12-2000

Developmental, Psychosocial, and Economic Predictors of Healthy Newborns in Michigan's Teenage Pregnancies

Cheryl Lauber
Western Michigan University

DEVELOPMENTAL, PSYCHOSOCIAL, AND ECONOMIC PREDICTORS OF HEALTHY NEWBORNS IN MICHIGAN'S TEENAGE PREGNANCIES

by

Cheryl Lauber, D.P.A.

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Public Administration
School of Public Affairs and Administration

Western Michigan University
Kalamazoo, Michigan
December 2000

DEVELOPMENTAL, PSYCHOSOCIAL, AND ECONOMIC PREDICTORS OF HEALTHY NEWBORNS IN MICHIGAN'S TEENAGE PREGNANCIES

Cheryl Lauber, D.P.A.

Western Michigan University, 2000

Teenage pregnancy is a critical health indicator. Using a risk reduction model, this study examined the relationship between the characteristics of the teenage mother and her newborn. The research questions were: (1) what risk factors are associated with poor birth outcomes, (2) is addressing each factor the best way to reduce the risk, and (3) has the overall risk changed as the birth rate has declined? Developmental, psychosocial and economic risks were identified as independent variables, while age and race were mediators.

Combining the birth certificate records of women under age 20 from 1990 through 1997 resulted in a population of 136,973 cases. Births to 20-24 year olds in 1993 were analyzed for comparison. The birth weight of 91 percent of the babies was normal. Over 81 percent of the babies were term births. Ninety four percent survived past the first week of life. Ninety seven percent had no congenital anomalies, and 90 percent had no newborn illnesses.

While most pregnancy outcomes were healthy, there were areas of concern: (a) 3,000 babies were born to teenagers under age 15, (b) 18,070 were premature, (c) 38 percent of births were to black teens, in a population that is 18% black.

tested the relationship between variables and outcome, and a ratio of risk to non-risk was calculated. Odds ratios of low weight gain, inadequate prenatal care or a prenatal medical condition in the mother revealed 2-3 times greater risk of poor birth outcomes. No identified father, living in an urban area or in a higher income county produced twice the risk. Being non-white with no identified father put the teen at twice the risk of a poor outcome; being non-white and living in a higher income county had twice the risk.

Trend analysis of the data showed no differences in outcomes or risk factors corresponding to the declining birth rate. So the fact that fewer teens are having babies has not affected the risk of a poor birth outcome.

INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

Bell & Howell Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
800-521-0600

ACKNOWLEDGMENTS

I would like to begin by thanking Carol Getts, Kathy Humphrys and Michael Beebe, of the Division for Vital Records and Health Statistics, Michigan Department of Community Health, for their help in obtaining birth certificate data. Their mastery of query techniques and field definitions saved me much time and effort in collecting needed information.

I would also like to thank fellow classmate, Troy Feltman, for his support and encouragement during the formative stage of the ideas for this study. I also acknowledge the support of the members of my dissertation committee, Dr. Kathleen Reding, Dr. Peter Kobrak, and Dr. Kenneth Wilcox, who sharpened the focus of my thoughts, and were very kind in critiquing my efforts.

Above all my deepest appreciation is extended to my husband, Peter, for his continuous love and understanding throughout this amazing mid-life crisis.

Cheryl Lauber

TABLE OF CONTENTS

Table of Contents—continued

Table of Contents—continued

Table of Contents—continued

Table of Contents—continued

LIST OF TABLES

List of Tables—Continued

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Statement of the Problem

More than 15,000 young women under age 20 gave birth in Michigan in 1997. Babies born to teenagers tend to weigh less, to be born prematurely, and experience more medical problems and congenital anomalies than births to older women (Fraser, Brockert & Ward, 1995; Institutes of Medicine, 1985).

