Since the nonwhite female is more likely to bear a child out-of-wedlock, her risk is multiplied and her chances of receiving prenatal care are diminished.

In addition to using race or SES as determinants of infant mortality or birthweight, age of mother, parity, legal status, and timing and frequency of prenatal care will be described as critical links.

a. There is a curvilinear relationship between the age of the mother and the birthweight of her child. Therefore, if a mother's age is at either extreme of her childbearing years, a greater likelihood exists that her baby will be low birthweight.

b. There is a curvilinear relationship between the parity of a mother and the birthweight of her child. Therefore, women who are primiparous or who have a parity of four or greater are more likely to have a low birthweight infant.

c. The infant born out-of-wedlock has a greater likelihood of being low birthweight.

d. The longer the mother postpones seeking prenatal health care, the lower the birthweight of the infant.

e. The fewer the number of prenatal visits by the mother during her pregnancy, the lower the birthweight of the infant.

f. The influence of SES on birthweight is explained by the intervening effects of age of mother, parity, legal status, and frequency and timing of prenatal care.

g. The influence of race on birthweight is explained by the intervening effects of age of mother, parity, legal status, and frequency and timing of prenatal care.

The hypotheses presented here predict that SES and race are related to birthweight only through the mediating effects of the variables age of mother, parity, legal status and timing and frequency of prenatal care. Now that the relationships between the "mediating variables" (age, parity, legal status, and prenatal care) and birthweight have been specified, the final link in the causal chain, infant mortality, may be added.

6. The last proposition looks at the direct effects of three variables--birthweight, SES, and race--on an infant's chances of survival. In analyzing each variable's relationship with infant mortality, we expect the following:

a. The lower the birthweight of the infant, the poorer are its chances of surviving beyond the semanatal and/or neonatal period.

b. The nonwhite infant has a poorer chance of surviving beyond the neonatal period than the white infant.

c. The lower the SES of the infant, the poorer are its chances of surviving beyond the semanatal and/or neonatal period.

d. Of the variables "birthweight," "SES," and "race," birthweight has the greatest effect on the ability of the infant to survive beyond the semanatal and/or neonatal period.

We are suggesting that SES and race influence infant mortality, but that their influence is less direct than that of birthweight. Socioeconomic deprivation, as expressed in low SES or the negative consequences of being a minority group member, is most appropriately described through the moderating effects of other variables in the model. In other words, certain aspects of SES and race elaborate the manner in which they are related to infant mortality. Identifying those links is the purpose of this model.

Keeping these basic subpropositions and their respective hypotheses in mind, we have now formalized the relationships explaining the operation of social factors on low birthweight and survivorship of infants.

## Data of the Investigation

Since the data for this dissertation are taken from vital statistics records, a comment on the completeness, accuracy, and representativeness of the data is especially important. In 1950, a test of birth registration completeness was conducted in the U.S. which revealed that 98.6 percent of white births and 93.5 percent of nonwhite births were registered (NCHS, 1965). No definitive information exists on the completeness of death registration, but it is suspected that it follows (and probably exceeds) the pattern for live births fairly closely. We have previously mentioned that underreporting of small infants who die immediately after birth accounts for some error. These infants may, on occasion, be incorrectly registered as fetal deaths rather than as infant deaths. Although the total infant mortality rate (especially the semanatal and neonatal rates) could be affected by this practice, these inconsistencies cannot be reliably measured nor are they believed to be great.

The item "birthweight" was added to practically all state live birth certificates in 1949. Each year some live births are registered with birthweight information missing but the number is generally small. In 1950, 2.7 percent of all live birth certificates in the U.S. had birthweight information missing. By 1967, only .2 percent lacked this entry (Chase and Byrnes, 1972). Although these figures are for the U.S. as a whole, the same general trend is assumed to exist in Oklahoma. In short, the birthweight information recorded on live birth certificates is assumed to be fairly accurate. Data for use in this study are not generally susceptible to the "heapings" at certain intervals that we find in such information as "period of gestation." For most infants, birthweight is measured on standard hospital scales at the time of birth. As an objective measure which avoids maternal recall, birthweight is a highly reliable, well-recorded item.

In Oklahoma in 1975, 99.3 percent of all births occurred in hospitals with physicians in attendance. Since the best possible recording of information on birth certificates should be available from such a source, it is assumed that error is minimal. Although Chase and Byrnes (1972) report serious error by attending physicians in recording weeks of gestation on birth certificates, this is probably due to the nature of that information and the resultant heaping at 36 to 40 weeks of gestation.

As reported by The U.S. President's Commission on Population Growth and the American Future (1972), it is undoubtedly true that many births occurring out-of-wedlock are reported as legitimate births. They estimate that in 1960 the white illegitimacy rate of 9.3 should have been between 9.9 to 10.2, if adjusted for false reporting. Since the informant who supplies the information recorded on the birth certificate is usually the mother, it is suspected that she may want to conceal her marital status if she is single or if the child's father is someone's husband other than her own. However, as the President's Commission points out, to falsify the record she would have to give the name of an alleged or fictitious father to both the child and herself. She might also give her maiden name or falsify a maiden name for the record.

The Commission report discusses two factors which might deter falsification of the record. First, the birth certificate is a permanent record which allows no second thoughts. Second, if the mother presents herself as legally married, the child will not be eligible for adoption at a later date without the "husband's" written consent. This greatly complicates adoption proceedings. Since a sizeable proportion of fathers of children born out-of-wedlock are married to women other than the child's mother, it is unlikely that the man's name would be recorded as the father. There might be reason to falsify a record with the name of a man who has promised to marry the mother after the birth of the child, but the Commission assumes this group to be small. They conclude that there is less reason for concealment of an out-of-wedlock birth than we might suspect. Nor do they believe that nonwhite females having an illegitimate child would be any more or less likely to conceal this fact than white females.

One especially attractive feature of a study based on vital statistics is the ability of researchers to identify a sample that is highly representative of the population. Quite frequently, studies investigating birthweight and fetal mortality or morbidity use clinic or hospital records whose representativeness is highly suspect. By using vital statistics data, chance variation may be measured and evaluated.

Another advantage in the use of existing data, such as vital statistics records, is that cooperation in keeping current records complete and up-to-date is to a large extent assured. State law requires that the attendant (usually an M.D.) complete an accurate certificate of birth for every child. Although the accuracy of state health department vital records is dependent upon cooperation by every attending physician and institution where births occur, birth and death records are assumed to be complete to a very large measure. The data are not likely to be contaminated by the intrusion of an investigator who might, in other instances, influence the responses that the subjects give. We may conclude--when vital statistics are used as the data source for research--completeness, accuracy, and representativeness are far less likely to be a source of error and contamination that problems concerned with the validity of empirical indicators.

## Techniques of Analysis

### The Sample

In order to test the proposed model, a sample of 430 single live births was drawn from live birth records of the Oklahoma State Department of Public Health. In Oklahoma during 1975, 42,704 live births were recorded. Of that number, 7.4 percent (3,168) were low weight births. We know from published vital statistics that the highest risk of death is found among the smallest infants, and that chances of survival improve for any additional weight at birth. The sample has been drawn from all infants born in 1975 in weight categories up to 3,000 grams. In this manner, the model may be used to explore differences in social etiology for infants of low birthweight (2,500 grams or below) and those at slightly higher weights (2,501 to 3,000 grams). Some marked differences in survival ability in the 500 gram weight category of 2,501 to 3,000 grams should be seen.

It should also be noted that, of the population universe of all infants born in single births with weights up to 3,000 grams

(10,750 infants), only approximately 28 percent were low birthweight infants. The remaining 72 percent weighed between 2,501 and 3,000 grams at birth. Those same proportions were also found in the sample drawn for this research (29 percent were low birthweight). In sum, the four percent sample of all single live births in Oklahoma for 1975 whose birthweight was 3,000 grams or less gave us a sample of 430 births, 126 (29 percent) low birthweight infants and 304 (71 percent) with weights from 2,501 to 3,000 grams.

In an earlier discussion it was noted that race is a very important component of our theoretical model. Because it figures prominently in the model, the sample was stratified so that we insured enough nonwhite infants in the sample to make the inclusion of the variable, race, worthwhile. Approximately 18 percent of the live births in Oklahoma for 1975 were to nonwhite parents. The sample was stratified so 52 percent (222 infants) would be white and 48 percent (204 infants) would be nonwhite, thus insuring a large enough number of nonwhite infants in our sample to document the effects of race on the other variables in the model. Ideally, we might have preferred to sample all births in Oklahoma in 1975 and then analyze the manner in which birthweight and survivorship were influenced by the variables in our model. However, since the sample was drawn by hand from files of the State Department of Public Health and then punched by hand on computer cards, the sample size was necessarily small. A manageable sample of all birthweights would have yielded only a small percentage of low birthweight infants (approximately 7.4 percent of all births.) Since the analysis depended upon a rather large number of low weight infants, a truncated range of weights was chosen to insure a sufficient number of cases for the analysis.

## Linking Birth and Death Records

Once the sample had been drawn, the outcome of each birth was obtained through the linked birth and death records of the State Department of Public Health. Through the use of the linked record series (completed only a month prior to the time in which the data collection took place), those infants in the sample born in 1975 and died during the first year of their life were identified. The Oklahoma State Department of Public Health linked record series has been completed for 1975 and 1976 and will now become part of the permanent data file which is continuously collected by that agency.

## Index Construction

It will be noted from the theoretical model that the variable "SES" is actually a construct representing two underlying variables. Management of this construct will be specified below.

An immediate concern in the use of vital statistics data for social research, such as that involved in the current project, is the lack of suitable indicators of socioeconomic status. Several strategies have been employed to locate an acceptable measure of SES which would be most appropriate for this research. Although researchers have often used ecological data, such as median income of the tract in which the respondent resides or median dollar value of property in the tract to measure SES, these indicators are less desirable (indeed, inappropriate) for use in conjunction with information on individuals such as that found on the certificate of live birth. Considering the danger of committing the ecological fallacy, we cannot necessarily assume that a single individual living in a census tract possesses the identical (or even general) characteristics ascribed to the tract as a whole. It may be concluded that if other individualized means of measuring SES are available, they are far more desirable and appropriate.

Two possible measures of SES have been devised here. Each will be described and evaluated. Both are based on the education of the mother with a correction factor for her age. For each of the members of the sample residing in urban tracted locations, we have collected census tract information (median income of the tract, etc.) which will be used here to assess the power and utility of both of our SES indicators.

## SESOE: Observed vs. Expected Education

For this measure of SES (called SESOE), the score for each mother was based on her age and education and the number of years of education that other Oklahoma women had completed by her specific age. This estimation was derived from the 1970 U.S. Census of Population for Oklahoma which reported, among other things, on the median number of school years completed by age for the total female population aged 14 or older.

The manner in which the observed vs. the expected educational levels were compared is represented in Table 1. From Table 1 we can see that the indicator yields a three level, ordinal scale of a

TABLE 1

SOCIOECONOMIC INDEX SESOE: MOTHER'S EDUCATION AND AGE

| AGE | EDUCATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | None | Elem. 1-6 | Elem. 7-8 | H.S. 9-11 | H.S. 12 | Coll. 13 | Coll. 14-15 | Coll. 16 | Coll. 17+ |
| 13 | Low[a] | Low | Med.[b] | High[c] | High | -- | -- | -- | -- |
| 14 | " | " | Med. | High | High | -- | -- | -- | -- |
| 15 | " | " | Low | Med. | High | High | -- | -- | -- |
| 16 | " | " | " | Med. | High | High | High | -- | -- |
| 17 | " | " | " | Low | Med. | High | " | High | High |
| 18 | " | " | " | " | " | High | " | " | " |
| 19 | " | " | " | " | " | High | " | " | " |
| 20 | " | " | " | " | " | Med. | " | " | " |
| 21+ | " | " | " | " | " | " | " | " | " |

[a]LOW

All ages - None
All ages 1-6 elem.
15+ 7-8 elem.
18 + 9-11 H.S.

[b]MEDIUM

13, 14 7-8 elem.
14-17 9-11 H.S.
17+ 12 H.S.
20+ 13 Coll.

[c]HIGH

13 9-11 H.S. or above
14-16 12 H.S. or above
13-19 13 Coll. or above
All ages 14-15 Coll. or above
All ages 16 Coll.
All ages 17+ Coll.

mother's age and the grade level she should have completed by that age. For example, one to three years completed in high school (grade nine through eleven) would be expected for a mother who was 16 at the time of her child's birth. If the number of years of education completed was less than ninth grade, the mother would score low on this measure of SES. If the mother was 18 years of age or over and completed less than four years of high school, her SES score would be low.

When SESOE is compared with traditional SES indicators provided by the 1970 census, some interesting findings emerge. The measure of SESOE has a rather low correlation with traditional census measures, such as median income of tract (r= .20), the average dollar value of owner occupied residences within the tract (r= .22) (Table 2, page 95). Although those tract SES indicators have fairly high intercorrelations with one another, they are rarely better predictors of the variables in the model than the measure, SESOE.

To assess the precise content of our variable SESOE, we can see that the bulk of the measure is attributed to the mother's education (r= .76) while a much smaller portion (r= .14) is explained by the age of the mother (Table 2). The low correlation of the mother's age with SESOE demonstrates the predictive validity of SESOE as an indicator composed mainly of educational level rather than the age of the mother.

### SESINT: Sum of Education and Age of Mother

The measure of socioeconomic status called SESINT has been constructed by adding the number of years of education completed by the mother plus her age up to 18 years. In other words, if a mother is 16

TABLE 2

ZERO-ORDER CORRELATIONS, MEANS, STANDARD DEVIATIONS OF ALL VARIABLES
(n= 429)

| | DTH | BW | PREMO | PREVS | PRVSTRAN | RACE | LEGAL | RACE LEGAL | RASES | SESOE | SESINT | EDUCM | AGEM | AGEM TRAN | PAR | PAR TRAN | MEDIN | DLVAL TCT | DLVAL BL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DTH | 1.00 | -.29[a] | -.30 | -.02 | -.09 | .10 | .04 | .08 | .06 | -.16 | -.04 | -.07 | .03 | .01 | .00 | .00 | .04 | .02 | -.10 |
| BW | | 1.00 | -.03 | .25 | .31 | .09 | .06 | .10 | .03 | .03 | .08 | .11 | .06 | .08 | .03 | .04 | .05 | -.02 | .05 |
| PREMO | | | 1.00 | -.51 | -.69 | -.17 | -.22 | -.25 | -.23 | -.11 | -.21 | -.17 | -.15 | -.17 | .13 | .09 | -.15 | -.16 | -.12 |
| PREVS | | | | 1.00 | .86 | .17 | .13 | .18 | .10 | .24 | .07 | .02 | .20 | .21 | .11 | .08 | -.02 | -.07 | -.05 |
| PRVSTRAN | | | | | 1.00 | .20 | .21 | .26 | .20 | .03 | .09 | .10 | .14 | .19 | -.02 | .01 | .03 | -.01 | .00 |
| RACE | | | | | | 1.00 | .45 | .90 | .92 | .09 | .11 | .12 | .14 | .15 | -.05 | -.03 | .27 | .16 | .11 |
| LEGAL | | | | | | | 1.00 | .62 | .47 | .07 | .07 | .16 | .30 | .32 | .09 | .15 | .22 | .19 | .11 |
| RACE-LEGAL | | | | | | | | 1.00 | .84 | .09 | .06 | .15 | .20 | .22 | -.01 | .03 | .21 | .14 | .07 |
| RASES | | | | | | | | | .100 | -- | .52 | -- | .25 | .29 | -- | -- | -- | -- | -- |
| SESOE | | | | | | | | | | 1.00 | .68 | .76 | .14 | .17 | .02 | -.12 | .20 | .22 | .31 |
| SESINT | | | | | | | | | | | 1.00 | .96 | .35 | .23 | -.04 | -.02 | .68 | .19 | .23 |
| EDUCM | | | | | | | | | | | | 1.00 | .23 | .29 | .01 | -.04 | .21 | .22 | .26 |
| AGEM | | | | | | | | | | | | | 1.00 | .99 | .63 | .63 | .28 | .39 | .29 |
| AGEMTRAN | | | | | | | | | | | | | | 1.00 | .61 | .63 | .28 | .38 | .28 |
| PAR | | | | | | | | | | | | | | | 1.00 | .93 | .00 | -.02 | -.09 |
| PARTRAN | | | | | | | | | | | | | | | | 1.00 | .02 | .00 | -.06 |
| MEDIN | | | | | | | | | | | | | | | | | 1.00 | .90 | .67 |
| DLVALTCT | | | | | | | | | | | | | | | | | | 1.00 | .70 |
| DLVALBL | | | | | | | | | | | | | | | | | | | 1.00 |
| $\bar{X}$ | .09 | 2564.9 | 3.9 | 8.3 | .83 | .52 | .7 | .5 | 3.5 | 1.9 | 29.7 | 11.8 | 22.6 | 1.3 | 2.1 | .24 | 8581.6 | 12604.4 | 10650.0 |
| X | .39 | 471.1 | 2.2 | 5.1 | .32 | .5 | .46 | .5 | 1.8 | .7 | 5.0 | 2.3 | 5.4 | .1 | 1.5 | .25 | | 5732.1 | 8558.1 |

[a]p< .05 for all correlations ≥ .08

and has completed 11 years of school, her SESINT score is 27 (16 + 11). However, if a mother is 45 years old and has completed 12 years of school, her SESINT score is 30 (18 + 12). Beyond age 18, mothers have 18 added to the number of years of school completed so that their higher age will not artifically inflate their SESINT score. For example, a mother who is 45 would have an unusually high SESINT score due to her age rather than her education if age of mother was not accounted for. The result of summing education and age of mother is an interval level score which ranges from 18 to 38. The interval level scores of SESINT compare with only three levels of SESOE, described above.

When SESINT is compared with the median property value of the census tract (r= .19) and block (r= .23) of residence, the correlations are moderate, as was the case with SESOE. However, SESINT and the median income of the tract in which a mother resides have a much stronger correlation (r= .68). Again, SESINT has approximately the same predictive value with the variables in the model as the tract indicators. SESINT is a somewhat better predictor of the variables than SESOE, however.

It should be noted that mother's education comprises the greatest portion of SESINT (r= .96) while a rather small portion may be attributed to age (r= .35). The predictive validity of SESINT is enchanced by the finding that the bulk of the SESINT measure of socioeconomic status may be attributed to the education of the mother.

The obvious concern with the measures of socioeconomic status created here is that of their validity. Although they are only moderately correlated with other measures of SES available for our urban tract residents, they provide as good a predictor of other variables in the model. It can be concluded that we are probably measuring a different but related concept which underlies socioeconomic status. While the census tract measures of SES may be measuring some facet of SES, such as income (median income of tract or property value), the indices of SES measure education. We are reminded of Duncan's (1961) conclusion that education qualifies individuals for occupational life and serves to link their education to their income. On the basis of his argument that any single measure of SES is not suitable for all research purposes, we feel justified in using a measure of SES based on education (and corrected for age of mother). It is assumed to measure education, an important component of the construct, SES.

## SESOE and SESINT Compared

To illustrate the difference between the two indices of SES, two regression equations using birthweight as the dependent variable and SESINT and SESOE alternately as one of the independent variables were computed. These calculations reveal a slightly greater proportion of the variance explained with SESINT ($R= .40$, $R^2= .17$) than with SESOE ($R= .39$; $R^2= .15$). These findings are summarized in Table 3. The two indices of socioeconomic status are significantly related to one another ($r= .68$). The manner in which age is treated undoubtedly accounts for this difference from unity ($1-r= .32$). We have chosen SESINT as our indicator of socioeconomic status. Either index might appropriately be used; but due to the somewhat greater predictive value of SESINT with other variables in the model, it was chosen over SESOE.

TABLE 3

STEPWISE REGRESSION OF BIRTHWEIGHT ON SESINT AND ON SESOE

| Dependent Variable: Birthweight | Simple r | b | Beta | Cumulative Multiple R | Cumulative $R^2$ | RSQ Change |
|---|---|---|---|---|---|---|
| Independent Variables: | | | | | | |
| Prenatal visits (prvstran) | .30 | 684.5 | .47 | .30 | .09 | .09 |
| Prenatal month (prentlmo) | .00 | 68.0 | .32 | .38 | .15 | .05 |
| SESINT | .14 | 24.2 | .14 | .40 | .16[a] | .02 |
| Dependent Variable: | | | | | | |
| Birthweight | | | | | | |
| Independent Variables: | | | | | | |
| Prenatal visits (prvstran) | .30 | | .49 | .30 | .09 | .09 |
| Prenatal month (prentlmo) | .00 | | .30 | .38 | .15 | .05 |
| SESOE | .03 | | .05 | .38 | .15[b] | .00 |

[a] $F= 27.6$; $df= 3,424$; $p= .01$

[b] $F= 24.6$; $df= 3,424$; $p= .05$

It has been noted that the age of the mother operates rather independently of SESINT (r= .35). Because a mother's age is accounted for only up to age 18, it is important and appropriate to include it in the model as a separate variable.

## Statistical Techniques for Analysis

The model which will will be tested in this dissertation is composed of numerous sets of independent and dependent variables. Although the ultimate concern is to explain low birthweight and infant mortality, we will need to analyze several sets of relationships to take us from one portion of the model to another. The analysis will consist of testing each piece of the model in turn as we move from left to right, from race and SES toward low birthweight and infant mortality. Among the nine variables included in the model are two nominal (race and legal status) and seven ordinal (or higher) variables. The statistical treatment given to each relationship depends upon its positioning in the model. First, analysis of covariance has been chosen as a major statistical tool because of its ability to handle both categorical and continuous independent variables. The use of analysis of covariance will display a key role for the categorical variables race and legal status and isolate their effect on birthweight and infant mortality while partialing out the effects of all other variables. For example, we can look at the relationship between race and legal status on birthweight with the effects of SES, age of mother, parity and prenatal care partialed out.

Second, because of its ease of interpretation and its robust qualities as a statistical procedure, multiple regression will also be used where appropriate in this analysis. It is an important tool with which to assess the utility of specific indices and to evaluate the percentage of variance explained by a linear combination of the variables in the model. We will also use partial correlation to control for the effects of variables whose influence we wish to remove from a relationship under study. Dummy variables will be used to include nominal variables, such as race and legal status into the equations. Because of the similarities between analysis of variance, covariance, and multiple regression, the use of a combination of these techniques should not produce any discontinuity. In fact, the combined use of the statistical procedures should enable us to evaluate the strengths and weaknesses of the model more thoroughly.

Third, since analysis of covariance and multiple regression cannot be used with a nominal dependent variable, the statistical strategies will be different when legal status is used as the dependent variable. During this portion of the analysis, nonparametric tests, such as chi-square and gamma will be used. Chi-square is a test of statistical significance performed to determine if a systematic relationship exists between two or more nominal variables. The actual computation of chi-square compares cell frequencies which would be expected if no relationship existed with the actual values in the table. Chi-square will be zero if all observed and expected frequencies are identical. If no relationship exists between two variables, then any deviations from the expected value are due to chance if a randomly selected sample has been employed. Chi-square implies that a systematic relationship of some kind exists between the variables (Nie et. al., 1975). Although chi-square may enable the researcher to decide if a relationship exists between two nominal variables, it cannot assess the strength or direction of the alleged association. For these estimates, gamma will be used. Gamma tells us both the strength and direction of a relationship through a very simple calculation. It is ratio of the number of concordant pairs (P) minus the number of discordant pairs (Q) divided by the total number of united pairs (P + Q):

$$\text{Gamma} = \frac{P - Q}{P + Q}$$

From this it can be seen that gamma has a positive value if the concordant pairs predominate or a negative value of discordant pairs predominate. If the values are equal, gamma's value becomes zero (Nie et. al., 1975).

In each of the relationships in the model where the dependent variable is ordinal, covariance analysis or multiple regression may appropriately be used. The analysis of variance subprograms, ONEWAY, will be used to check for linear or quadratic trends in the variables such as age of mother or number of prenatal visits. Since mothers at lowest and highest ages are expected to incur greater risk of producing low birthweight infants than mothers in the prime childbearing years, we will be able to track curvilinear or quadratic trends between age of mother and low birthweight. In other relationships, such as that between age of mother and the incidence of out-of-wedlock births, no evidence exists to suggest a relationship other than a linear one. The ONEWAY program, which includes a priori contrasts, allows the researcher to chart such trends in the relationships among variables.

The purpose of the diagrammatic presentation of the model (page 78) is to summarize the multiple operations which will be performed with the data. At various points in the analysis, parity, age of mother, legal status, timing and frequency of prenatal health care, and birthweight are treated as independent variables; at other points, each will serve as the dependent variable. The overriding concern of this analysis is to use statistical manipulation to identify the viable linkages in the model and the ones which should be eliminated. The end product will be the most parsimonius model available from the constructs measured through data included on live birth certificates.

## Conclusion

This dissertation develops a model for the analysis of social factors associated with low birthweight and survivorship of infants. Its intent is to document linkages between the variables socioeconomic status and race and account for their relationship with low birthweight and infant mortality. To date, these links have not been clearly probed and established in the literature.

Analysis of covariance and multiple regression will be used as the primary means of testing the model so that both categorical and continuous variables may be analyzed. Information for the study is derived from certificates of live birth and infant deaths in Oklahoma for 1975.

Our plan is to elaborate and explain some of the ambiguities and gaps in the literature on the relationship between race, socioeconomic status, birthweight and infant mortality. We will also show the importance of age of mother, parity, legal status, and prenatal health care of the mother as important intervening links between race and SES on the one hand and birthweight and infant mortality on the other hand.

CHAPTER V

# FINDINGS

## Introduction

Having specified the theoretical model and methodological strategies, we now reveal the nature of the findings and provide the substance of the data that will be used in the analysis, Chapter VI. Since the range of birthweights for this sample is limited to the lowest group of live births, we recognize that we are studying a special group of mothers and infants rather than a representative one. A look at the key characteristics of the sample reveals some vital distinctions.

## Description of the Sample

### Birthweight

The actual birthweights encountered in our sample range from 454 grams (1 lb.) to a maximum of 2,977 grams (6 lbs., 9 oz.). With a median weight of 2,711.4 grams and a mean weight of 2,567.5, all infants in the sample fall considerably below the median birthweight for all live born infants in Oklahoma in 1975, 3,317 grams (7 lbs., 5 oz.).

This may be compared with the national median birthweight in 1973 of 3,310 grams.

Although in Oklahoma in 1975 7.4 percent of all births were low weight, we have been able to select a sample inflating percentage to 29 percent by truncating the range of birthweight to an upper limit of 3,000 grams. The remaining 71 percent is located in the 500 gram range of 2,501 to 3,000 grams. This matches the estimates for the entire state where 28 percent of all live births up to weight 3,000 grams are found to be low birthweight infants with the remaining 72 percent ranging from 2,501 to 3,000 grams.

One consistent theme in the literature and in state and national statistics is the striking difference in median birthweights between whites and nonwhites. For example, in Oklahoma in 1975, the percentage of low weight white infants was 6.9 percent of all live births compared to 9.7 for nonwhites. This translates to a median birthweight of 3, 343 for whites and 3,243 grams for nonwhites. In the sample the median birthweight for nonwhites is lower (2,693 grams) than for whites (2,750.3 grams). In fact, young, nonwhite unmarried females--whose socioeconomic status is low and whose prenatal care was late in commencing and infrequent once begun--run a greater risk of having low birthweight infants than other women in our sample. Later in this chapter, we will present the findings leading to these conclusions and describe the specific manner in which each variable is related to birthweight.

## Infant Mortality

In 1975 in the U.S., infant deaths occurred at the rate of 16 deaths per 1,000 live births. At this rate, in a sample of 429 births we might expect to find only a very small number of infant deaths (approximately seven deaths). However, since low birthweight infants are known to have a far higher mortality rate, we anticipated a greater number of deaths within the sample. After the linking of birth and death certificates have been completed, we found 21 infants in our sample had died within the first year of their life, a rate of 49 per 1,000.[1] An infant mortality rate of three times that of all live births should stress the unique nature of our sample. The greatest number of those to die did so during the semanatal period (67 percent), usually within the first 24 hours of life.

It is a major premise of this study that birthweight is an important predictor of an infant's ability to survive its first year of life. Correspondingly, we find that 76 percent of the infants who died weighed 2,500 grams or less. The median weight of all of those who died was 1,559.5 grams. Of course, a very low weight at birth does not always mean an infant cannot survive infancy. The smallest infant in the sample, a white female who weighed only 454 grams (1 lb.) at birth, survived despite her extraordinarily low weight. But five (71.4 percent) of the seven infants in the sample weighing below 1,000 grams died, with four of those five deaths occurring during the first week of life.

## Race

It was noted earlier that the sample is stratified to increase the very small number of nonwhites which might otherwise be encountered.

---

[1] Infant mortality rate was calculated for the sample as:

$$\frac{\text{Number of infant deaths}}{\text{Total N of sample}} \text{ X } 1{,}000 \text{ or } \frac{21}{429} \text{ X } 1{,}000 = 49.0$$

As a result, 48 percent of the mothers in the sample are nonwhite, although only approximately 18 percent of all live births in Oklahoma during 1975 were to nonwhite mothers. There is justification in inflating this portion of the sample because of the dramatic differences expected to be found between whites and nonwhites on a variety of characteristics in the sample.

## Socioeconomic Status

Using the measure of socioeconomic status called SESINT, we find a median SES score of 29.8. Individual scores range from 13 to 38. The mode, 30, includes 40 percent of the sample. We have seen that a large portion of the variance of SESINT may be explained by mother's educational level ($r = .96$; $r^2 = .92$). The mothers in our sample have a slightly lower level of education ($\overline{X} = 11.8$) than the average for women in Oklahoma in 1970 (12.0), but this is probably due to the slightly lower median age of the sample. The mean SESINT score (29.5) is pulled down by three members of the sample who had received no formal education at the time of their child's birth.

For descriptive purposes, SESINT is also trichotomized into high, medium, and low levels. With 28 percent of the sample falling into the low SES group, it was found that 32 percent are nonwhites and 26 percent are whites. The largest portion of middle SES respondents are nonwhite (55 percent compared to 48 percent white). Within the high SES group, however, whites outnumber nonwhites by a rather large margin; while 21 percent of the total sample score high on SES, 27 percent of whites and only 14 percent of nonwhites fall into this category.

## Age of Mother

Because we suspect that mothers of low weight infants tend to be somewhat younger than other mothers, it is not surprising to find that the median age for the sample is 21.5 years, compared to 23 for all Oklahoma mothers (1975). Mothers in our sample range in age from 11 to 45 years. The range is narrower for whites (14 to 41) than for nonwhites (11 to 45). While married mothers' ages range from 15 to 45, single mothers are found mainly in younger age groups (11 to 34).

The month in which a mother initially seeks prenatal care varies by her age. Those who begin prenatal care tend to be somewhat older (22.6) than those delaying their first visit until the second (20.4) or third (20.3) trimester of pregnancy.

Since the literature indicates both the youngest and the oldest mothers may have a greater risk of having low birthweight infants, we performed a log transformation on the age of the mother to see if a non-linear trend occurs in the data. A very slight increase in the zero-order correlations may be noted between every variable in the model and the transformed variable, called "AGEMTRAN" (Table 2). In addition to zero-order correlations, multiple regression equations alternately using AGE and AGEMTRAN indicate very little difference between the two as predictors of the variables. Table 4 shows the contribution made by each of the measures of mother's age in equations where birthweight is the dependent variable. The use of AGEMTRAN in the multiple regression equations will be accompanied by a discussion of the shape of the non-linear trend indicated.

TABLE 4

STEPWISE REGRESSION OF BIRTHWEIGHT ON AGE AND ON AGEMTRAN

| Dependent Variable: Birthweight | Simple r | b | Beta | Cumulative Multiple R | Cumulative $R^2$ | RSQ Change |
|---|---|---|---|---|---|---|
| Independent Variables: | | | | | | |
| Prenatal visits | .23 | 16.7 | .24 | .23 | .05 | .05 |
| Prenatal month | .00 | 14.1 | .07 | .23 | .05 | .00 |
| AGEM | .06 | 3.6 | .04 | .24 | .06[a] | .00 |
| Dependent Variable: | | | | | | |
| Birthweight | | | | | | |
| Independent Variables: | | | | | | |
| Prenatal visits | .23 | 16.7 | .24 | .23 | .05 | .05 |
| Prenatal month | .00 | 14.9 | .07 | .23 | .05 | .00 |
| AGEMTRAN | .07 | 283.1 | .06 | .24 | .06[b] | .00 |

[a] $F= 8.4$; $df= 3,423$; $p= .05$

[b] $F= 8.7$; $df= 3,423$; $p= .05$

## Parity

The median number of children born to women in our sample, including the present birth, is 1.7. The major factor in keeping this figure unusually low is, undoubtedly, the young age of the mothers. The completed family size for the women would probably be closer to the Oklahoma average size of family which is 2.2. Although the median parity is low, the parities in the sample range from one to 12. The higher mean parity (2.1) is a reflection of the extreme scores of one percent (5 women) of the sample having parities from eight to 12.

Since we anticipate that parity may have a non-linear relationship with variables such as birthweight and prenatal care, a log transformation was performed on parity, creating the variable "PARTRAN." If PARTRAN explains a greater proportion of the variance than PAR (parity) in any of our multiple regression equations, the transformed variable will be used and the nature of the non-linear trend will be analyzed.

## Legal Status

In Oklahoma in 1975, 11.1 percent of all live births were born to unwed mothers. In this sample, 31 percent of births were to unmarried mothers. However, this should not be mistakenly attributed to the low weight nature of our sample. The reader will recall that we stratified the sample into white and nonwhite infants, with a disproportionately large number of nonwhites being drawn (48 percent). We find that 82.2 percent of the out-of-wedlock births come from the nonwhite portion of the sample. While only 10.4 percent of white births were to unwed mothers, 52 percent of nonwhite births were to single mothers.

Single mothers tend to be younger, with a median age of 18.6 years compared to 22.7 years for married mothers. They wait longer to seek prenatal care (4.6 months vs. 3.6 months for married women) and, consequently, average fewer prenatal visits (6.8 vs. 8.7). Married mothers have a higher educational level (12.0) than their unmarried counterparts (11.2) and, therefore, score higher on our SES indicator (29.9 vs. 28.5).

We find parity to be lower for unmarried mothers (1.8 children) than for unmarried ones (2.2). While the number of children born to married women ranges from one to 12, unmarried women's parity ranges from one to seven. However, marital status at the time of the previous birth is unknown.

Prenatal Care

Month Prenatal Care Began. In a recent report released by the National Center for Health Statistics (March, 1977) on the use of medical procedures associated with preventive care, 99 percent of all women studied in the Health Interview Survey of 1973 had some prenatal care during their pregnancy. In 60 percent of the cases, the care began in the first trimester of pregnancy. Only 53 percent of women in our sample received care by the end of the first trimester. In addition, four percent received no care at all. As noted earlier, young women and unmarried mothers are least likely to receive care early.

Another difference between mothers seeking early versus late care is parity. Those who begin care early tend to have a lower parity (1.9) than those who are in their second (2.1) or third (2.4) trimester of pregnancy when prenatal care begins.

Lower educational level (and thus low SES) is another notable characteristic of mothers who are late in seeking care. Those delaying care into the third trimester had a mean educational level of 11.4 years compared to 12.3 for mothers who sought care early.

Frequency of Prenatal Care. More strikingly divergent from the findings of the Health Interview Survey of 1973 is the frequency with which mothers in our sample obtain prenatal care. While the national survey finds an average of eleven visits per live birth for all women, the mean number of visits for our sample is 18.1. Again we see four percent receiving no care while others in the sample have as many as 50 prenatal visits.

Because the literature mentions that either extreme of prenatal care (an abnormally high number or no visits) may be associated with a negative outcome at birth (either low birthweight and/or death from some complication), a log transformation was done for the number of prenatal visits. The new variable PRVSTRAN proved to be a more useful predictor of the variables in the model than its non-transformed version. In its zero-order correlation with birthweight, PRVSTRAN explains 10 percent of the variance ($r = .31$; $r^2 = .10$) while PRENTLVS predicts only five percent of the variance of birthweight ($r = .23$; $r^2 = .05$). In a multiple regression equation using birthweight as the dependent variable, PRVSTRAN shows greater utility than PRENTLVS (Table 5).

A series of contrasts were performed on the relationship between the number of prenatal visits and birthweight to check for quadratic or linear trends in the data. The results indicate a

TABLE 5

STEPWISE REGRESSION OF BIRTHWEIGHT ON PRENATAL VISITS AND ON PRVSTRAN

| Dependent Variable: Birthweight | Simple r | b | Beta | Cumulative Multiple R | Cumulative $R^2$ | RSQ Change |
|---|---|---|---|---|---|---|
| Independent Variables: | | | | | | |
| Prenatal visits (prentlvs) | .23 | 16.7 | .24 | .23 | .05 | .05 |
| Prenatal month | .00 | 14.9 | .07 | .23 | .05 | .00 |
| AGEMTRAN | .07 | 283.1 | .06 | .24 | .06[a] | .00 |
| Dependent Variable: | | | | | | |
| Birthweight | | | | | | |
| Independent Variables: | | | | | | |
| Prenatal visits (prvstran) | .31 | 717.1 | .50 | .31 | .10 | .10 |
| Prenatal month | .00 | 65.6 | .31 | .39 | .16 | .06 |
| AGEMTRAN | .07 | 218.1 | .05 | .40 | .16[b] | .00 |

[a] $F= 8.7$; df= 3,423; $p= .05$

[b] $F= 26.3$; df=3,423; $p= .01$

quadratic relationship due to greater differences between a low number of visits versus medium and higher levels. Table 6 illustrates this trend. From Table 6 we can see it is mothers with very few visits (0 to 5) who tend to have lower weight infants than those with higher levels (6 or greater). As a result, both linear and quadratic trends appear to be significant. Since the number of visits varies with birthweight from low to high, the linear trend is signficant ($t= 5.9$; $df= 426$; $p<.05$). Because the transformed variable PRVSTRAN is a better predictor of the variables in our model, it will be used when applicable. The manner in which the number of prenatal visits is related to the dependent variables--birthweight and infant mortality--will be analyzed later in more detail. In multiple regression equations, we will use the transformed variable to enhance our ability to predict the dependent variable from a linear combination of our independent variables.