Teenage pregnancy, births to women under 20, is one of the "critical health indicators" used by the Department of Community Health (DCH) to evaluate the health of our communities. Data collected annually helps set the statewide health agenda. Related policies and program development resources are directed to strategic areas in order to reduce the health risk. The DCH policy regarding teenage pregnancy at this time is simply to reduce the incidence. Fortunately birth rates to teens are on the decline according to the latest vital statistics. Although this suggests an improved health trend, it underscores the fact that no department policy sets the agenda to improve birth outcomes for those teens who do become pregnant. State resources to support teenage mothers must be targeted in order to produce the best outcomes.

It is estimated that 78% of pregnancies among 15-17 year olds are unwanted (Kist & Forrest, 1995). Over half (56%) of the 15-19 year olds who gave birth in 1988 were poor, with annual family incomes under $12,000, while only 17 percent had family incomes of over $25,000. Children born to unmarried, teenage mothers are 10 times more likely to be living in poverty for as long as 12 years after birth (Kids Count in Michigan, 1996). Poverty is blamed for a whole complex of social problems that adversely affect the outcome of teenage pregnancy. Access to health care and the inclination to go to a health care provider are affected by low income and the values associated with low socioeconomic status. Poverty and young age are associated with problem parenting and child abuse (Dunifon, 1999; Klerman, 1993; Maynard, 1997). Teenage mothers tend to have subsequent pregnancies, further reducing a family's economic well-being. Eight of every ten teenage women who give birth are from economically disadvantaged households. Almost all of these women will not have completed high school at the time of giving birth. Thus for many reasons, teenage pregnancy remains a public social problem.

Public agencies in Michigan have directed federal and state resources to a number of programs that target low income, high risk, pregnant women. Since all adolescent pregnancies are considered to be high risk, and most have no income, most teenagers qualify for these programs. Health departments typically serve as clearing houses for information and referral for teens. School districts who have cooperative programs with the health department also have counselors who refer pregnant teens to services. There are over 20 teen health centers across the state which provide both

pregnancy testing and referral services.

Existing programs in Michigan that target this population include:

1. Maternal and Infant Health Advocacy Services. This program utilizes paraprofessionals, indigenous to the community, to identify low income, high risk women early in their pregnancy and to support continuous and appropriate utilization of prenatal care. Advocates encounter women at home, using personal relationship building to persuade them to improve their health care practices. There are 22 teams of four advocates in 16 counties, which cover most high risk infant mortality areas. Teen parents are eligible for services in these areas. In 1997 there were 640 women under age 20 who received services, which was roughly 4 percent of the live births that year.

2. Prenatal Care Enrollment and Coordination. Low income pregnant women receive assistance from local community-based providers, separate from the state social services agency, to enroll in Medicaid, and to access prenatal care providers who accept Medicaid through this program. The use of less stigmatized sources of care and shortened enrollment forms encourages women to access Medicaid benefits earlier in the pregnancy.

Those who are denied Medicaid initially have a recourse for medical care coverage through "Non-Medicaid Mich-Care", using health department staff to determine eligibility and guaranteeing coverage until the current obstacles to full Medicaid coverage are resolved. There were 478 teens who used this process in 1996 (approximately 3% of the teens who delivered live births that year). Teens usually

qualify for Medicaid as single parents, but may resist identifying themselves early, if the pregnancy is unwanted or unplanned, so these programs do not resolve the issue of access to insurance.

3. Maternal Support Services. This is a case management approach to providing Medicaid eligible, high risk, pregnant women with the non-medical support services complimentary to medical prenatal care. Services such as nutrition counseling, public health nursing, psychosocial services and prenatal smoking cessation are provided throughout the pregnancy. Services may be delivered at home or in a clinic setting in order to meet the needs of the teen parent. Data regarding enrollment for this Medicaid program is not available in a reliable form at this time. Teens themselves may not have information about these services, however, unless they attend health department clinics.