## Analysis of the Model

### Introduction

In the theoretical model, the concern is not only with each variable and its relationship to birthweight or infant mortality, but also with the way in which the entire model "hangs together" in a causal sequence. In the literature there is extensive documentation of two variable relationships where either birthweight or infant mortality are used as dependent variables. However, little has been written concerning the elaboration of these simple relationships. To assess the nature of the relationships proposed in the model, we have

TABLE 6

EFFECTS OF PRENATAL VISITS ON BIRTHWEIGHT: UNADJUSTED MEANS AND ANALYSIS OF VARIANCE OF BIRTHWEIGHT

| Dependent Variable: Birthweight | Low (0-5) | Medium (6-9) | High (9+) | Total |
|---|---|---|---|---|
| | 2353.5 | 2623.9 | 2712.8 | 2567.5 |

| Source of Variation: | df[a] | df[b] | Mean Square | F | t | probability |
|---|---|---|---|---|---|---|
| Total | 428 | | | | | |
| Prenatal visits | 2 | | 4120448.0 | 20.4 | | .001 |
| Residual | 426 | | 201714.1 | | | |
| Contrasts: | | | | | | |
| Linear Trend | | 426 | | | 5.9 | .001 |
| Quadratic Trend | | 426 | | | 2.1 | .05 |

[a] Degrees of freedom associated with mean squares.

[b] Degrees of freedom associated with t-statistics.

generated a set of subpropositions and their resultant hypotheses. In this chapter we will describe the findings as sets of dependent and independent variables. In the following chapter we will discuss each subproposition and its hypotheses in relation to these findings. The analytical strategy is to move systematically across the model from left to right by identifying each variable to the right of SES and race as the dependent variable. Each variable will be analyzed, in turn, by using all variables to its left as independent variables. In this manner, a causal sequence of relationships may be traced and the theoretical model empirically tested.

Dependent Variable: Age of Mother

Although a large portion of the variance of mother's age remains unexplained ($1 - r^2 = .81$) when race and SES are used as the predictors, a linear combination of the two variables explains 19 percent of the variance (Table 7). As the model suggests, SES and race are significantly associated. For whites, the mean SES score (30.2) is signficantly greater than that of nonwhites (29.2) (Table 8). Not only are SES and race associated with one another, but each shows a significant relationship with the dependent variable, age of mother.

At each level of SES, mothers tend to be somewhat older at the time of their child's birth. Low SES mothers have a mean age of only 19.7 years and are, therefore, younger than middle and high SES women (24.7 years) (Table 9). Both analysis of variance (Table 9) and the zero-order correlation coefficient (Table 7) indicate that white women tend to be older than nonwhite women at the time their children are born. The mean age of white mothers is 23.3 years while for nonwhites

TABLE 7

STEPWISE REGRESSION OF AGE OF MOTHER ON SESINT AND RACE

| Dependent Variable: Age of Mother | Simple r | b | Beta | Multiple R | Cumulative $R^2$ | RSQ Change | Partial r[a] |
|---|---|---|---|---|---|---|---|
| Independent Variables: | | | | | | | |
| SESINT | .43 | .02 | .41 | .42 | .18 | .18 | -- |
| Race | .15 | .02 | .10 | .44 | .19[b] | .01 | .11 |

[a]Partial r is the correlation of race with the dependent variable after the other variable already in the equation (SESINT) has been partialed out.

[b]F= 49.8; df= 2,424; p= .01

TABLE 8

EFFECTS OF RACE ON SESINT: UNADJUSTED MEANS AND
ANALYSIS OF VARIANCE OF SESINT

| Dependent Variable: | Race | | |
|---|---|---|---|
| SESINT | White | Nonwhite | Total |
| | 30.2 | 29.2 | 29.7 |

| Source of Variation: | df | Mean Square | F | probability |
|---|---|---|---|---|
| Total | 425 | | | |
| Race | 1 | 106.2 | 4.4 | .05 |
| Residual | 424 | 24.4 | | |

TABLE 9

EFFECTS OF RACE AND SESINT ON AGE OF MOTHER: UNADJUSTED MEANS AND ANALYSIS OF VARIANCE OF AGE OF MOTHER

| Independent Variables: | | Dependent Variable: Mean Age of Mother | |
|---|---|---|---|
| Race | | SESINT | |
| White | 23.3 | Low | 19.7 |
| Nonwhite | 21.9 | Medium | 23.3 |
| Mean | 22.6 | High | 24.7 |
| | | Mean | 22.6 |

| Source of Variation: | df[a] | df[b] | Value | t value | F | probability |
|---|---|---|---|---|---|---|
| Total | 425 | | 29.6 | | | |
| Race | 1 | | 22.3 | | .8 | NS |
| SESINT | 2 | | 380.1 | | 14.1 | .001 |
| Interaction | 2 | | 16.6 | | .6 | NS |
| Race-SESINT | | | | | | |
| Residual | 420 | | 26.4 | | | .001 |
| Contrasts: | | | | | | |
| Nonwhite/white | | 420 | 3.9 | 2.4 | | .02 |
| Low SES/Medium, high SES | | 420 | 15.2 | 6.6 | | .001 |
| Medium SES/High SES | | 420 | 2.1 | 1.6 | | NS |
| Interaction | | 420 | 1.3 | .6 | | NS |
| Interaction | | 420 | 1.5 | 1.1 | | NS |

[a]Degrees of freedom associated with mean squares.

[b]Degrees of freedom associated with t-statistics.

it is only 21.9.

In a stepwise regression solution where race becomes a dummy variable, SES makes the greatest contribution to mother's age ($\beta$= .41) while a small but significant change is attributable to race ($\beta$= .10) (Table 7). When we control for SES in the relationship between race and age of mother, the relationship remains relatively unchanged (partial r= .11). Had the two variable relationships disappeared, we might have argued that SES accounts for the association between race and a mother's age at the time of her child's birth. Since this did not occur, we are led to support the notion that both a mother's SES and her race make independent contributions to the age at which a woman bears a child.

Because of the way in which race and SES are jointly displayed in the model, we also may look at their combined influence on the age of the mother at the time of the child's birth. By employing a series of contrasts (Table 9) of groups ranging from low SES nonwhites to high SES whites, we find significant differences in the mean age of mother not only for whites versus nonwhites (t= 2.5; p= .01) but also at various levels of SES. While race and SES vary by age of mother from low (nonwhite, low SES) to high (white, high SES), the contrasts performed in Table 9 give additional information concerning the nature of the relationship. A significant difference exists between the nature of white and nonwhite mothers, and between women of low SES versus middle and high SES. However, no significant difference exists in the age of mother between middle and high SES women (t= 1.6; df= 420; p= NS), although the relationship is in the direction predicted. Low

SES women, regardless of race, are significantly younger than other mothers. Tests for interaction were performed and no significant interaction was found to exist between race and SES. Although low SES nonwhite women are the youngest group of mothers (19.6 years), low SES white mothers follow closely (40.4). The low SES white mothers are younger than middle or upper SES nonwhite mothers. Within each racial group, SES varies from low to high with low SES women having the lowest mean age. Nonwhite mothers are younger at each level of SES than white women.

## Dependent Variable: Parity

A substantial proportion of the variance ($R^2$= .44) of parity is explained by the variables race, SES, and age of the mother (Table 10). However, a beta weight of .69 tells us the bulk of the variance of parity is explained by the age of the mother. The beta weight is a standardized partial regression coefficient stating which variable in the equation contributes the most to the explanation of the dependent variable, after controlling for all of the other variables in the equation. In other words, beta allows the comparison of the relative effects of each independent variable on the dependent variable. We see that SES ($\beta$= -.17) and race ($\beta$= -.11) make small but significant contributions to the explanation of parity.

Since the age of the mother is such a strong predictor of parity compared to race and SES, we have controlled for age in the relationship between both SES and parity, and race and parity:

<u>SES</u>. The zero-order correlation between SES and parity is extremely low (r= -.02). However, when we partial the effects of age of

TABLE 10

STEPWISE REGRESSION OF PARITY ON INDEPENDENT VARIABLES

| Dependent Variable: Parity | Simple r | b | Beta | Cumulative Multiple R | Cumulative $R^2$ | RSQ Change | Partial r[a] |
|---|---|---|---|---|---|---|---|
| Independent Variables: | | | | | | | |
| Age of Mother | .63 | 1.70 | .69 | .63 | .40 | .40 | -- |
| SESINT | -.02 | -0.01 | -.17 | .65 | .43 | .03 | -.22 |
| Race | -.03 | -0.16 | -.11 | .66 | .44[b] | .01 | -.17 |

[a] Partial r is the correlation of the independent variable with the effects of those variables already entered into the equation partialed out.

[b] F= 110.2; df= 3,419; p= .001

mother from the relationship, the partial correlation actually increases (r= -.22). Table 11 shows the mean parity score both before (unadjusted score) and after (adjusted score) we control for age of mother. As we look at the relationship between parity, SES, and age of mother, the reason for the increase in the association between parity and SES becomes clear. Classical suppression exists between SES and parity. The age of the mother actually conceals or "suppresses" the true nature of the relationship. In Chapter VI, "Analysis," the empirical meaning of classical suppression and the theoretical implications it may have for our model will be reviewed.

Race. The simple r between race and parity (r= -.02) reveals a slight but significant association between the two variables. However, when we control for the effects of age of mother, the relationship becomes stronger (r= -.17) and a suppressive relationship becomes apparent.

Table 12 shows the mean parity scores before and after we adjust for age of mother. Before age is controlled (column 1), only minute differences in parity are evident between white mothers (2.0) and nonwhite mothers (2.1). However, when we control for age, the differences between the two groups become clearer. In Chapter VI, "Analysis," the implications of this finding will be discussed.

Age of Mother. Table 13 describes the relationship between age of mother and parity. Although it can be seen that age of mother and parity are significantly associated, additional analysis is necessary to describe the nature of that relationship. When we perform

TABLE 11

EFFECTS OF SESINT ON PARITY: UNADJUSTED MEANS AND MEANS OF PARITY ADJUSTED FOR AGE OF MOTHER, ANALYSIS OF COVARIANCE OF PARITY

| Independent Variable: | | Dependent Variable: Parity | |
|---|---|---|---|
| | | Unadjusted Means | Adjusted Means |
| SESINT | | | |
| | Low | 1.9 | 2.6 |
| | Medium | 2.3 | 2.5 |
| | High | 2.0 | 1.8 |

| Source of Variation: | df | Mean Square | F | probability |
|---|---|---|---|---|
| Total | 426 | 2.2 | | |
| Age of Mother | 1 | 425.3 | 363.7 | .001 |
| SESINT | 2 | 28.9 | 24.7 | .001 |
| Residual | 423 | 1.2 | | |

TABLE 12

EFFECTS OF RACE ON PARITY: UNADJUSTED MEANS AND MEANS OF PARITY ADJUSTED FOR AGE OF MOTHER, ANALYSIS OF COVARIANCE OF PARITY

| Independent Variable: | Dependent Variable: Parity | |
|---|---|---|
| Race | Unadjusted Means | Adjusted Means |
| White | 2.0 | 1.9 |
| Nonwhite | 2.1 | 2.3 |

| Source of Variation: | df | Mean Square | F | probability |
|---|---|---|---|---|
| Total | 423 | 2.2 | | |
| Age of Mother | 1 | 386.7 | 303.9 | .001 |
| Race | 1 | 16.3 | 12.8 | .001 |
| Residual | 421 | 1.3 | | |

TABLE 13

EFFECTS OF AGE OF MOTHER ON PARITY: ANALYSIS OF VARIANCE ON PARITY

| Source of Variation: | df[a] | df[b] | value | t value | F | probability |
|---|---|---|---|---|---|---|
| Total | 426 | | | | | |
| Age of Mother | 2 | | 139.3 | | 91.2 | .001 |
| Residual | 424 | | 1.5 | | | |
| Contrasts: | | | | | | |
| Linear Trend | | 424 | 2.3 | 13.1 | | .001 |
| Quadratic Trend | | 424 | -0.9 | -3.7 | | .001 |

[a]Degrees of freedom associated with mean squares.

[b]Degrees of freedom associated with t-statistics.

a priori contrasts between the two variables, both linear and quadratic trends in the data are found. While there is a positive, linear association between age of mother and parity, a quadratic trend is also apparent because of the significantly lower parities among both very young (11 to 18) and medium aged (19 to 26) mothers. Only older mothers (27 years or older) have high parities.

In sum, race, SES, and the age of the mother each have direct effects on parity. Although the age of the mother makes the greatest relative contribution to the explanation of parity, race and SES make significant contributions to the dependent variable if the age of the mother is controlled. We will now add parity and age of mother to the list of independent variables and assess the impact of each on another key dependent variable in the model, legal status.

## Dependent Variable: Legal Status

Legal status is the only non-metric dependent variable in the model and, thus, its statistical management will be different. Chi-square will be used as a measure of association while gamma will measure strength and direction. Not only will we look at the relationship between legal status and each independent variable, but we will also look for interpretive sequences of relationships where ever they are indicated.

Age of Mother. A chi-square of 58.4 (df= 2; $p < .001$) indicates that a significant relationship existing between age of mother and her marital status at the time of her infant's birth (Table 14). A gamma of -.57 indicates a relatively strong, negative association between age

TABLE 14

LEGAL STATUS BY AGE OF MOTHER: CHI SQUARE TEST[a]

| Legal Status | Age of Mother | | | |
|---|---|---|---|---|
| | 11-18 | 19-26 | 27+ | Total |
| In-Wedlock | 40.2[b] (43)[c] | 76.5 (173) | 84.4 (81) | 69.2 (297) |
| Out-of-Wedlock | 59.8 (64) | 23.5 (53) | 15.6 (15) | 30.8 (132) |
| Total | 24.9 (107) | 52.7 (226) | 22.4 (96) | 100.0 (429) |

[a] $X^2$ = 58.4; df= 2; $p < .001$; gamma= -.58

[b] Percent of cases

[c] Number of cases

and legal status. As expected, women who are very young (under 18 years) are more frequently unmarried than other mothers. When we control for the effects of race, parity, and SES, the relationship remains intact.

Race. A chi-square of 42.9 (df= 1; $p < .001$) indicates that there is an association between race and legal status. While almost one-third of the infants (30.3 percent) in the sample were born out-of-wedlock, the majority of those births (82.2 percent) were to nonwhite mothers. Only 10.4 percent of births to white women were out-of-wedlock. The value of gamma (.80) indicates a strong, positive association between race of mother and her marital status. When we control for the effects of SES, parity, and age of the mother the relationship remains intact (Table 15).

Parity. A small, negative association exists between parity and legal status ($X^2 = 22.4$; df= 5; $p < .001$; gamma= -.29). From the statistics we may assume that low parity mothers are more likely to bear a child out-of-wedlock than high parity mothers (Table 16). However, the relationship between parity and legal status is undoubtedly influenced by the mother's age. When we control for age of mother, the relationship between parity and legal status disappears (Table 17). Rather than describe this interpretive relationship as an intervening link, there are theoretical reasons for assuming that a spurious relationship exists. Age of mother actually predicts both the legal status of the child and the mother's parity rather than linking one to the other. In Chapter VI, "Analysis," the empirical and

TABLE 15

LEGAL STATUS BY RACE: CHI SQUARE TEST[a]

| Legal Status | Race | | |
|---|---|---|---|
| | White | Nonwhite | Total |
| In-Wedlock | 89.6[b] (199)[c] | 48.0 (98) | 69.7 (297) |
| Out-of-Wedlock | 10.4 (23) | 52.0 (106) | 30.3 (120) |
| Total | 52.1 (222) | 47.9 (204) | 100.0 (426) |

[a]$X^2$= 85.2; df= 1; p= .01; gamma= .81

[b]Percent of cases

[c]Number of cases

TABLE 16

LEGAL STATUS BY PARITY: CHI SQUARE TEST[a]

| Legal Status | Parity | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5+ | Total |
| In-Wedlock | 58.6[b] (112)[c] | 79.4 (100) | 80.6 (50) | 64.0 (16) | 76.0 (19) | 69.2 (297) |
| Out-of-Wedlock | 41.4 (79) | 20.6 (26) | 19.4 (12) | 36.0 (9) | 24.0 (6) | 30.8 (132) |
| Total | 44.5 (191) | 29.4 (126) | 14.5 (62) | 5.8 (25) | 5.8 (25) | 100.0 (429) |

[a] $X^2 = 37.6$; df= 4; $p < .001$; gamma= -.29

[b] Percent of cases

[c] Number of cases

TABLE 17

LEGAL STATUS AND AGE OF MOTHER CONTROLLING FOR PARITY: CHI SQUARE TEST[a]

Parity

Age of Mother

| Legal Status | Low (11-18) | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Total |
| In-wedlock | 36.4[b] (32) | 57.9 (11) | 0 (0) | 0 (0) | 0 (0) | 40.2 (43) |
| Out-of wedlock | 63.6 (56)[c] | 42.1 (8) | 0 (0) | 0 (0) | 0 (0) | 59.8 (64) |
| Total | 82.2 (88) | 17.8 (19) | 0 (0) | 0 (0) | 0 (0) | 100.0 (107) |

| Legal Status | Medium (19-26) | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Total |
| In-wedlock | 75.3 (70) | 80.2 (65) | 81.1 (30) | 50.0 (5) | 60.0 (3) | 76.5 (173) |
| Out-of wedlock | 24.7 (23) | 19.8 (16) | 18.9 (7) | 50.0 (5) | 40.0 (2) | 23.5 (53) |
| Total | 24.7 (93) | 19.8 (81) | 18.9 (37) | 50.0 (10) | 40.0 (5) | 23.5 (226) |

| Legal Status | High (27+) | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Total |
| In-wedlock | 100.0 (10) | 92.3 (24) | 80.0 (20) | 73.3 (11) | 80.0 (16) | 84.4 (81) |
| Out-of wedlock | 0 (0) | 7.7 (2) | 20.0 (4) | 26.7 (4) | 20.0 (4) | 15.6 (15) |
| Total | 10.4 (10) | 27.1 (26) | 26.0 (25) | 15.6 (15) | 20.8 (20) | 100.0 (96) |

[a] $\chi^2$= 2.2; df= 1; p= NS; gamma= -.41 — [a] $\chi^2$= 5.8; df= 4; p= NS; gamma =.03 — [a] $\chi^2$= 8.9; df= 8; p= NS; gamma= .40

[b] Percent of cases

[c] Number of cases

theoretical meaning of this finding will be fully discussed.

SES. A negative relationship exists between SES and legal status ($X^2$= 15.5; df= 2; p<.001; gamma= -.32). In Table 18 out-of-wedlock births are shown to be concentrated in low and middle SES groups. However, when the effects of age of mother are removed, the relationship disappears (Table 19). It appears that when the contaminating effects of age of mother are removed from the relationship between SES and legal status, the variables no longer appear to be significantly related. The original association between the two variables was apparently due to the mediating effects of age of mother. We are alerted to the possibility of an intervening variable between SES and legal status with the addition of test factor, age of mother.

Additionally, the relationship between SES and legal status is effected by the factor race. The relationship between SES and legal status disappears for nonwhite mothers only when we control for the effects of race (Table 20). This suggests that significant interaction exists between race and SES in their relationship with legal status. In Chapter VI, the meaning of each of these findings will be discussed.

Dependent Variable: Timing of Prenatal Care

Using SES, race, legal status, age of mother, and parity as independent variables, we are able to account for 15 percent of the variance of the timing of care (the month in which prenatal care begins). Table 21 shows that although each of the independent variables has a significant zero-order correlation with month in which care begins, their entry into a stepwise regression equation yields

TABLE 18

LEGAL STATUS BY SESINT: CHI SQUARE TEST[a]

| Legal Status | SESINT Low | Medium | High | Total |
|---|---|---|---|---|
| In-Wedlock | 55.6[b] | 73.7 | 77.3 | 69.2 |
| | (69)[c] | (160) | (68) | (297) |
| Out-of-Wedlock | 44.4 | 26.3 | 22.7 | 30.8 |
| | (55) | (57) | (20) | (132) |
| Total | 28.9 | 50.6 | 20.5 | 100.0 |
| | (124) | (217) | (88) | (429) |

[a] $X^2 = 15.5$; df= 2; $p < .001$; gamma= -.32

[b] Percent of cases

[c] Number of cases

TABLE 19

LEGAL STATUS BY SESINT CONTROLLING FOR AGE OF MOTHER: CHI SQUARE TEST[a]

| | Age of Mother | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SESINT | | | | | | | | | | | |
| | Low | | | | Medium | | | | High | | | |
| Legal Status | Low (11-18) | Med. (19-26) | High (27+) | TOT. | Low | Med. | High | TOT. | Low | Med. | High | TOT |
| In-wedlock | 40.5[b] (30)[c] | 46.6 (13) | 0.0 (0) | 40.2 (43) | 76.5 (26) | 78.5 (106) | 71.9 (41) | 76.5 (173) | 81.3 (13) | 82.0 (41) | 90.0 (27) | 84.4 (81) |
| Out-of-wedlock | 59.5 (44) | 59.4 (19) | 100.0 (1) | 59.8 (64) | 23.5 (8) | 21.5 (29) | 28.1 (16) | 23.5 (53) | 18.8 (3) | 18.0 (9) | 10.0 (3) | 15.6 (15) |
| Total | 69.2 (74) | 29.9 (32) | .9 (1) | 100.0 (107) | 15.0 (34) | 59.7 (135) | 25.2 (57) | 100.0 (226) | 16.7 (16) | 52.1 (50) | 31.3 (30) | 100.0 (96) |

[a]$X^2$= .7; df= 2; p= NS; gamma= .03

[a]$X^2$= 1.0; df= 2; p= NS; gamma= .10

[a]$X^2$= 1.1; df= 2; p= NS; gamma= -.23

[b]Percent of cases

[c]Number of cases

TABLE 20

LEGAL STATUS BY RACE AND SES (RASES): CHI SQUARE TEST[a]

| | Race | | | | | | |
|---|---|---|---|---|---|---|---|
| | Nonwhite SES | | | White SES | | | |
| Legal Status | Low | Med. | High | Low | Med. | High | Total |
| In-Wedlock | 34.4[b] (22)[c] | 55.9 (62) | 48.3 (14) | 82.5 (47) | 92.5 (98) | 91.5 (54) | 69.2 (297) |
| Out-of-Wedlock | 65.6 (42) | 44.1 (49) | 51.7 (15) | 17.5 (10) | 7.5 (8) | 8.5 (5) | 30.8 (132) |
| Total | 14.9 (64) | 25.9 (111) | 6.8 (29) | 13.3 (57) | 24.7 (106) | 13.8 (59) | 100.0 (429) |

[a]$X^2$= 103.8; df= 6; p= .001; gamma= -.66

[b]Percent of cases

[c]Number of cases

TABLE 21

STEPWISE REGRESSION OF PRENATAL MONTH ON INDEPENDENT VARIABLES

| Dependent Variable: Prenatal Month | Simple r | b | Beta | Cumulative Multiple R | Cumulative $R^2$ | RSQ Change | Partial $r^2$ |
|---|---|---|---|---|---|---|---|
| Independent Variables: | | | | | | | |
| Race-legal | -.25 | -1.69 | -.39 | .25 | .06 | .06 | -- |
| Race | -.17 | 1.09 | .35 | .28 | .08 | .02 | .13 |
| Parity | .13 | .46 | .31 | .31 | .10 | .02 | .14 |
| AGEMTRAN | -.17 | -6.34 | -.29 | .39 | .15 | .05 | -.25 |
| SESINT | -.11 | -0.01 | -.03 | .39 | .15 | .00 | -.03 |
| Legal Status | -.23 | -0.11 | -.02 | .39 | .15[b] | .00 | -.02 |

[a]Partial r is the correlation of the independent variable after all other variables already in the equation have been partialed out.

[b]$F = 12.4$; $df = 6,416$; $p = .05$

important information about their relationship with the dependent variable, the timing of care. Analysis of covariance (Table 22) reveals the same information. After looking at each independent variable's association with the timing of care, any interpretive relationships existing in the data will be evaluated.

Race, Legal Status. We can see from the simple r's (Table 21) between race and month that care begins on the one hand, and between legal status and month that care begins on the other hand, that each independent variable is significantly associated with the dependent variable. In the stepwise regression solution presented in Table 21, we observe that the interaction variable race-legal makes the largest contribution to the explanation of the dependent variable and is, therefore, entered first. We also see that legal status does not make a significant contribution to the coefficient of determination ($R^2$). When the effects of both race and legal status on the month that prenatal care begins are analyzed, significant interaction between the two variables is indicated. When race and legal status are combined into a single variable (race-legal) (Table 23), it is clear that the interaction of race and legal status figures prominently in the analysis of this relationship. Through the use of stepwise regression, race-legal, as an interaction variable, makes the greatest contribution of the independent variables to the explanation of the variance of the month in which care begins. The findings indicate that the reason that legal status does not produce a significant change in $R^2$ is because its value depends on another variable, race. Therefore, race-legal becomes important in the regression equation while the variable legal status,

TABLE 22

EFFECTS OF INDEPENDENT VARIABLES ON PRENATAL MONTH: ANALYSIS OF COVARIANCE OF PRENATAL MONTH

| Source of Variation: | df | Mean Square | F | probability |
|---|---|---|---|---|
| Total | 421 | 4.9 | | |
| Covariables | | | | |
| SESINT | 1 | 2.9 | 0.7 | NS |
| AGEM | 1 | 80.7 | 18.7 | .001 |
| Parity | 1 | 114.8 | 26.6 | .001 |
| Main Effects | | | | |
| Race | 1 | 20.3 | 4.7 | .03 |
| Legal Status | 1 | 54.3 | 12.6 | .001 |
| Interaction | 1 | 28.8 | 6.7 | .01 |
| Race-legal | | | | |
| Residual | 415 | 4.3 | | |

TABLE 23

EFFECTS OF RACE AND LEGAL STATUS (RACE-LEGAL) ON PRENATAL MONTH: UNADJUSTED MEANS AND ANALYSIS OF COVARIANCE OF PRENATAL MONTH

| Dependent Variable: | Race | | | | |
| --- | --- | --- | --- | --- | --- |
| Prenatal Month | White | | Nonwhite | | |
| | In-wedlock | Out-of-wedlock | In-wedlock | Out-of-wedlock | Total |
| | 3.3 | 5.2 | 4.1 | 4.5 | 3.9 |

| Source of Variation: | df[a] | df[b] | Value | t-value | F | probability |
| --- | --- | --- | --- | --- | --- | --- |
| Total | 423 | | | | | |
| Race-legal | 3 | | 46.9 | | 10.2 | .001 |
| Residual | 420 | | | | | |
| Contrasts | | | | | | |
| White/Nonwhite | | 420 | -.1 | -0.1 | | NS |
| In-wedlock/Out-of-wedlock | | 420 | -2.2 | -3.9 | | .001 |
| Interaction | | 420 | -1.5 | -2.5 | | .01 |

[a]Degrees of freedom associated with mean squares.

[b]Degrees of freedom associated with t-statistics.

by itself, does not.

Parity. Parity makes a small but significant contribution to the explanation of timing of care. The direct association between the two variables indicates that a mother whose parity is high is most likely to begin prenatal care late. It is important to note that the relationship between parity and the month in which care begins is a linear one. Table 24 shows that the a priori contrast which specifies a linear trend is signfiicant while the contrast which specifies a quadratic trend is not. However, as we look at the mean prenatal month at each parity, we see that the t value of the quadratic trend approaches significance ($t= -1.86$; $df= 424$; $p= .06$). The interpretation of this finding will be discussed in Chapter VI.

It has been suggested in the literature that significant interaction exists between parity and age of mother. A check for interaction, using multiple regression analysis, reveals that no significant interaction exists in the relationship of age and parity with the month in which prenatal cae begins.

Age of Mother. In the regression equation displayed in Table 21, the age of mother makes a significant contribution to the explanation of the timing of prenatal care. There is a negative association between a mother's age and the month in which her prenatal care begins. A check for linear and quadratic trends (Table 25) shows that the relationship is a linear one. The timing of care varies inversely with age so that young mothers begin care significantly later (month 4.5) than middle aged mothers (month 3.8) or older mothers (month 3.5).

TABLE 24

EFFECTS OF PARITY ON PRENATAL MONTH: UNADJUSTED MEANS AND ANALYSIS OF VARIANCE OF PRENATAL MONTH

| Dependent Variable: | Parity | | | |
|---|---|---|---|---|
| Prenatal Month | Low (1) | Medium (2-3) | High (4+) | Total |
| | 3.9 | 3.8 | 4.6 | 3.9 |

| Source of Variation: | df[a] | df[b] | Value | t-value | F | probability |
|---|---|---|---|---|---|---|
| Total | 426 | | | | | |
| Parity | 2 | | 14.1 | | 2.9 | .05 |
| Residual | 424 | | 4.9 | | | |
| Contrasts | | | | | | |
| Linear Trend | | 424 | .8 | 2.2 | | .03 |
| Quadratic Trend | | 424 | -.9 | -1.9 | | .06 |

[a]Degrees of freedom associated with mean squares.

[b]Degrees of freedom associated with t-statistics.

TABLE 25

EFFECTS OF AGE OF MOTHER ON PRENATAL MONTH: UNADJUSTED MEANS AND MEANS OF PRENATAL MONTH ADJUSTED FOR PARITY, ANALYSIS OF VARIANCE OF PARITY

| Age of Mother | Prenatal Month: Unadjusted Means | Prenatal Month: Adjusted Means |
|---|---|---|
| Low (11-18) | 4.5 | 4.9 |
| Medium (19-26) | 3.8 | 3.9 |
| High (27+) | 3.5 | 3.0 |

| Source of Variation: | df[a] | df[b] | Value | t-value | F | probability |
|---|---|---|---|---|---|---|
| Total | 426 | | 5.0 | | | |
| Parity | 1 | | 108.3 | | 23.5 | .001 |
| AGEM | 2 | | 70.0 | | 15.1 | .001 |
| Residual | 423 | | 4.6 | | | |
| Contrasts | | | | | | |
| Linear Trend (Age of Mother) | | 426 | -1.0 | -3.2 | | .001 |
| Quadratic Trend (Age of Mother) | | 426 | -0.5 | -1.2 | | NS |

Although a significant association is present between age of mother and the month in which care begins, there are theoretical reasons for believing that parity may elaborate the relationship between the age of the mother and the timing of prenatal care. In anticipation of this, we controlled for parity and found that the correlation between age of mother and month in which care begins (r= -.17) significantly increases (r= -.25). The interpretation for this circumstance is that classical suppression exists between age of mother and the month in which care begins. While a small but significant association exists between the two variables (Table 25, unadjusted means), when we control for the effects of parity, a stronger association between age of the mother and month care begins is found (Table 25, adjusted means).

SES. From both stepwise regression (Table 21) and analysis of covariance (Table 22), we find that SES is not directly related to the month in which prenatal care begins. Although the simple r between SES and month care begins suggests a significant relationship between the two variables, it does not make a significant contribution to the month care begins when considered in a stepwise multiple regression equation where the effects of the other independent variables are accounted for. Looking at the partial correlation coefficients in Table 21, we see that the significant zero-order correlation between SES and month-care-begins disappears when age of mother and parity are each controlled. In each case, an intervening link is indicated. In Chapter VI, the empirical evidence and the theoretical rationale for establishing these intervening links will be discussed.

Dependent Variable: Frequency of Care

In a multiple regression equation with the number of prenatal visits as the dependent variable, we are able to explain 48 percent of the variance of the number of visits by a linear combination of our variables. However, Table 26 indicates that 47 percent of the variance is contributed by one variable, the month that prenatal care begins. Only one other variable, race-legal, explains any additional variance. Using regression statistics and analysis of variance techniques, we will look at the relationship of each independent variable with the number of prenatal visits.

Timing of Care. As expected, there is a strong inverse association between month care begins and the number of prenatal vists (r= -.69). Logically, the sooner a mother begins prenatal care, the more physician visits she will have during her pregnancy. If we control for other variables in the equation, the relationship remains unchanged. Month-care-begins is entered first in the stepwise regression solution because of its highest zero-order correlation with the number of prenatal visits. In a stepwise solution, tests are performed at each step to determine the contribution of each variable already in the equation as if it were entered last. Thus, it is possible to discard a variable that was initially a good predictor if it is no longer statistically significant. The month in which prenatal care begins, however, remains as the variable contributing nearly all of the variance explained by the independent variables.

Race-Legal. The second entry in the stepwise regression solution is the interaction variable, race-legal. From multiple

TABLE 26

STEPWISE REGRESSION OF PRENATAL VISITS ON INDEPENDENT VARIABLES

| Dependent Variable: Prenatal Visits | Simple r | b | Beta | Cumulative Multiple R | Cumulative $R^2$ | RSQ Change | Partial r[a] |
|---|---|---|---|---|---|---|---|
| Independent Variables: | | | | | | | |
| Prenatal Month | -.69 | -0.10 | -.67 | .69 | .47 | .47 | -- |
| Race-Legal | .26 | .02 | .04 | .69 | .48 | .01 | .13 |
| PARTRAN | .01 | .07 | .05 | .70 | .48 | .00 | .09 |
| Race | .20 | .03 | .05 | .70 | .48 | .00 | .03 |
| AGEMTRAN | .19 | .07 | .02 | .70 | .48 | .00 | .02 |
| Legal Status | .21 | .01 | .01 | .70 | .48[b] | .00 | .01 |

[a]Partial r is the correlation of the independent variable after all other variables already in the equation have been partialed out.

[b]F= 65.1; df= 6,416; p= .05

regression statistics we see that neither race nor legal status make an independent contribution to the explanation of the number of prenatal visits. They operate only through the effects of the interaction variable, race-legal. As the effects of race-legal on the number of prenatal visits (Table 27) are examined, we can see that the number of prenatal visits made by white and nonwhite mothers is influenced by marital status for white women only. Since this same trend was observed in the relationship between month that care begins and the number of prenatal visits, we checked for the possibility that timing of care serves as an intervening variable between race-legal and the number of prenatal visits. As suggested in the theoretical model, the mediating effects of timing of care on the original two variable relationships serves as an intervening variable. The relationship between race-legal and the number of prenatal visits disappears upon controlling for the month that care begins (Table 28).

Parity. In addition to a zero-order correlation indicating no association between parity and the number of prenatal visits (r= .01), parity does not make a significant contribution to the number of visits in the stepwise regression solution (Table 26). When we control for the effects of the month care begins and race-legal, the relationship remains insignificant (r= .09).

Through multiple regression, a test for interaction was performed on the variables "age of mother" and "parity," or the variable "AGEPAR." Since there was no significant interaction between the two variables, the multiple regression results may be treated as additive.

TABLE 27

EFFECTS OF RACE AND LEGAL STATUS ON PRENATAL VISITS: UNADJUSTED MEANS, ANALYSIS OF VARIANCE OF PRENATAL VISITS

| Dependent Variable: | Race | | | | |
|---|---|---|---|---|---|
| | Nonwhite | | White | | |
| Prenatal Visits | Out-of-wedlock | In-wedlock | Out-of-wedlock | In-wedlock | Total |
| | 8.5 | 7.6 | 5.7 | 9.3 | 8.5 |

| Source of Variation: | df[a] | df[b] | Value | t-value | F | probability |
|---|---|---|---|---|---|---|
| Total | 422 | | | | | |
| Race-legal | 3 | | 123.9 | | 3.2 | .05 |
| Residual | 419 | | 38.8 | | | |
| Contrasts | | | | | | |
| Nonwhite/White | | 419 | -1.0 | -0.6 | | NS |
| Out-of-wedlock/In-wedlock | | 419 | 2.7 | 1.6 | | NS |
| Interaction | | 419 | 4.5 | 2.7 | | .01 |

[a]Degrees of freedom associated with mean squares.

[b]Degrees of freedom associated with t-statistics.

TABLE 28

EFFECTS OF INDEPENDENT VARIABLES ON PRENATAL VISITS: ANALYSIS OF COVARIANCE OF PRENATAL VISITS

| Source of Variation: | df | Mean Square | F | probability |
|---|---|---|---|---|
| Total | 417 | 19.7 | | |
| Covariables | | | | |
| SESINT | 1 | 1.6 | .1 | NS |
| AGEM | 1 | 25.3 | 2.0 | NS |
| Parity | 1 | 0.2 | .0 | NS |
| Prenatal Month | 1 | 2176.5 | 169.8 | .001 |
| Main Effects | | | | |
| Race | 1 | 37.1 | 2.9 | NS |
| Legal Status | 1 | 15.4 | 1.2 | NS |
| Interaction | 1 | 16.4 | 1.3 | NS |
| Race-legal | | | | |
| Residual | 410 | 12.8 | | .001 |

Age of Mother. Although the zero-order correlation between the age of the mother and the number of prenatal visits is significant (r= .19), it does not contribute any change in the amount of variance of prenatal visits explained after the variables already in the equation have been controlled. Nor does analysis of variance reveal any significant association between the two variables. Because evidence from these two sources disclaims an association between age of mother and the number of prenatal visits, any direct link between them in the model would not be appropriate.

If age has an effect on the number of prenatal visits, it is through the mediating effects of month care begins. The zero-order correlation between age and the number of prenatal visits disappears when we partial out the effects of month-care-begins. The zero-order correlation drops from .19 to .06 when the effects of month-care-begins is partialed out of the relationship. From Table 26 we can see that the partial r of AGEMTRAN (where all of the variables already entered in the equation have been partialed out) indicates that the relationship between age of mother and the number of prenatal visits is an indirect one mediated by the effects of intervening variable, timing of care.