4. Supplemental Food and Nutrition Program for Women, Infants and Children (WIC) provides nutrition assessment, counseling and food supplements for pregnant women. In calendar year 1998, 11,793 women under age 20 used WIC services and were pregnant. During the same calendar year 1,979 women under age 20 were breastfeeding and used WIC services, and 13, 864 women under age 20 were non-lactating and used WIC services. These numbers do not correspond to the number of births during 1998, but do indicate that WIC is an important resource for teen mothers.

5. The Teen Parent Program assures access to a variety of community resources for teens who are referred by protective services. Program coordinators

make arrangements for any or all of the services listed above as well as parenting education classes, arranging for transportation, and/or setting up doctor visits. This program is administered by the state social services agency and operates in 17 counties, incorporating a mix of urban and rural populations. During fiscal year 1999 there were 992 new intakes to the program. This is an important resource for high risk teens across the state.

To determine the best service delivery options and financial support for programs, state policymakers must consider questions such as the following:

1. How can the state best achieve the goal of improved prenatal care service delivery for the adolescent population?

2. Should the state continue to provide pregnant adolescent Medicaid recipients with access to expanded support services?

3. What barriers exist that restrict an adolescent's access to prenatal care services?

4. What policy changes are suggested by the vulnerability of pregnant adolescents?

5. How do recent changes in welfare policy and Medicaid Managed Care affect the pregnant adolescent?

These questions will serve to direct the conclusions made from this research in order to promote the more effective use of public resources for young families.

Purpose of the Study

The purpose of this study is to examine the relationship between characteristics of the teenage mother in Michigan and the occurrence of a healthy newborn. The characteristics which influence the outcome of pregnancy are grouped into categories of vulnerability: developmental (weight gain, prenatal care, prenatal medical risks), psychosocial (smoking, number of pregnancies, education level, father identified), and economic (insurance, urban/rural residence, zip code). Age and race are factors that can not be modified, that affect the outcome of pregnancy. The goal is to establish the predictive ability of these characteristics on pregnancy outcomes in order to focus interventions for the greatest impact. Readily available secondary data will be the source of information about characteristics of the mother and the newborn. The relationship of these variables to each other will be statistically analyzed. Information gained from this study will be valuable for policy setting, program planning and the allocation of resources in maternal child health arenas.

Theoretical Framework

Adolescent Stage of Development

The adolescent experience has been characterized as a crisis (Group for the Advancement of Psychiatry, 1986). Each stage of development has its own sense of disorganization, frenzy, stress and change. Accomplishment of certain tasks becomes the mark of successful passage through a stage of development and the resolution of

the immediate crisis. Crises have both negative and positive correlates, which may be useful to understanding the complexity of interpretation of events. Adolescents have the sexual urge, and social need to engage in adult activities and the capacity to do so. They are capable of grasping abstract ideas and planning for the future. However most adolescents lack the knowledge, experience, and judgment to take on adult responsibility. It is precisely during a crisis that individuals are the most motivated to learn new skills to reduce the stress of the confusion. And the self-limiting nature of crisis events holds promise for those in the journey as well as the helpers. There is a normalcy about the crises of development that makes it possible to view the past as a training ground for the rewarding challenges of the future.

Adolescence is a stage of development described by Erikson (1968) as a transition from childhood to adulthood. Developmental theorists such as Erikson posit that the major task of adolescence is identity formation. As in every stage of development, the outcome predicts the success of future development. Identity is conceptualized as an internalized, self-selected regulatory system that represents an organized and integrated psychic structure that requires the developmental distinction between the inner self and the outer social world (Erikson, 1982). Successful identity formation is an active searching and self-selection process, where self-chosen commitments are integrated into an organized psychic structure. This form of identity is associated with self-assurance, self-certainty, and a sense of mastery. Erikson describes passive identity as a less successful outcome. Passive identity is reflected in either a foreclosing process where an adolescent accepts, without

evaluation, the roles and self-images provided by others, or a diffused identity associated with role confusion. Passive identity youths are thought to harbor self-doubt and uncertainty, and seem to lose one's self when removed from the foreclosed and structured environment in which they live. Passive identity leads to identity diffusion, which is hypothesized to be a correlate of persistent risky behavior in some adolescents.

The life stage of adolescence provides young people with the optimal situation for defining a sense of identity. Not yet firmly tied by adult commitments, the adolescent may try out a variety of possible commitments in relationships and ideology, eventually adopting a more or less permanent sense of who he or she is. Growing physical strength and agility, combined with new social opportunities and obligations, mean that adolescents may express themselves in less than well-coordinated ways that are new to themselves and possibly surprising to their significant others. Exploration of acceptable social interaction is an important way of testing one's identity. Adolescents may indulge in risky behavior as a normal expression of this exploration of identity, unaware of the long-term consequences, and unprepared to deal with the challenges it brings. Erikson (1982) expresses some of the range of identity issues that face the developing adolescent.

> It is difficult...if deep down you are not quite sure that you are a man (or a woman), that you will ever grow together again and be attractive, that you will be able to master your drives, that you really know who you are, that you know what you want to be, that you know what you look like to others, and that you will know how to make the right decisions without, once for all, committing yourself to the wrong friend, sexual partner, leader, or career (p. 98).

The essence of identity is not just the persistent sameness within oneself, but the persistent sharing of oneself with others. Identity is a social reality, not simply a psychological construct, involving the world of family, friends, and heroes. Girls seem to be influenced by their social environment more than by physical development (Hayes, 1987). Identity achievement is essential for the capacity to experience intimacy in relationships (McKinney, Lorion & Zax, 1976). A clear sense of identity is associated with a sense of personal well being in the form of self-esteem and self-acceptance and the relative absence of debilitating emotional states such as anxiety and depression. A clear sense of identity is associated with goal-directed activity both in terms of goal setting and in the sophistication of cognitive functioning necessary for success in achieving the goals set (Waterman, 1992).

As was true in the previous stages, adolescents need a safe place in which to retreat when the stress gets too much. Typically, the family provides these arms of security, just as parents do for infants who are out of control, giving a warm, controlled environment that helps calm the crying, disorganized baby. Friends provide a safe sounding board and peer interaction, but rarely are nurturing, and knowledgeable about the needs of teens in crisis (Group for the Advancement of Psychiatry, 1986).

The Pregnant Adolescent

The onset of puberty has been blamed for much stress and disruption of the teenager's life. The change in hormonal function at any age causes physical

uncertainty and triggers steps taken to eliminate the stress. For adolescent girls, the choice to become sexually active may be influenced by hormonal imbalance, but seems to have more of a relationship to the norms of her social environment. More than 80 percent of males and 70 percent of females have become sexually active before their twentieth birthday. Black boys and girls become sexually active on average two years earlier than their white counterparts (Hayes, 1987). Some explain racial differences in sexual behavior on socioeconomic differences, others trace it to normative differences in the acceptability of early sexual behavior.

Pregnancy that begins soon after a young girl's menarche is hypothesized to be at risk because of the immaturity of the girl's body (Hayes, 1987). Growth in stature continues for at least two years after onset of menarche, suggesting that pregnancy may stunt the teen's growth, or cause the diversion of needed nutrients from the developing baby. A teenage girl's perception of herself is also important to the outcome of the pregnancy. Most girls feel they are overweight, and unattractive because of hips or thighs that are too big. During the pregnancy some teens are very anxious about gaining weight, which will further damage an already compromised self-image. A pregnant teen's identity formation may be seriously hampered by the physical and emotional changes inherent in pregnancy.

Attachment to a developing baby and the ability to provide a nurturing environment is difficult for a teen mother or father. A degree of self-acceptance and ability to delay gratification is necessary to meet the physical and psychosocial needs of a newborn.