SES. No relationship appears to exist between SES and the number of prenatal visits. Nor is there any significant interaction between race and SES that might contribute to the explanation of the dependent variable. In the stepwise regression solution shown in Table 26, SES does not contribute enough to the explanation of the dependent variable to be included in the equation. SES does not make a significant contribution to the variance of the number of prenatal visits either by itself or in combination with the other independent variables in question here.

Dependent Variable: Birthweight

We are able to explain 17 percent of the variance of birthweight by a linear combination of the variables. We see in Table 29 that the number of prenatal visits and the month that care begins are the only variables making significant contributions to the explanation of birthweight. Several unusual and theoretically informative findings emerge from the analysis of birthweight and our independent variables.

Frequency of Care. With a simple r of .31 and a beta weight of .55, the number of prenatal visits emerges as the independent variable in the equation contributing most to the explanation of birthweight after all other variables have been controlled. Even after controlling for possible intervening variables, the relationship remains intact. In the relationship between the number of prenatal visits and birthweight, it was also necessary to control for the effects of gestational age. Since the frequency of prenatal visits normally increases during the last month of pregnancy, the number of visits will be lower if gestational age[1] is abbreviated. When the effect of gestational age is partialed out of the relationship between the number prenatal visits and birthweight, the association remains unchanged. Just as the regression equation indicates the number of prenatal visits as the key factor among our variables in explaining the variance of birthweight,

---

[1]Gestational age is defined here as the number of days lapsed between the first day of the last normal menstrual period and the date of birth.

TABLE 29

STEPWISE REGRESSION OF BIRTHWEIGHT ON INDEPENDENT VARIABLES

| Dependent Variable: Birthweight | Simple r | b | Beta | Cumulative Multiple R | Cumulative $R^2$ | RSQ Change | Partial $r^a$ |
|---|---|---|---|---|---|---|---|
| Independent Variables: | | | | | | | |
| Prenatal visits | .31 | 812.0 | .55 | .31 | .09 | .09 | -- |
| Prenatal month | -.02 | -82.9 | -.38 | .41 | .17 | .07 | -.28 |
| SESINT | .08 | 7.0 | .07 | .42 | .17 | .00 | .08 |
| Race-legal | .10 | 75.9 | .08 | .42 | .17 | .00 | .06 |
| AGEMTRAN | .08 | 92.6 | .02 | .42 | .17 | .00 | .01 |
| Legal Status | .06 | -22.9 | -.02 | .42 | .17 | .00 | .02 |
| Race | .09 | -28.3 | -.03 | .42 | .17 | .00 | .01 |
| Parity | .04 | -14.8 | -.01 | .42 | .17[b] | .00 | -.01 |

[a]Partial r is the correlation of the independent varible after all other variables already in the equation have been partialed out.

[b]F= 10.9; df= 8,414; p= .05

it becomes the strongest link in the model to the dependent variable, birthweight.

We noted earlier that a non-linear trend is indicated between the number of prenatal visits and birthweight. Accordingly, two a priori contrasts were performed on the relationship between number of prenatal visits and birthweight, a linear and a quadratic contrast. In Table 6, both of the a priori contrasts indicate significant, but different, trends in the data. The interpretation of these a priori contrasts will be discussed in Chapter VI.

Timing of Care. An unexpected finding occurs when we look at the relationship of month-care-begins and birthweight in our regression equation. While the zero-order correlation indicates no significant relationship between the two variables (r= -.02), a beta weight of -.38 indicates that the month that care begins is the second most important contributor to the explanation of the variance of birthweight. For a variable to be entered in a stepwise regression solution, it must make the greatest contribution to $R^2$ of all independent variables not already entered in the equation. It is the variable having the highest partial correlation after controlling for all variables already in the equation. When we control for the number of prenatal visits in the relationship between month-care-begins and birthweight, the partial correlation is -.28.

As we look at the relationship between the three variables--birthweight, month care begins, and number of prenatal visits--the reason for the unusual relationship between month care begins and birthweight becomes clearer. Classical suppression exists between month care begins and birthweight. While no relationship exists between the two variables, when we control for the effects of the number of prenatal visits, a significant association between month care begins and birthweight emerges. The variable "prenatal visits" appears to be suppressing the strength of the relationship between month care begins and birthweight. The manner in which this suppressive relationship operates will be discussed in Chapter VI.

Other Independent Variables. Both analysis of variance and multiple regression statistics indicate that SES does not contribute significantly to the explanation of birthweight. If SES has any effect on birthweight, it must be through indirect channels via variables, such as those specified in the model. The same may be concluded of other independent variables in the model. Their zero-order correlations with birthweight are low (ranging from r= .10 for race-legal to r= .04 for parity) but the correlations are reduced even further as they become one of eight independent variables in the stepwise regression equation.

### Dependent Variable: Infant Mortality

We know from an earlier descriptive discussion of the sample's characteristics that the overwhelming majority (95 percent) of the infants in the sample survived the postneonatal period. However, the mortality rate (49/1,000) is far higher among the truncated range of birthweights than might otherwise be expected.

To complete the analysis of the model, infant mortality serves as the dependent variable and all other variables serve as independents. The result is a regression equation predicting 11 percent of the variance of infant mortality (Table 30). Analysis of covariance yields the same results (Table 31). Among the independent variables, there are only two variables which make a significant contribution to the explanation of infant mortality, race and birthweight.

Birthweight. As anticipated, birthweight makes the greatest contribution to the explanation of infant mortality as it explains 9 percent of the variance. The inverse relationship indicates that the lower the birthweight, the greater the infant's chances of dying in its first year of life.

Race. Race makes a small but significant contribution to the explanation of infant mortality. But as we look at the unadjusted mean scores for whites and nonwhites (Table 31), we can see that white infants have a greater risk of death among members of our sample than do nonwhite infants. Since the relationship between race and infant mortality does not disappear when the effects of birthweight are partialed out of the equation, race appears to have an independent effect on infant mortality. The reason for the higher rate of infant mortality among white infants in our sample will be discussed in the following chapter.

## Conclusion

In this chapter, the characteristics of the sample and the results of the statistical analysis have been presented with only occasional references to the manner in which they correspond with the theoretical model. The findings of the research reveal that, in our sample, while race and SES are associated with age of mother, age serves

TABLE 30

STEPWISE REGRESSION OF INFANT MORTALITY ON INDEPENDENT VARIABLES

| Dependent Variable: Infant Mortality | Simple r | b | Beta | Cumulative Multiple R | Cumulative $R^2$ | RSQ Change | Partial r[a] |
|---|---|---|---|---|---|---|---|
| Independent Variables: | | | | | | | |
| Birthweight | -.29 | .00 | -.28 | .29 | .09 | .09 | -- |
| Race | .10 | .12 | .15 | .32 | .10 | .02 | .13 |
| AGEMTRAN | .04 | .30 | .08 | .32 | .10 | .00 | .05 |
| SESINT | -.04 | .00 | -.05 | .32 | .11 | .00 | -.04 |
| Prenatal visits | -.09 | -.11 | -.09 | .32 | .11 | .00 | -.04 |
| Prenatal month | -.03 | -.01 | -.07 | .33 | .11 | .00 | -.06 |
| Parity | .00 | -.04 | -.03 | .33 | .11 | .00 | -.02 |
| Race-legal | .08 | -.03 | -.04 | .33 | .11[c] | .00 | -.02 |
| Legal Status[b] | .04 | | | | | | |

[a]Partial r is the correlation of the independent variables after all other variables already in the equation have been partialed out.

[b]In a stepwise regression solution, legal status did not contribute enough to the change in $R^2$ to be entered into the equation.

[c]$F = 6.3$; $df = 8,414$; $p = .05$

TABLE 31

EFFECTS OF INDEPENDENT VARIABLES ON DEPENDENT VARIABLE, INFANT MORTALITY: UNADJUSTED MEANS OF INFANT MORTALITY BY RACE, ANALYSIS OF COVARIANCE OF INFANT MORTALITY

| Dependent Variable: | Race | | |
|---|---|---|---|
| | White | Nonwhite | Total |
| Infant Mortality | .12[a] | .04 | .08 |

| Source of Variation: | df | Mean Square | F | probability |
|---|---|---|---|---|
| Total | 424 | .15 | | |
| Covariates | | | | |
| Birthweight | 1 | 6.24 | 45.4 | .001 |
| SESINT | 1 | .17 | 1.3 | NS |
| Age of Mother | 1 | .26 | 1.9 | NS |
| Prenatal Month | 1 | .01 | .1 | NS |
| Prenatal Visits | 1 | .08 | .6 | NS |
| Main Effects | | | | |
| Race | 1 | .57 | 4.2 | .05 |
| Legal Status | 1 | .05 | .3 | NS |
| Interaction | 1 | .02 | .1 | NS |
| Race-legal | | | | |
| Residual | 416 | .14 | | |

[a]Mean mortality score

to suppress the relationship between race, SES, and parity. Although SES, race, age of mother, and parity are each associated with legal status, interpretive sequences between the independent and dependent variables are indicated. The month in which prenatal care begins depends on the interaction variable, race-legal, and parity; but parity acts as a suppressor variable between age of mother and the month in which care begins. Only the prenatal month is directly linked to the number of prenatal visits. However, race-legal and age of mother appear to be linked to the number of prenatal visits via the month in which care begins.

Prenatal care (both its timing and frequency) provides the only statistical link to birthweight available from the variables considered in this research. Birthweight makes the greatest contribution to the explanation of infant mortality, although race also makes an independent contribution to its variance.

In the following chapter, the findings of this research will be analyzed and interpreted so that the adequacy of the theoretical model may be evaluated.

# CHAPTER VI

# ANALYSIS

## Introduction

In this chapter we attempt to pull together the elements of the research story so that three major objectives may be accomplished: (1) to interpret the meaning of the research findings; (2) to determine how well the theoretical model is supported by the research hypotheses and the data of the investigation; and (3) to assess how the findings of this research relate to the body of knowledge which already exists in the field. Once these objectives have been addressed, the theoretical model on which the research is based will be modified to reflect the empirical findings. As a result, we will present the most parsimonious model of the relationships between the independent and dependent variables.

## Interpretation of the Findings

The interpretation of the findings will follow the same format as the report of the findings in Chapter V. We will move across the model from left to right by identifying each variable to the right of

SES and race as the dependent variable.

Dependent Variable: Age of Mother

The research question posed in Chapter IV asked, "To what extent is the age of the mother influenced by race and SES?" We hypothesized a curvilinear relationship between each of the independent variables and the age of the mother so nonwhite and lower SES mothers are predicted to be more likely to bear a child at an age which is at either extreme of their childbearing years.

1. a.[1] There is a curvilinear relationship between race and age of mother so that the nonwhite mother has a greater likelihood of being at either age extreme of her childbearing years at the time of the birth of her infant than the white mother.

From the statistical analysis, we know race is directly associated with age of mother; thus, nonwhite women are more likely to be young at the time of their child's birth than white women. Although race explains only a small portion of the variance of age of mother, its contribution is statistically significant.

2. b. There is a curvilinear relationship between SES and age of mother so that the lower the SES of the mother, the greater the likelihood of her being at either age extreme of her childbearing years at the time of the infant's birth.

Socioeconomic status makes the greatest contribution of the two variables race and SES in explaining the age of the mother. This relationship is undoubtedly influenced by the measure of SES composed of

---

[1]The numbering system employed here refers to the original statement of the hypotheses, page 79.

the mother's education and adjusted for the age of the mother. However, evidence presented in Chapter VI, "Methodology," determined that educational level composes the bulk of the measure of SES (r= .96). We also know that SES has an independent effect on the age of the mother, regardless of the mother's race. Although nonwhite mothers are consistently younger than white mothers, SES is directly related to the age of the mother for both white and nonwhite women. The data does not support the notion that a curvilinear relationship exists between SES and age of mother. While a linear relationship exists between race and the age of the mother, the relationship between SES and age of mother may be best described as "quadratic." Significant differences in mother's age exist between low SES mothers and those with higher SES levels. However, no significant differences may be found in the mother's age when middle and high SES women are compared. In other words, only low SES mothers tend to be significantly younger at the time of their child's birth.

If we analyze the combined effects of race and SES on age of mother, we find that low SES nonwhite women tend to be younger at the time of their child's birth than any other group of women, with a mean age of 19.6 years. Low SES white women follow closely (20.4 years) with a mean age lower than that of middle or upper SES nonwhite women. In other words, within each racial category, the age of the mother is significantly higher for middle and high SES women. The mother's age is significantly higher for white than for nonwhite mothers.

We noted in Chapter V, "Findings," that SES and race explained only 19 percent of the variance of age of mother. We, therefore, recognize that 81 percent of the variance may be attributed to factors outside the scope of the data. Although a linear combination of the independent variables explains only a small portion of the variance, we see the marked changes in the mean age between low SES and all other mothers, regardless of race. We see that white mothers tend to be older than their nonwhite counterpart in each SES category.

The findings support the general conclusion in the literature that young mothers are more frequently nonwhite, low SES women. However, no evidence exists to support the notion that nonwhite and low SES women tend to be older than other women at the time of their child's birth.

## Dependent Variable: Parity

In response to the research question, "To what extent is parity influenced by race, SES, and age of mother?", three research hypotheses were generated. Although each hypothesis associated with parity is supported by the data, elaboration of the relationships between the variables provides additional information for our explanation.

2. c.[1] The higher the age of the mother, the higher her parity.

Of the three independent variables concerned with parity, the age of the mother is the strongest predictor of parity. As expected, there is a direct relationship between a mother's age and her parity so that the older the mother, the higher her parity. We see that both

[1]The numbering system employed here refers to the original statement of the hypotheses, pages 79-80.

linear and quadratic trends are present in the relationship between age of mother and parity (Table 13). The reason for this becomes clear as we look at the mean parity scores at each age level. Although parity varies in a linear fashion, from (young mothers, aged 11 to 18) to high (mothers 27 years or older), a quadratic trend is also evident. Mothers whose ages range from 11 to 26 (low and medium ages) have significantly lower parities than the oldest group of mothers (aged 27 or greater). The large difference between the low and medium aged versus the older mothers produces a quadratic trend. It may be concluded that older mothers have a high parity while young and medium aged mothers tend to have significantly lower parities.

2. b. <u>The lower the SES of the mother, the higher her parity</u>.

Chapter V noted the low correlation between SES and parity (r= -.02) increases substantially (r= -.22) when the effects of the age of the mother are removed from the relationship (Table 11). The increase in the association between SES and parity may be attributed to the suppressive effect of age of mother acting to conceal or "suppress" the true nature of the relationship. After a review of the empirical meaning of classical suppression, we will interpret the theoretical implications that suppression has for our model.

In classical suppression, we find that $r_{Y2}= 0$, $r_{Y1}>0$, and $r_{12}= 0$. In this case, when $x_1=$ age of mother, $x_2=$ SES, and Y= parity, we see that all of the conditions of classical suppression are met, specifically, $r_{Y2}= 0$, $r_{Y1}= .63$, and $r_{12}= .23$. Cohen and Cohen (1975) explain that in the case of classical suppression, $R^2$ is effected in the following manner:

$$R^2_{Y\cdot 12}= \frac{r^2_{Y1}}{1-r^2_{12}}$$

Since the denominator of the equation is less than one, $R^2_{Y \cdot 12}$ must be greater than $r^2_{Y1}$. Even though $x_2$ and Y have a zero correlation, $x_2$ increases the variance accounted for in Y by serving to "suppress" some of the variance in $x_1$ irrelevant to Y.

Substantively, we see that the suppressor variable (in this case, age of mother) intercedes to cancel out or conceal the true nature of the relationship between SES and parity. The unadjusted means of parity by SES (Table 11, column 1) show that the lowest and the highest SES women have fewer children. This conclusion is highly misleading. It is the age of the mother in each of these SES categories that is suppressing the linear relationship between SES and parity. In column 2 of Table 11, adjusted means, we can see that when the age of the mother is controlled, a definite linear trend emerges: mothers whose SES is low have a higher parity (2.6) than middle (2.5) or higher (1.6) SES women. In other words, if a direct relationship between age of mother and SES did not exist (so that low SES women did not tend to have their children at an early age), SES would have little effect on parity. SES has a much greater effect on parity than originally observed because its effect is concealed by the suppressor variable, age of mother. As suggested in the research hypothesis, the lower the SES of the mother, the higher her parity. A most important finding, however, is the suppressive effect of the age of the mother on the relationship between SES and parity.

2\. a. The nonwhite mother has a greater likelihood of having a higher parity than the white mother.

As in the case of SES, race and parity are only slightly associated (r= -.03). When the effects of the mother's age are partialed out of the association, a suppressive relationship becomes evident. Before controlling for the age of the mother (Table 12, column 1), only a very small difference was found in parity between white mothers (2.0) and nonwhite mothers (2.1). However, when the effects of age are partialed out (Table 12, column 2), the difference in parity between white and nonwhite mothers becomes more distinct. Nonwhite mothers have significantly higher parities than white mothers. The age of the mother conceals the strength of the relationship between race and parity. Substantively, if many young mothers were not also nonwhite, race would have little effect on parity. Race has a much greater influence on parity than the zero-order correlation between the two had indicated because the effect of race on parity was concealed by the suppressor variable, age of mother. In sum, nonwhite mothers have a greater likelihood of having a higher parity than a white mother when the effects of age of mother are accounted for.

As suggested in the literature and in the research hypotheses, race, SES, and age of mother are useful predictors of parity. In addition, the analysis reveals the unexpected finding that the age of the mother conceals the true strength of the relationship between race, SES, and parity. The findings indicate that in order to understand the relationship between a mother's SES, race, and the number of children she has borne, her age at the time of the child's birth is of great importance.

## Dependent Variable: Legal Status

When the research question concerned with the extent to which the legal status of a child is influenced by the SES, race, and age of the mother was posed, four hypotheses were generated. The hypotheses predict that young, low SES, nonwhite and primiparous mothers are more likely to bear a child out-of-wedlock than other mothers. In the case of each independent variable, the predicted association with legal status is indicated, lending support to the research hypotheses and the general knowledge reported in the literature. However, as the process of elaboration proceeds, a more thorough understanding of the relationships between the independent and dependent variables becomes possible.

3. c.[1] The lower the age of the mother, the greater the likelihood the infant was born out-of-wedlock.

As suggested in the research hypothesis, a negative association exists between age of mother and legal status so the younger the age of the mother, the greater her likelihood of bearing a child out-of-wedlock. Women who have children before they are 18 years of age are most frequently unmarried as opposed to those in higher age brackets who are most frequently married. The 30 percent of women in the sample who are unmarried are more likely to be young (11 to 18), although a substantial percentage (40.2 percent) are between 19 and 26 years of age. Only 15.6 percent of the mothers in the sample aged 27 years or older were unmarried at the time of their child's birth (Table 14). Even after controlling for the effects of race, SES, and parity, the negative association between age of mother and legal status remains significant.

3. b. The nonwhite mother has a greater likelihood of having an infant born out-of-wedlock than the white mother.

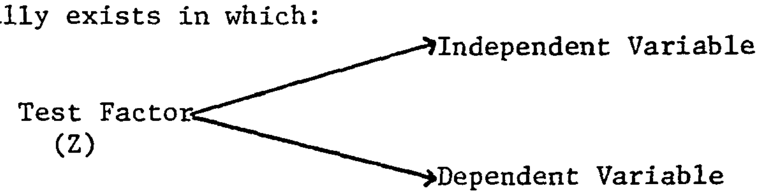
---

[1]The numbering system employed here refers to the original statement of the hypotheses, page 81.

There is a strong, positive association between race and legal status even after the effects of SES, parity, and age have been controlled. Of the 30.3 percent of the infants in the sample born out-of-wedlock, 82.3 percent of the unmarried mothers are nonwhite. Only 10.4 percent of white births were to single mothers. These findings concur with those reported in the literature that nonwhite women are more likely to bear a child out-of-wedlock than white women.

3. d. The lower the parity of the mother, the greater the likelihood of having an infant born out-of-wedlock.

The small, negative association between parity and legal status indicates that low parity mothers are more likely to bear a child out-of-wedlock than higher parity mothers (Table 16). Since there is reason to believe that a mother's age influences her parity, we controlled for age and found that the relationship between parity and legal status disappears when this statistical operation is performed (Table 17). The influence of the age of the mother on the relationship between the independent and the dependent variable lends itself to a spurious interpretation. A "spurious relationship" refers to a case in which the association between two variables is due to the fact that both are related to a third variable, the test factor (Z). Instead of an asymmetrical relationship in which X--→ Z--→ Y, a symmetrical relationship actually exists in which:



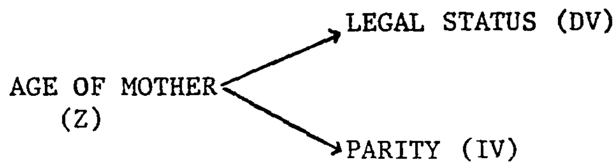

As in the case of an intervening variable, the test factor is significantly associated with both the independent and the dependent variable. We also find that the association between the independent and the dependent variable disappears when the test factor (Z) is controlled.

The relationships required of a spurious variable are the same as those in an intervening interpretation. The difference between the two is a theoretical one (Rosenberg, 1968). The influence of the age of the mother on the relationship between parity and legal status provides an excellent example of a spurious relationship. It also affords an opportunity to show the importance of theory in research.

Table 16 shows a low parity mother is more likely to bear a child out-of-wedlock than a high parity mother. Only a very small percentage (3 percent) of mothers having four or more children are unmarried. But rather than assume that low parity leads to an out-of-wedlock birth, the influence of the mother's age at the time of the child's birth must be considered. We know that although only a small porportion of 17 and 18 year olds are married, most women are married by their mid-twenties. Both legal and cultural strictures against marriages by women under 18 assure that younger women are less likely to be married than older women.

There is no theoretical reason to assume that parity (IV) "leads to" age of mother (Z) (as would be expected in the case of an intervening variable). However, the age of a mother (Z) should be a good predictor of how many children a woman has borne (DV). If she is very young, biological and social reasons keep her parity low. Therefore, there are no theoretical reasons to assume that parity predicts the age of a mother at the time of her infant's birth.

Instead, it may be assumed that a mother who is young will be most likely to have a low parity; a mother who is young is also more likely to bear a child out-of-wedlock. The age of the mother has provided a spurious interpretation of the relationship between parity and legal status. The relationship between parity and legal status disappears when age is controlled because the age of the mother (Z) explains both the independent and the dependent variable. The spurious relationship may be summarized in the following manner:




Had we not taken the spurious relationship into account, the interpretations would have been erroneous and misleading due to the failure to calculate the effects of an extraneous variable. In sum, parity is not significantly associated with the legal status of the child. The age of a mother at the time of her child's birth explains both her legal status and her parity.

3. a. <u>The lower the SES of the mother, the greater the likelihood that the infant was born out-of-wedlock</u>.

The negative association between SES and legal status indicates that the lower the SES of a woman, the greater the likelihood she will bear a child out-of-wedlock. However, when we control for age of mother, the relationship disappears (Table 19). In other words, when we remove the contaminating effects of age of mother from the relationship between SES and legal status, they no longer appear to be significantly related. The association existing between the two variables appears to be due to the mediating effects of age of mother. It is apparent that the age of the mother serves as an intervening link between SES and legal status. Rosenberg (1968) claims that an intervening variable requires the presence of three asymmetrical relationships: (1) the original relationship between independent and dependent variable (in this case, SES and legal status); (2) a relation between the independent variable (SES) and the test factor (age of mother); and (3) a relationship between the test factor (age of mother) and the dependent variable (legal status). In summary form, the three relationships are: IV---> DV; IV--> Z; Z--> DV. Or, as a causal sequence, an intervening relationship would appear as IV--> Z--> DV.

The relationship considered here meets all three requirements detailed by Rosenberg. We have seen that (1) SES is associated with legal status; (2) SES and age of mother are associated; and that (3) a significant relationship exists between age of mother and legal status. A causal sequence is established with age of mother as the intervening link between SES and legal status: SES--> age of mother--> legal status. In other words, low SES influences a woman's chances of having a child at a very early age which, in turn, increases the chance that she will be unmarried at the time of the birth.

In analyzing the relationship between SES and legal status, the effects of race must be accounted for. Chapter V states that the two variable relationships between SES and legal status disappears for nonwhite mothers only by controlling for the effects of race (Table 20). For nonwhites, low SES predicts an out-of-wedlock birth while higher SES nonwhite mothers are more likely to be married. White mothers are most likely to be married regardless of their SES. Since the effect of SES on legal status depends on the value of race, we have identified the interaction variable, "RASES," as a key independent variable in the relationship with the dependent variable, legal status.

Table 15 shows that 90 percent of all white births born in-wedlock compared to 48 percent for nonwhite mothers. Table 20 notes that regardless of the white mother's SES, she is far more likely to be married than the nonwhite mother. For nonwhites, however, low SES mothers are more likely to be single than higher SES nonwhite women. For nonwhites, middle SES mothers are least likely to bear children out-of-wedlock. Virtually no difference exists in the proportion of married versus single mothers among high SES nonwhites. However, the small number (N= 29) of nonwhite upper SES respondents may account for this finding.

Although the research hypothesis predicts that low SES mothers have a greater likelihood of bearing an infant out-of-wedlock, evidence presented here does not support such a conclusion. After the effects of age of the mother and race are controlled, the original association disappears. Intervening effects of age and race are directly linked to legal status in the model. Although a significant relationship between SES and legal status is found, further investigation reveals that age of the mother accounts for the association between SES and legal status. In other words, if the contaminating effects of age of mother are removed from the relationship, SES and legal status no longer appear to be significantly related. In addition, SES and race interact in their relationship with legal status so the interaction variable, RASES is most useful in describing the manner in which SES and legal status are associated. Instead of a direct link between SES and legal status, two indirect links are found, one via the age of mother and another via the interaction effects of SES and race on legal status. Although parity and legal status seem to be significantly associated, their association has been determined to be a spurious one. The age of the mother explains both the parity of the mother and her legal status. Without the effects of the age of the mother, the relationship between parity and legal status disappears.

## Dependent Variable: Timing of Care

To assess the extent to which the timing of prenatal health care is influenced by a mother's age, parity, legal status, SES and race, five hypotheses were generated. These hypotheses predict that young, nonwhite, low SES, and unmarried mothers are more likely to seek prenatal care later than other mothers. We also predict that mothers who are either primiparous or who have a parity of four or greater will seek care later.

One of the most striking features of the findings is the delay in seeking prenatal care on the part of a very large portion of mothers in the sample. Only 53 percent of the women in the sample received care during the first trimester of pregnancy. In addition, four percent received no care at all. A previously mentioned National Health Survey noted only 1 percent of mothers fail to receive any prenatal care during pregnancy, and 60 percent of all women receive care during the first trimester of their pregnancy. Although women in lower educational and income groups in the National Health Survey were less likely to receive early (first trimester) care, virtually all women received some medical attention during pregnancy (NCHS, 1977).

While comparable figures on prenatal care in Oklahoma are not yet available from the State Department of Public Health, the sample shows marked differences from the national sample. Whether this is due to low birthweight or to some other feature of our sample is, unfortunately, unknown.

4. a. (1.)[1] The nonwhite mother has a greater likelihood of beginning care at a later month of her pregnancy than the white mother.

4. e. (1.) The mother of the infant born out-of-wedlock has a greater likelihood of having fewer physician visits during her pregnancy than the mother of a child born in-wedlock.

As suggested in the research hypotheses, both race and legal status are significantly associated with the timing of prenatal care (the month in which care begins). Nonwhite mothers begin their care later in pregnancy (4.3 month) than white mothers (month 3.5), and unmarried mothers begin care later (month 4.3) than married mothers (month 3.6) (Table 18). However, the findings indicate the presence of significant interaction between race and legal status in their relationship with the month care begins. While all married mothers begin care earlier than all single mothers, significant differences exist between them in the timing of their care when race is taken into account. The month in which prenatal care begins is dependent upon marital status for

---

[1] The numbering system employed here refers to the original statement of the hypotheses, pages 81-82.

white mothers only. Married white mothers seek care during their first trimester of pregnancy while unmarried white mothers delay seeking care longer than any other group. There is no significant difference in the timing of care for nonwhite mothers. They tend to wait until the second trimester, whether they are married or not. In other words, white married mothers seek care early in their pregnancy while nonwhite mothers, regardless of marital status, are later in seeking care. However, unmarried white mothers wait considerably longer than any other group to begin prenatal care. Although the research hypotheses predict that both nonwhite and unmarried mothers will seek prenatal care later than other mothers, we find the timing of prenatal care depends on the interaction effects of race and legal status.

4. d. (1.) A mother who is primiparous or whose parity is four or greater will seek care later than other mothers.

Although a curvilinear relationship was predicted between parity and month care begins, a direct, linear association is found between the two variables so that high parity mothers are most likely to begin care late. However, in order to describe the relationship more fully, we need to analyze the results of the quadratic contrast (Table 24). Mothers whose parity is at low or medium levels (parity one through three) begin care at approximately the same time. Mothers whose parity is four or greater begin care late. The same general conclusion remains in the case of the linear or the quadratic trend: high parity women begin care at a significantly later month than women whose parity is three or less. However, the linear trend is significant while the quadratic contrast yields t values that are just outside the confidence interval acceptable in this research (.05).

4. c. (1.) A mother who is very young will seek prenatal care later than other mothers.

A negative association exists between the age of the mother and the month in which care begins. The month of the initial visit varies inversely with each age level so that young mothers begin care significantly later (month 4.5) than middle aged mothers (3.8) or older mothers (3.5).

Chapter V states there are theoretical reasons for believing that parity may elaborate the relationship between age of mother and the month in which care begins. When we control for parity, the zero-order correlation increases from -.17 to -.25. Classical suppression exists between age of mother and the month care begins. Substantively, a suppressor variable intercedes to conceal the true strength of the relationship between age of mother and month that care begins. Parity operates to conceal the relationship between the two variables. Partialing out the effects of parity has the effect of making the differences in timing of care more divergent for mothers in the age groups specified here. In other words, if a young mother does not also have a low parity, then her age has less of an effect on the timing of her care. Parity has concealed the true strength of age of mother on the month in which prenatal care begins.

4. b. (1.) The lower the SES of the mother, the longer she will wait before seeking prenatal care.

Although we had predicted an inverse association between SES and the month that care begins, we find that the two variables are not significantly associated when considered along with the other independent variables being used here. If SES has any effect on the month in which prenatal care begins, it operates indirectly, through race-legal, parity, and/or age of mother. Evidence to support this notion comes from the manner in which the zero-order correlation between SES and month-care-begins disappears once parity and age are partialed out of the relationship. Partial correlations (Table 21) indicate that the relationship between SES and month care begins is significantly affected by age of mother and parity so that each of the two test factors give evidence of intervening, causal linkages. In the case of parity, we see that (1) there is an association between SES (IV) and month care begins (DV); (2) SES (IV) and parity (Z) are associated; and (3) parity (Z) and month care begins (DV) are correlated. In other words, lower SES mothers tend to have a greater number of children; thus, these high parity women tend to seek medical care later in their pregnancy.

Age of mother also links a mother's SES with the month in which prenatal care begins. Low SES women (IV) are more likely to be young (age, Z) and young women, in turn, wait later to begin prenatal care (DV). An intervening link could not be established through race-legal. The interaction variable appears to have an independent effect on the month in which care begins.

Since only 15 percent of the variance of month-care-begins is accounted for through a linear combination of the independent variables discussed here, it is important to emphasize the effects of variables not measured and evaluated in this research. It seems reasonable that financial status and measures of a woman's willingness (subcultural or otherwise) to seek prenatal care are among the most notable missing variables. Research on the motivational factors associated with seeking prenatal health care (or medical care in general) is needed to explain this phenomenon more fully.

Dependent Variable: Frequency of Care

To evaluate the effects of age of mother, parity, legal status, SES, race, and prenatal care, six hypotheses were formulated. These hypotheses predict that young, nonwhite, low SES, and unmarried mothers are more likely to have fewer prenatal visits than other mothers. A curvilinear relationship between parity and the number of prenatal visits is predicted. In addition, we hypothesize that women who begin care late will have fewer prenatal visits.

In evaluating the findings of the statistical anlaysis, we see that the month in which prenatal care begins provides nearly all of the explanatory power of the regression equation. Only the interaction variable, race-legal, explains any additional variance (Table 26).

4. f.[1] The longer a mother waits to begin prenatal care, the fewer the number of prenatal visits she will have.

As expected, the longer a mother waits to begin prenatal care, the fewer the number of physician visits she has during her pregnancy. Even after controlling for the effects of the other variables in the equation, there is still a strong, negative association between the

[1]The numbering system employed here refers to the original statement of the hypotheses, pages 81-82.

month in which care begins and the number of physician visits.

4. a. (2.) The nonwhite mother has a greater likelihood of having fewer physician visits during her pregnancy than the white mother.

4. e. (2.) The mother of the infant born out-of-wedlock has a greater likelihood of having fewer physican visits during her pregnancy than the mother of a child born in-wedlock.

While neither race nor legal status makes an independent contribution to the explanation of the number of prenatal visits, the interaction variable makes a small, but significant, addition to the explanation. Nonwhite women have approximately the same number of visits regardless of their marital status. In fact, married nonwhite women have only slightly fewer visits than unmarried nonwhite mothers. However, for white mothers the number of visits is sharply distinguished by a mother's marital status. Married white women have more visits than any other group (9.3), but unmarried white mothers have fewer visits (5.7) than any other group of mothers.

Earlier, we saw that race-legal influences the month in which prenatal care begins in much the same manner as it influences the frequency of prenatal visits. This similarity, and the theoretically based assumption that the month that care begins is an intervening variable between race-legal and the number of prenatal visits, led us to control for the effects of month in which care begins. When the relationship between race-legal and the number of prenatal visits disappeared, the presence of an intervening variable was explored.

As explained earlier, an intervening variable operates so that when its contaminating effects are removed from the original relationship, the association disappears. Following the criteria specified by Rosenberg for an intervening variable, (1) race-legal (IV) is associated with the number of prenatal visits (DV); (2) race-legal (IV) is significantly related to the month in which prenatal care begins (Z); and (3) there is a significant relationship between month that care begins (Z) and the number of prenatal visits (DV). As a causal sequence, the three variable relationship appears as IV--> Z--> DV or race-legal--> month-care-begins--> number of prenatal visits. The combined effects of a mother's race and legal status influence the month in which she begins prenatal care. The month in which care begins, in turn, influences the number of visits she makes. In other words, if a mother is nonwhite or if she is a white, single mother, she tends to delay seeking care. If she begins care late, she will have fewer physician visits during her pregnancy.

4. c. (2.) <u>A mother who is very young will have fewer physician visits during her pregnancy than other mothers</u>.

Although there is a significant zero-order correlation between the age of the mother and the number of prenatal visits, the relationship disappears when the effect of month-care-begins is partialed out. Following Rosenberg's criterion for establishing an intervening link: (1) the zero-order correlation between age of the mother (IV) and the number of prenatal visits (DV) is significant; (2) the age of the mother (IV) is significantly associated with month care begins (Z); and (3) there is a significant association between month care beings (Z) and the number of prenatal visits (DV). Since the necessary requisites for an intervening relationship are met here, the conclusion is that young mothers are more likely to begin care late and they, therefore, have fewer prenatal visits than older mothers.

Although the research hypothesis predicts young mothers are more likely to begin care late, the evidence presented here does not support that conclusion. The intervening effects of the timing of care links the age of the mother to the frequency with which she receives care.

The following research hypotheses were also presented to explain the frequency with which a mother receives prenatal care:

4. b. (2.) The lower the SES of the mother, the fewer physician visits she will have during pregnancy.

4. d. (2.) A mother who is primiparous or whose parity is four or greater will have fewer prenatal visits than other mothers.

The data does not support either of these research hypotheses.

Dependent Variable: Birthweight

One of the primary questions of this research is, "To what extent is birthweight the consequence of SES, race, the age of the mother, parity, legal status, and the timing and frequency of prenatal health care?" Seven hypotheses were generated from this research question. Through these hypotheses we predicted that race and SES are associated with birthweight only through the indirect linkages of age of mother, parity, legal status, and the timing and frequency of prenatal health care. Only these "interpretive" variables would be directly associated with birthweight. From the statistical analysis we can see the key variables for predicting birthweight are those measuring the timing and frequency of prenatal care. None of the other variables make a direct contribution to the explanation of the variance of birthweight (Table 29).

5. e.[1] The fewer the number of prenatal visits by the mother during her pregnancy, the lower the birthweight of the infant.

As predicted in the model, the number of prenatal visits is the key predictor of birthweight. Even when the effects of gestational age are controlled, the number of prenatal visits has a strong positive correlation with birthweight.

The a priori contrasts performed on the relationship between the number of prenatal visits and birthweight indicate two significant, yet different, trends in the data. Both linear and quadratic contrasts are significant. The reason for this finding becomes apparent when the mean birthweight scores for each level of the independent variable, number of prenatal visits, is explained. Birthweight varies from low (2553.5 grams) to high (2712.8) in a linear fashion. However, as the number of prenatal visits increase, infants whose mothers have a low number of visits (0 to 5) are much more likely to have a lower birthweight than those whose mothers had five or more visits. In other words, there are significant differences in birthweight among infants whose mothers had very few prenatal visits and all other infants. In fact, by comparing mean birthweights, mothers who have from 0 to 5 visits are more likely to have a low birthweight infant (2,500 grams or less) while infants whose mothers have had 5 or more visits are more likely to weigh above the 2,500 gram criterion for low birthweight. Even when the

[1]The numbering system employed here refers to the original statement of the hypotheses, page 84.

length of the gestational period is controlled, the relationship remains unchanged.

5. d. The longer the mother postpones seeking prenatal health care, the lower the birthweight of the infant.