Many pregnant teens with good support and healthy environments, physically, psychosocially, and economically, seem to weather this storm and continue to develop in a normal way, providing a healthy experience for their newborns. However, many teen mothers are unable to form a complete identity in this stressful environment, thereby putting themselves at risk for arrested development and endangering their unborn infants.

The social milieu of the adolescent plays a defining role in how the pregnancy, birth experience, and parenting tasks are understood. Though much has been reported on the medical and economic consequences of adolescent pregnancy, not enough has been determined about the dynamic impact of the social world of today's teenager. Still less is known about the development of this environment or how change happens. The passage of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 is just beginning to affect adolescent mothers and their children. Although based on a premise that dependence on government aid hinders long-term self-sufficiency, there are considerable unknowns about the impact of this legislation on the economic and social world of teen parents. It is unlikely that economic disincentives to have children will have a great impact on future teenage pregnancies. The reality may be that teens will experience increased stress from demands of living without governmental support, producing a deeper problem of poverty, and putting more children at risk.

Another source of stress from this new policy may be the forced residency with parents. It is hoped that more family interaction and support will be fostered by

this legislation. Teens who have been rejected by their parents may be subjected to further isolation with little resources.

Several characteristics of the adolescent world may play a role in determining health behavior. Most adolescents have very little experience with illness, with medical providers, or hospitals. Some may even have an aversion to medical care presumably because it suggests a less than perfect health. Most adolescent females have their first gynecological exam when they present with a request for birth control. This suggests that there is little preparation for puberty through health care providers, and that there may be little trust established with providers prior to the experience of pregnancy.

Theory of Risk Reduction

Risk reduction is a phenomenon of the disease prevention model. It is a strategy of primary prevention which Fletcher, Fletcher and Wagner (1988) describe in their three levels of disease prevention: (1) primary prevention – through which disease is prevented by removing risk factors, (2) secondary prevention - through which disease is detected early while asymptomatic and treated to halt its progress, and (3) tertiary prevention – where clinical activity to manage or reduce the damage of the disease are effected.

A model for risk reduction is suggested by Bandura's theory of social learning, in which better outcomes are realized through primary prevention. First, a link must be established between specific behavioral risk factors and poor outcomes

by quantitative means. Then, the presence of specific risks is assessed in a particular individual and that person is warned of the threat of this behavior to health. Finally, education and support are given to influence the reduction of the risk behavior in lieu of other more healthy behaviors. The model illustrates: the greater the intensity of the intervention, the more likely the improvement in the individual's outcome (Shi, 1992).

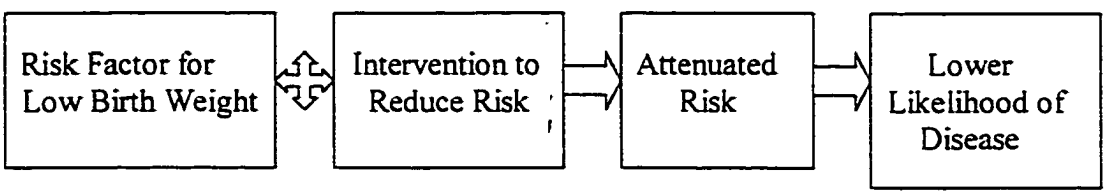


Figure 1. Model of Risk Reduction.

Figure 1 is a schematic of risk reduction suggested by Hogan (1994). The arrows illustrate the expected process of reducing the risk for low birth weight. As Hogan points out, this model works well for factors that are amenable to modification. For risk factors such as age or race that cannot be modified, she suggests that these factors make women more *vulnerable*, and thus in need of a specific *quality* of care to reduce this vulnerability. For example, prenatal care cannot change the educational level of a woman, but it can deliver prenatal education in a manner commensurate with the literacy level of the woman. This is particularly relevant since a large part of prenatal intervention involves motivating women to change behavior that puts them at risk.