Instead of finding a direct link between the month that prenatal care begins and birthweight, we have discovered that a suppressive relationship exists between the two variables due to the effects of the number of prenatal visits. We saw earlier that a suppressor variable intercedes to cancel out or conceal the true relationship between two variables. In this case, the number of prenatal visits is operating to cancel out the relationship between the month that care begins and birthweight. In other words, if a large number of visits did not accompany an early start to prenatal care, then the timing of care would not have an effect on birthweight. Contrary to the original finding, the month in which care begins does appear to have an effect on birthweight; but this effect is concealed by the associated factor, number of prenatal visits.

5. f. The influence of SES on birthweight is explained by the intervening effects of age, of mother, parity, legal status, and frequency and timing of prenatal care.

5. g. The influence of race on birthweight is explained by the intervening effects of age of mother, parity, legal status, and frequency and timing of prenatal care.

As predicted in the model and the resultant hypotheses, SES and race do not make direct contributions to the explanation of birthweight when the other variables in the model are considered. For example, the zero-order correlation between race and birthweight (r= .09) disappears when the effects of all of the other variables in the equation are accounted for (Table 24).

5. a. There is a curvilinear relationship between the age of the mother and the birthweight of her child. Therefore, if a mother's age is at either extreme of her childbearing years, a greater likelihood exists that her baby will be low birthweight.

5. b. There is a curvilinear relationship between parity of a mother and the birthweight of her child. Therefore, women who are primiparous or who have a parity of four or greater are more likely to have a low birthweight infant.

5. c. The infant born out-of-wedlock has a greater likelihood of being low birthweight than the infant born in-wedlock.

Age, parity, and legal status do not make direct contributions to the explanation of the variance of birthweight. As the model suggests, the influence they have on birthweight is indirect and mediated through the effects of prenatal health care.

A linear combination of the independent variables in this study enables us to explain 17 percent of the variance of birthweight. Moreover, we see that the timing and frequency of prenatal health care account for all of the variance of birthweight explained by this study. When we compare the predictive value of these variables with the results of comparable studies, some comments are possible as to the economy and precision of our model.

Wiener and Milton (1970) are able to explain only 6 percent of the variance of birthweight by using the same independent variables as those in this study, with one exception. Instead of measuring both timing and frequency of prenatal care, a modified version of the timing of care is used: trimester in which care begins. In this manner, they fail to include the major components used in this study to predict birthweight: (1) the number of prenatal visits (the strongest link to birthweight) and (2) the suppressive effect of the number of prenatal visits as the key factor in explaining the relationship between timing of care and birthweight. Without accounting for the effects of the number of visits, the relationship between timing of care and birthweight remains concealed or "suppressed."

Another study is mentioned here because of the nature of the independent variables it employes. Abernathy et. al. (1966) uses 25 variables, almost half of which were biological in nature (e.g., blood pressure, placental abnormalities, antepartum hemoglobin, etc.). Each variable accounted for in the present work except timing and frequency of prenatal care is included in Abernathy's list of variables. Abernathy is able to explain 16 percent of the variance of birthweight with a linear combination of both social and biological variables. Since he does not evaluate the effects of prenatal care on birthweight, we do not know what effects such a variable would have on birthweight if considered along with independent variables of a biological nature. Such an investigation is needed.

Both studies mentioned here lend credibility to the parsimonius character of the model. With careful analysis, fewer variables that have greater explanatory power may be used to predict birthweight. Variables whose effects are more indirect may be identified and labelled as such.

Dependent Variable: Infant Mortality

"To what extent is infant mortality the consequence of birthweight, SES, and race?" In response to this research question, we hypothesize that, of the variables considered in the model, birthweight provides the key link to a newborn's ability to survive infancy. In order to analyze the direct effects of race and SES on infant mortality, we also hypothesize that nonwhite and low SES newborns have a greater risk of infant death than other children. Each of these independent variables is discussed below.

6. a.[1] The lower the birthweight of the infant, the poorer are its chances of surviving beyond the semanatal and/or neonatal period.

As expected, birthweight is the strongest predictor of infant mortality among the variables (Table 30). The lower the birthweight of an infant, the greater its risk of death during the first year of its life.

6. b. The nonwhite infant has a poorer chance of surviving beyond the neonatal period than the white infant.

Although we predicted that nonwhite infants would have a greater risk of death during their first year of life, it was found that the opposite is true (Table 31). White infants in the sample have a greater risk of death than nonwhite infants. An explanation for this finding may be derived from the composition of the sample and studies in

[1]The numbering system employed here refers to the original statement of the hypotheses, page 85.

the literature examining the relationship between race and birthweight. Over 76 percent of the infants in the sample who died were low birthweight with 68 percent of the deaths occurring during the first week of life. Thus, the infants in the sample who died were largely low birthweight infants who died semanatally. According to studies in the literature, among low birthweight infants, nonwhites have a greater chance of survival during their first week of life than white infants. After that period, nonwhite death rates exceed the rate for white infants.

A sample yielding a larger number of infant deaths is necessary to analyze fully the relationship between race and birthweight. However, in the comparatively small low weight sample, the death rate among white infants is higher (67.6 per 1,000) than the rate for nonwhites (29.4 per 1,000). Although these differences seem dramatic, it should be remembered that, with such a small number of infant deaths, relative rates may be dramatically affected by only slight changes in the number of infant deaths.

6. c. The lower the SES of the infant, the poorer are its chances of surviving beyond the semanatal and/or neonatal period.

The expected inverse association between SES and infant mortality does not occur in this sample. We may conclude that if SES has an influence on the mortality experience of newborns, it is through indirect channels. The conclusion, then, is that SES affects infant mortality through a sequence of events which are specified in the theoretical model developed in this dissertation. Of the variables considered in the model, only birthweight and race have a direct effect on infant mortality.

With only 11 percent of the variance of infant mortality explained by the variables, we recognize the importance of the identification of many additional factors not measured here. Continued research into both social and biological variables associated with infant mortality is vital.

## The Revised Model

The theoretical model presented in Chapter III has been evaluated and may now be revised to correspond with the empirical findings. The revised list of theoretical propositions may be compared with the original list of propositions (page 65-66). Two sets of propositions are included below, one dealing with age of mother and the other with parity. The reason for the inclusion of two independent sets of theoretical propositions will be discussed below.

The set of theoretical propositions concerned with age of mother are as follows:

1. If a mother is nonwhite, she is more likely to have a low socioeconomic status.
2. If the mother has a low socioeconomic status, she is more likely to be very young at the time of the child's birth.
3. If the mother is nonwhite, she is more likely to be very young at the time of the child's birth.
4. If the mother is very young at the time of the child's birth, she is more likely to have the child out-of-wedlock.
5. If the mother is nonwhite or single and white, she is more likely to begin prenatal care at a later month in her pregnancy.

6. If the mother begins prenatal care late in her pregnancy, she is more likely to have fewer prenatal visits.

7. If the mother has a low number of prenatal visits, she is more likely to have a low birthweight infant.

8. If the child has a low birthweight, its chances of surviving its first year of life are lessened.

The set of theoretical propositions concerned with parity include:

1. If a mother is nonwhite, she is more likely to have a low socioeconomic status.

2. If the mother has a low socioeconomic status, she is more likely to have a high parity.

3. If a mother is nonwhite, she is more likely to have a high parity.

4. If the mother has a high parity, she is more likely to begin prenatal care at a later month in her pregnancy.

5. If the mother begins prenatal care late in her pregnancy, she is more likely to have fewer prenatal visits.

6. If the mother has a low number of prenatal visits, she is more likely to have a low birthweight infant.

7. If the child has a low birthweight, its chances of surviving its first year of life are lessened.

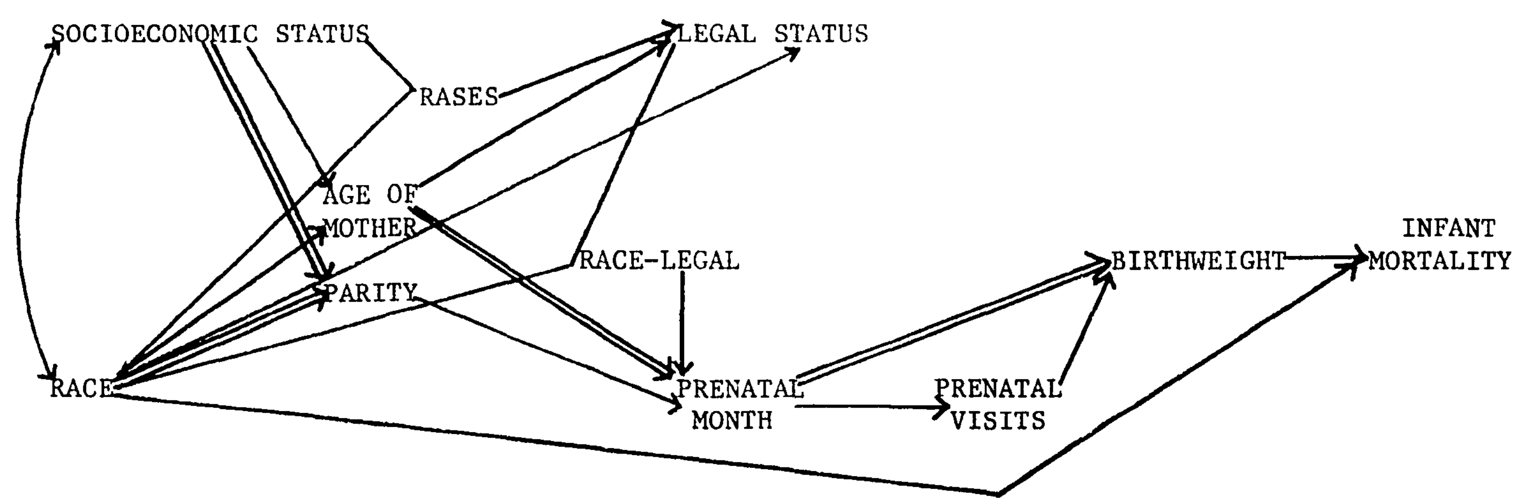
Two sets of propositions have been generated here because of (1) the important relationship of SES and race with age of mother and parity and (2) because of the peculiar relationship between age and parity. Nonwhite, low SES women tend to be younger at the birth of their children than other mothers in the sample, but they also tend to have a higher parity. Since this is true, these independent variables are inversely associated with parity but directly associated with age of mother. This is complicated by the direct association between age of mother and parity. In other words, the same independent variables (SES and race) predict two outcomes quite distinct from one another (young age, high parity). While age and parity are highly associated with one another, their relationship with one another in the model is not theoretically meaningful. The variable mediating between age of mother and prenatal month is race-legal status. For high parity mothers, the link to prenatal month is a direct one. Although the causal chain of events can be diagrammatically represented in the same model, the causal sequence flows through two separate channels: one for age and another for parity (Figure 3).

The finding which cannot be explained by the theoretical model is the lower rate of infant mortality among nonwhite infants. Earlier it was pointed out that this factor is probably due to the low birthweight nature of the sample. Since nonwhite infants whose birthweight is low tend to have better rates of survival during the semanatal period, higher death rates for white infants in the sample may be explained on that basis. Unfortunately, this work cannot explain (nor does any published work) the reason for the higher survival rate of nonwhite low weight infants. The explanation for this perplexing finding must be left to future research in the field.

## Conclusion

In this chapter, each research question and hypothesis has been addressed in order to test the theoretical model on which this

FIGURE 3: DIAGRAMMATIC REPRESENTATION OF THE REVISED THEORETICAL MODEL




→ Direct relationships are indicated in solid lines

⇒ Double line indicates a suppressive relationship study is based. The analysis has revealed nonwhite, low SES women are most likely to be young at the time of their infant's birth. Because these women are younger than other mothers, their chances of bearing an infant out-of-wedlock is increased. The effects of legal status combine with race to reveal that nonwhite mothers and single white mothers tend to delay seeking prenatal care until the second trimester of pregnancy. They have fewer physician visits during pregnancy and, therefore, increase the risk of bearing a low birthweight infant. Low birthweight infants, in turn, have a greater risk of death during their first year of life.

Nonwhite, low SES women also tend to have a higher parity than other women. These high parity women tend to put off seeking care until later in their pregnancy and, therefore, have fewer physician visits than other women. As noted before, women with fewer prenatal visits have an increased risk of bearing an infant whose weight falls below 2,500 grams and whose chances of survival are, therefore, decreased. In the final chapter, a more detailed summary of the findings and the conclusions derived from this research will be presented.

CHAPTER VII

# SUMMARY AND CONCLUSIONS

## Introduction

The format of this dissertation has followed a developmental sequence beginning with a review of existing literature on birthweight and infant mortality and their relationship to the variables race, socioeconomic status, age of mother at the time of her infant's birth, parity, legal status, and prenatal health care. Employing the existing knowledge in the field, a theoretical scheme was designed to display the manner in which specific social variables influence birthweight and infant mortality. The theoretical model was translated into a logical sequence of theoretical propositions, subpropositions and, finally, research hypotheses. These hypotheses were empirically tested on data from 1975 vital statistics records from the State of Oklahoma and analyzed in detail. This final chapter will review the principal findings of the study and discuss the theoretical implications that our findings have for the analysis of the relationships proposed in the model. The limitations of the findings and suggestions for further research will also be discussed.

## Principal Findings

The analysis of the empirical findings of this study reveal that nonwhite mothers and mothers whose socioeconomic status is low are most likely to be young at the time of their child's birth. Because nonwhite and low SES women are younger (18 years or less) at the time of their child's birth, their chances of bearing a child out-of-wedlock are significantly higher than mothers aged 18 years or older. The results of this study are in agreement with the findings of numerous reports claiming the legal status of the child to be closely linked to the mother's race. Nonwhite mothers are far more likely to be single than white mothers.

Legal status also combines with race in determining the timing of prenatal care. Nonwhite mothers and single white mothers tend to delay seeking prenatal care until the second trimester of pregnancy or beyond. Since the timing of care is delayed, they have fewer physician visits during pregnancy. In this study, prenatal care is the variable linking all other independent variables to birthweight. The number of prenatal visits reported by the mother is directly related to an infant's weight at birth. The month in which care begins is also an important factor in predicting a child's birthweight, but its effects are concealed by the number of prenatal visits a mother has. In other words, if a large number of visits does not accompany an early start to prenatal care, then the timing of care has no effect on the birthweight of the child. If a mother begins care early, but returns only infrequently (or not at all) during her pregnancy, the benefits of an early start for prenatal care are nullified. The initial physician visit may be for a pregnancy test, after which a significant number of women may fail to return for prenatal care. Since both the timing and frequency of prenatal care are important in the analysis of birthweight, researchers should include both dimensions of care if they intend to assess the importance of the timing of care on birthweight. It is also important for health care programs to stress to their patients (and potential obstetrical patients) that prompt initiation of care and continued care throughout the pregnancy is vital to their health and to the health of their baby.

The findings of this study are in agreement with the general knowledge in the field that low birthweight infants have a greater risk of death during their first year of life than infants whose weight is above 2,500 grams at birth. Although only a small portion of the variance of infant mortality in our study is explained by an infant's weight at birth, the consistency of this finding dramatizes its importance as a factor contributing to infant death. While SES does not have a direct effect on infant mortality, nonwhite infants have a better chance of survival during the first week of life than their white counterpart. The small number of infant deaths in the sample prohibit any definite conclusion regarding the relationship between race and infant mortality.

Nonwhite, low socioeconomic status mothers also tend to have a higher parity than other mothers. We find that age is a critical factor in explaining the relationship of a mother's race and age to her parity. If low SES women did not tend to have children at an early age, then their socioeconomic status would have very little effect on their parity. Likewise, if nonwhite women did not also tend to have children at an early age, race would have little effect on parity. High parity women tend to put off seeking prenatal care until the second or third trimester of their pregnancy. Since they begin care late, they have fewer physician visits during pregnancy, and, therefore, have an increased risk of bearing a low birthweight infant. As has been seen before, the low weight infant has a greater chance of death during its first year of life than an infant whose birthweight exceed 2,500 grams.

In sum, the effects of SES and race on birthweight are mediated by a number of important social variables identified in this study. Age of mother, parity, legal status, and the timing and frequency of prenatal care are variables linking SES and race to an infant's weight at birth. While the effect of SES on infant mortality operates through indirect channels via age of mother, parity, and prenatal care, race appears to have a direct effect on infant mortality. The theoretical implications of these findings are discussed below.

## Theoretical Implications

The findings of this study tend to support the elements of a theory of deprivation. Nonwhite, low SES women who are young, unmarried, and who lack adequate prenatal care (in terms of its timing and its frequency) have a greater risk of a negative pregnancy outcome. Women in this high risk group are most frequently among those whose life style is associated with a complex of factors such as poor health, inadequate diet, and inadequate health care. The result is a chain of events beginning with the deprived life circumstances of the nonwhite, low SES woman and continuing with an increase in the mother's risk at every stage of the process. Although many components of the "style of life" described here are not dealt with empirically in this study, we have linked race and socioeconomic status to a number of factors (e.g., young, unmarried, high parity mothers, inadequate prenatal care) which appear to express these differences.

## Limitations of the Study

The most serious limitation of studies using vital statistics as a data source is the validity of empirical indicators. This becomes especially evident in our measure of SES. The use of education (with a correction factor for mother's age) is the only measure of SES available from the live birth certificate. Although this measure proves to be a useful predictor of variables in the model, important dimensions of SES remain outside the scope of this study. One especially important component of SES, income, is needed to analyze the utilization of health care services. Although education is assumed to be the component of SES linking occupation to income (Duncan, 1961), the availability of income as a measure of SES would provide an opportunity for researchers to explore avenues of inquiry not possible in this study. In addition, other variables, undoubtedly important in the analysis of variables in the model, are unavailable from the live birth certificate. Quality of care may be as important to birthweight as the timing and frequency of prenatal care; however, no measure of the quality of care received is available here. Another important unavailable variable is the marital status of the mother at the time of conception. The availability of this information would allow us to measure the incidence of "forced marriage" (marriage after conception but before the child's birth) and the impact of race and SES on this phenomenon.

The model developed in this study has been empirically tested on a sample of infants whose birthweights are far below the median for infants born in the U.S. Although we anticipate that the model is applicable to a sample with a full range of birthweights, the accuracy of that assumption is, as yet, unknown.

In analyzing the relationship between social factors and phenomenon physiologically manifested (e.g., birthweight, infant mortality), an additional caveat must be considered. Social variables fail to account for any real physiological differences that may exist between social groups. For example, consistent differences in median birthweight among whites and nonwhites may be based, at least in part, on biological rather than social differences. The explanation of the nonwhite low birthweight infant's superior survival ability during the semanatal period may be due to unknown physiological processes whose effects cannot be measured. We also recognize that social variables may be very limited in their ability to explain "biosocial" variables, such as birthweight and infant mortality. The best predictors of these biosocial variables may be biological variables which are unavailable to us here.

## Suggestions for Further Research

The results of this study suggest a number of questions which should be given high priority in future research in this field. Primary emphasis should be given to the identification of social and biological variables associated with low birthweight and infant mortality. While a number of important variables are available from the certificate of live birth, the impact of other variables on birthweight and infant mortality should be considered. However, collecting this information from a representative sample of mothers and infants is a difficult task. A strategy for collecting detailed information from a representative sample of mothers and infants should be devised.

The major complaint with the existing literature in the field is the absence of the elaboration of relationships between birthweight, infant mortality, and a large number of independent variables. Future research should focus on establishing links between variables which appear to be associated with birthweight and infant mortality.

Research needs to be focused on racial differences in birthweight and rates of infant mortality. Why do nonwhite low birthweight infants have a better chance of surviving infancy than white low birthweight infants, even though nonwhite infant mortality is approximately twice as common as white infant mortality? Although a number of explanations for this finding have been presented in the literature, the conclusions of the studies are contradictory and unsatisfying.

A number of unresolved questions have been derived from the analysis of the data in relation to the dependent variable, legal status. Although the explanation of the effects of race and SES on an infant's legal status is of secondary importance in relation to interest in birthweight and infant mortality, the findings may be used to address some important theoretical issues. In the analysis presented in

Chapter VI, low SES nonwhite women have a very high rate of illegitimate births. As SES increases, the incidence of illegitimacy among nonwhite women declines. White women, regardless of their SES, are usually married at the time of their infant's birth. Low SES mothers tend to have children at an earlier age than higher SES mothers, and a youthful mother has a greater likelihood of bearing an illegitimate child. It is critical that future research determine the incidence of "forced marriage" among white women who are young and have a low SES. White women--even if they are young and low SES--are most often married. Since young, low SES nonwhite mothers tend to be single, the factors accounting for the divergent pattern between whites and nonwhites must be explored. The involvement of forced marriage in the explanation of these differences may be an important factor.

One can only speculate as to why single white mothers hesitate to seek prenatal care while married white mothers tend to seek care earlier than any other group. Since nonwhite mothers, regardless of their marital status, tend to put off seeking care until the second trimester of pregnancy, married white mothers are the only group who seek prenatal care early. The anticipated stigma of being unmarried and pregnant, the financial inability to obtain care, or any number of psychological or social exigencies may delay a single white woman's initial visit to a physician. Nonwhite women, regardless of their marital status, may experience socially constructed barriers due to their race in addition to the financial and social obstacles they have in common with unmarried white females. Statistical tests indicate that neither SES nor age of mother affect the relationship between race-legal and the month care begins. Perhaps a direct measure of income, if available, would provide the necessary elaboration. Since vital statistics records do not provide information on income, this question must be left to future research.

The future of productive research on low birthweight and infant mortality depends on the coordinated efforts of both social scientists and medical researchers into the identification of a wide variety of factors associated with these dependent variables. A better understanding of the influence of social factors associated with low birthweight and survivorship will depend upon these coordinated efforts.

APPENDICES

## APPENDIX A

### CONVERSION OF POUNDS AND OUNCES TO GRAMS

| Ounces | 1 lb. | 2 lb. | 3 lb. | 4 lb. | 5 lb. | 6 lb. | 7 lb. | 8 lb. |
|---|---|---|---|---|---|---|---|---|
| | Gm. | Gm. | Gm. | Gm. | Gm. | Gm. | Gm. | Gm. |
| 0 | 454 | 907 | 1,361 | 1,814 | 2,268 | 2,722 | 3,175 | 3,629 |
| 1 | 481 | 936 | 1,389 | 1,843 | 2,296 | 2,750 | 3,204 | 3,657 |
| 2 | 510 | 964 | 1,418 | 1,871 | 2,325 | 2,778 | 3,232 | 3,686 |
| 3 | 539 | 992 | 1,446 | 1,899 | 2,353 | 2,807 | 3,260 | 3,714 |
| 4 | 567 | 1,021 | 1,474 | 1,928 | 2,381 | 2,835 | 3,289 | 3,742 |
| 5 | 595 | 1,049 | 1,503 | 1,956 | 2,410 | 2,836 | 3,317 | 3,771 |
| 6 | 624 | 1,077 | 1,531 | 1,985 | 2,438 | 2,892 | 3,345 | 3,799 |
| 7 | 652 | 1,106 | 1,559 | 2,013 | 2,466 | 2,920 | 3,374 | 3,827 |
| 8 | 680 | 1,134 | 1,588 | 2,041 | 2,495 | 2,948 | 3,402 | 3,856 |
| 9 | 709 | 1,162 | 1,616 | 2,070 | 2,523 | 2,977 | 3,430 | 3,884 |
| 10 | 737 | 1,191 | 1,644 | 2,098 | 2,552 | 3,005 | 3,459 | 3,912 |
| 11 | 765 | 1,219 | 1,673 | 2,126 | 2,580 | 3,033 | 3,487 | 3,941 |
| 12 | 794 | 1,247 | 1,701 | 2,155 | 2,608 | 3,062 | 3,515 | 3,969 |
| 13 | 822 | 1,276 | 1,729 | 2,183 | 2,637 | 3,090 | 3,544 | 3,997 |
| 14 | 851 | 1,304 | 1,758 | 2,211 | 2,665 | 3,119 | 3,572 | 4,026 |
| 15 | 859 | 1,332 | 1,786 | 2,240 | 2,693 | 3,147 | 3,600 | 4,054 |

The table provides a method for converting pounds into grams. The conversion is done by multiplying the number of pounds by 453.6 and the number of ounces by 28.4 and adding the two products. For example to convert 3 pounds, 14 ounces, 3 multipled by 453.6= 1.360.8; 14 multiplied by 28.4= 397.6; 1,360.8 + 397.6= 1,758.4 grams.

To convert into pounds and ounces a weight in grams not shown in the table, multiply the number of grams by .002205. For example, 2,000 grams multiplied by .002205= 4.41 lb., or 4 lb. 6½ oz.; 1,260 grams multiplied by .002205= 2.77830, or 2.78 lb., or 2 lb. 12½ oz.

BIBLIOGRAPHY

# BIBLIOGRAPHY

## Books


Cohen, Jabob and Patricia Cohen
1975 Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences. New York: John Wiley and Sons.

Fuchs, Victor R.
1974 Who Shall Live? Health, Economics, and Social Choice. New York: Basic Books.

Grundy, F. and E. Lewis-Fanning
1957 Morbidity and Mortality in the First Year of Life. Cardiff: Cardiff Printers, Lt.

Labovitz, Sanford and Robert Hagedorn
1976 Introduction to Social Research. New York: McGraw-Hill.

Mechanic, David
1968 Medical Sociology. New York: Free Press.

National Academy of Science
1973 Infant Death: An Analysis by Maternal Risk and Health Care. Washington, D.C.: Institute of Medicine.

Nie, N.H., C.H. Hull, Jean G. Henkins, K. Steinbrenner, and Dale H. Bent
1975 Statistical Package for the Social Sciences. New York: McGraw-Hill.

Rosenberg, Morris
1968 The Logic of Survey Analysis. New York: Basic Books, Inc.

Ryan, William
1971 Blaming the Victim. New York: Pantheon Books.

## Articles

Abernathy, J.R., B.G. Greenberg, H.B. Wells, T.M. Frazier
1966 "Birthweight, gestation, and crown-heel length as response variables in multivariate analysis." American Journal of Public Health 56: 1281.

Alberman, E.D.
1963 "Birthweight and length of gestation in cerebral palsy." Developmental Medicine and Child Neurology 5: 388.

Anderson, Nina A., Estelle W. Brown, R.A. Lyon
1943 "Causes of prematurity." American Journal of Diseases of Children 65 (April): 523-534.

Anderson, Odin W.
1958 "Infant mortality and social and cultural factors." In E.G. Jaco (ed.), Patients, Physicians, and Illness (1st edition), Glencoe, Ill.: Free Press: 10-24.

Antonovsky, Aaron
1967 "Social class, life expectations and overall mortality." Milbank Memorial Fund Quarterly 45 (April): 31-73.

Armstrong, Robert J.
1972 "A study of infant mortality from linked records by birthweight, period of gestation and other variables." Vital and Health Statistics, Series 20/12. Washington, D.C.

Baird, D., F.E. Hytten, A.M. Thomson
1958 "Age and human reproduction." Journal of Obstetrics and Gynecology of the British Empire 65: 865.

Baird, D.
1964 "The epidemiology of prematurity." Journal of Pediatrics 65: 909-924.

Battaglia, Frederick C., T.M. Frazier, Andre E. Hellegers
1963 "Obstetric and pediatric complications of juvenile pregnancy." Pediatrics 32 (November): 902-910.

Baumgartner, L.
1962 "The public health significance of low birthweight in the U.S.A." Bulletin of the World Health Organization 26: 175-182.

Bennett, C.G., L.S.K. Louis
1959 "Demographic factors influencing birthweight." Hawaii Medical Journal 18 (January-February): 239-244.

Benton, A.L.
1940 "Mental development of prematurely born children: a critical review of the literature." American Journal of Orthopsychiatry 10: 719-746.

Berkov, Beth
1971 "Illegitimate fertility in California's population." Unpublished, University of California, Berkeley.

Bernstein, Blanche and Mignon Sauber
1960 "Deterrents to early prenatal care and social services among women pregnant out-of-wedlock." State Department of Social Welfare, Community Council of Greater New York: Albany, New York.

Beutow, K.C.
1961 "An epidemiological approach to the problem of rising neonatal mortality in Baltimore." American Journal of Public Health 51 (February): 271-227.

Bundesen, Herman N. et. al.
1951 "Progress in the prevention of needless neonatal deaths." Annual Report of the Chicago Health Department. Chicago, Illinois.

Butler, Neveille
1965 "Perinatal death." Clinical Developmental Medicine 19: 74-82.

California State Department of Public Health
1957 "Public prenatal care in California--report of a statewide study of quantity, quality, and eligibility." State Department of Public Health, Bureau of Maternal and Child Health. Berkeley, California (February), Mimeographed.

Chase, Helen C.
1962 "Father's occupation, infant birthweight and mother's age." The Relationship of Certain Biological and Socioeconomic Factors to Fetal, Infant, and Early Childhood Mortality, Part II. Albany, New York.

1969 "Infant mortality and weight at birth: 1960 U.S. birth cohort." American Journal of Public Health 59: 1618-1628.

1972 "Trends in prematurity." National Center for Health Statistics, DHEW Pub. No. 72-1030 (January). Washington, D.C.

Clague, Alice J. and Stephanie J. Ventura
1968 "Trends in illegitimacy, U.S. 1940-1965." National Center for Health Statistics, DHEW Series 21/15 (February). Washington, D.C.

Conner, A., C.G. Bennett, L.S.K. Louis
1957 "Birthweight patterns by race in Hawaii." Hawaii Medical Journal 16 (July-August): 626-632.

Daly, C. et. al.
1955 "Social and biological factors in infant mortality: III. Effects of mother's age and parity on social class differences in infant mortality." Lancet 6861 (February 26): 445-448.

Douglas, J.W.B.
1950 "Health of premature children from birth to four years." British Medical Journal 1: 748.

Drillien, C.M.
1958 "Growth and development in a group of children of very low birth weight." Archives of Diseases of Childhood 33: 10.

1970 "The small-for-date infant: Etiology and prognosis." Pediatric Clinics of North America 17: 9-24.

1974 "Prenatal and perinatal factors in etiology and outcome of low birth weight." Clinical Perinatology 1 (September): 197-211.

Duffield, T.J., S.L. Parker, L. Baumgartner
1940 "Birth weight and its relation to neonatal mortality: Analysis of date on live births in New York City in 1939." The Child 5 (November-December): 123-129.

Duncan, O.D.
1961 "Occupational components of educational differences in income." Journal of the American Statistical Association (December): 783-784.

Dunn, P.
1965 "The respiratory distress syndrome of the newborn: Immaturity vs. prematurity." Archives of Diseases of Childhood 40: 62.

Eastman, Nicholson J.
1947 "Prematurity from the viewpoint of the obstetrician." American Practitioner 1 (March): 343-352.

Erhardt, C.L., G.B. Joshi, F.G. Nelson
1964 "Influence of weight and gestation on perinatal and neonatal mortality by ethnic group." American Journal of Public Health 54: 1841-1855.

Fraccaro, M.
1956 "A contribution to the study of birthweight based on an Italian sample." Human Genetics 20: 282.

Griswold, D.M., D. Cavanagh
1966 "Prematurity: the epidemiological profile of the 'high-risk' mother." American Journal of Obstetrics and Gynecology 96: 878.

Guerrin, R.F. and E.F. Borgatta
1957 "Socioeconomic and demographic correlates of tuberculosis incidence." Milbank Memorial Fund Quarterly 43: 269-280.

Hendricks, C.H.
1967 "Delivery patterns and reproductive efficiency among groups of differing socioeconomic status and ethnic origins." American Journal of Obstetrics and Gynecology 97: 608-624.

Herzog, E., R. Bernstein
1964 "Health services for unmarried mothers." Children's Bureau, DHEW (July), Washington, D.C.

Heuser, Robert L., Stephanie J. Ventura, Frank H. Godley
1970 "Natality statistics analysis, U.S., 1965-67." National Center for Health Statistics, DHEW, PHS Pub. 1000, Series 21/19 (May), Washington, D.C.

Howard, P.H., D.J. Worrell
1952 "Premature infants in later life. Study of intellectual and personality development in 22 premature infants at ages 8-19 years." Pediatrics 9: 577.

James J.A.
1958 "The later health of premature infants: a field for further study." Pediatrics 22: 154-160.

Kane, S.H.
1964 "Significance of prenatal care." Obstetrics and Gynecology 24 (July): 66-72.

Kantero, R.L., M. Frisk, G. Holmstrom
1965 "Small prematures at 6-7 years of age." Annals Paedeitrics Finnland 11: 169.

Katz, C.M., P.N. Taylor
1967 "The incidence of low birthweight in children with severe mental retardation." AMA Journal of Diseases of Children 114 (July): 80-87.

Kovar, Mary Grace
1968 "Variations in birth weight for legitimate live births, U.S., 1963." National Center for Health Statistics, Series 22/8 (November), Washington, D.C.

Martin, F.M.
1954 "Primiparae and prematurity." Medical Officer 92 (November 19): 263-270.

McDonald, A.D.
1962 "Neurological and opthalmic disorders in children of very low birth weight." British Medical Journal 1: 895.

1963 "Cerebral palsy in children with very low birth weight." Archives of Diseases of Children 38: 579.

Montgomery, T.A., M. Hammersly, A. Lewis
1963 "Perinatal mortality and survival: Part II." California Medicine 99 (October): 241-247.

National Center for Health Statistics
1965 Weight at Birth and Survival of the Newborn in the U.S. Early 1950. Vital Statistics Special Reports, PHS (July), Washington, D.C.

1977 Use of Selected Medical Procedures Associated with Preventive Care, U.S., 1973. DHEW Pub. 77-1538. Series 10/110 (March): Washington, D.C.

Oklahoma Health Statistics
1975 Oklahoma State Department of Health, Public Health Statistics Division.

Packter, J., H.J. Rosner, H. Jocobziner, F. Greenstein
1961 "Out-of-wedlock births in New York City: II--medical aspects." American Journal of Public Health 51 (June): 846-865.

Rashbaum, William, Helen Rehr, Janice Paneth, Martin Greenberg
1963 "Use of social services by unmarried mothers." Children 10 (January-February): 11-16.

Rosen, M.
1968 "The quality of reproduction in an urban indigent population." Obstetrics and Gynecology 31: 276-282.

Rosenwaike, I.
1971 "The influence of socioeconomic status on evidence of low birthweight." HSMHA Public Healt- Reports 86: 641-649.

Russell, George
1977 "The American underclass: Destitute and desperate in the land of plenty." Time 110 (August 29): 14-27.

Salber, Eva J. and E.S. Bradshaw
1951 "Birthweight of South African babies. II. Effects of birth rank on birthweight." British Journal of Social Medicine: 247-253.

Schneider, Jan
1968 "Low birthweight infants." Obstetrics and Gynecology 31 (February): 283-287.

Scott, R.B., M.D. Jenkins, R.P. Crawford
1950 "Growth and development of Negro infants." Pediatrics 6: 425-31.

Shah, Farida K. and Helen Abbey
1971 "Effects of some factors on neonatal and postneonatal mortality: analysis by a binary variable multiple regression method." Milbank Memorial Fund Quarterly 49: 33-57.

Shapiro, Sam and Jeanne Unger
1965 "Weight at birth and cause of death in the neonatal period: U.S., early 1950." Vital Statistics Special Report, Series 21/6, PHS (July), Washington, D.C.

Shapiro, Sam, E.R. Schlesinger, R.E.L. Nesbitt, Jr.
1965 "Infant and Perinatal Mortality in the U.S." Vital Statistics Analytical Study, Series 3/4, PHS. Washington, D.C.

Schwartz, S.
1962 "Prenatal care, prematurity, and neonatal mortality." American Journal of Obstetrics and Gynecology 83 (March): 591-598.

Smith, A. and T. McKeown
1955 "Prenatal growth of mongoloid defectives. Archives of Diseases of Children 20: 257-259.

Steiner, Morris and William Pomerance
1950 "Studies on prematurity II. Influence of fetal maturity on fatality rate." Pediatrics 6 (December): 872-877.

Stevenson, S.C., K.L. Garnee, E. Siegel
1957 "Premature and full-term infants: A comparison of their maternal histories." AMA Journal of Diseases of Children 94: 169-178.

Stockwell, E.G.
1962 "Infant mortality and SES: A changing relationship." Milbank Memorial Fund Quarterly 40: 101-111.

1963 "A critical examination of the relationship between SES and mortality." American Journal of Public Health 53: 956-964.

Taback, Matthew
1951 "Birthweight and length of gestation with relation to prematurity." Journal of the American Medical Association 146 (July 7): 897-901.

Terris, M. and E.M. Gold
1969 "An epidemiological study of prematurity." American Journal of Obstetrics and Gynecology 103: 358-379.

U.S. Census of the Population of Oklahoma
1970 Population Characteristics. Washington, D.C.

U.S. President's Commission on Population Growth and the American Future
1970 Washington, D.C., Government Printing Office.

Vital Statistics of the U.S.
1968 Mortality. Washington, D.C.

Von Der Ahe, C.V.
1967 "Pregnancy in the very young primagravida," Pacific Medicine and Surgery Journal 67: 118-122.

Wiener, G. and T. Milton
1970 "Demographic correlates of low birthweight." American Journal of Epidemiology 91: 260-272.

World Health Organization
1950 WHO Expert Group on Prematurity: Final Report. Technical Series of the World Health Organization, No. 27 (October). Geneva

1957 WHO Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death. Based on the Recommendation of the Seventh Revision Conference, 1955, Geneva.

Wunderlich, Gooloo S.
1968 "Educational attainment of the mother and family income: White legitimate births, U.S., 1963." National Center for Health Statistics, DHEW, Series 22/6 (August), Washington, D.C.

Yankauer, Alfred, K.G. Goss, Salvatore Romeo
1953 "An evaluation of prenatal care and its relation to social class and social disorganization." American Journal of Public Health 43 (August): 1001-1010.

Yerushalmy, J.
1938 "Neonatal mortality by order of birth and age of parents." American Journal of Hygiene 28: 244-270.

1965 "Birthweight and gestation as indices of 'immaturity'--neonatal and congenital anomalies of the 'immature'." American Journal of Diseases of Children 109: 43-57.