The fact that interventions for an individual often impact on broader systems is illustrated by Hogan's model of vulnerability (Figure 2). Strategies in this realm are likely to involve changes in provider behavior and in the delivery system, in addition to changes in the subject whose risk is being addressed. There is considerable need to alter the common delivery modalities of services to meet the needs of the vulnerable teen population.

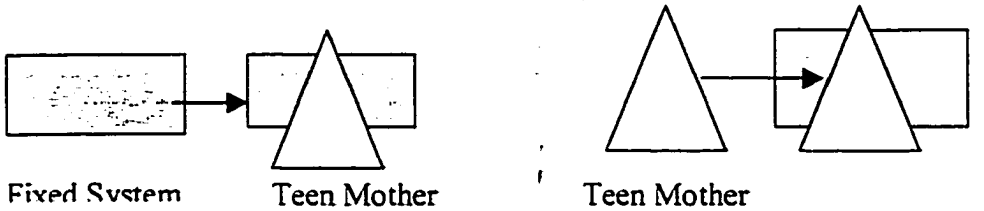


Figure 2. System Model of Vulnerability.

Research Questions

As a starting point in defining the best interventions to promote a healthy outcome of teenage pregnancy this study examines:

1. What specific risk factors in the adolescent woman are associated with a poor birth outcome?

2. Is addressing each specific risk factor the most effective way to reduce the risk of a poor birth outcome?

3. How has the overall risk to teenage pregnancy changed as the birth rate has declined?

Limitations of the Study

A limitation of this study is that the data was collected from the available information on the birth certificates. The birth certificate currently used in Michigan was revised in 1989 to improve the reporting of information during the pregnancy. The data is considered reliable at this time, but there is some missing data. It is not known whether this information is unavailable or if the parent refused to answer. Fields, which are considered unreliable, were not included in this study.

The birth certificate does not provide information about the adolescent mother's support system and other dynamics of her social and psychological environment, which have been found to affect the teenager's pregnancy experience. The identification of a father at the time of birth will be used as a proxy for social support.

Significance of the Study

The pregnancy data in Michigan has not been evaluated in recent decades to determine the affect of specific characteristics of teenage pregnancy on pregnancy outcome. Since teenage pregnancies are considered high risk, the findings of this study will provide valuable parameters for public resource program evaluation. This study will also give needed information to policy makers, program planners, and those who determine the allocation of resources regarding the future direction for adolescent programming.

Michigan, like many other states, has experienced a decline in the number of

teenage pregnancies over the last decade. By including population data from 1990 through 1997 this study will demonstrate any changes in the relationship of study variables to pregnancy outcome over this time frame.

CHAPTER II

REVIEW OF THE LITERATURE

Teen births are a cause for concern among health care advocates because of the high rates of poor outcomes. It is generally accepted that more babies born to teens, especially teens less than 18 years old, are underweight and premature which threatens their physical and mental development. A higher number of fetal and infant deaths are attributed to the younger age of the mother as well. Reasons for these poor outcomes tend to focus on behaviors of teens such as smoking, insufficient weight gain, inadequate prenatal care, multiple pregnancies in a short time, and uncontrolled medical problems. However, other demographic factors are also linked to poor outcomes, such as living in rural areas, non-white race and low educational level.

In the following examination of pertinent literature the issue of what constitutes a healthy outcome of pregnancy will be explored. Next, issues related to the risks of pregnancy associated with age and minority race will be described. Finally, studies will be reviewed that describe risks associated with developmental, psychosocial and economic factors.

Healthy Newborns Versus Newborns With Poor Outcomes

The vast majority of babies born to teenage mothers are normal healthy newborns. That is, they have the best chance for surviving and thriving during infancy and are in the range of normal on the following parameters. Normal newborns are born between 38 and 42 weeks of gestation, called term deliveries. At this age, babies have achieved adequate development to sustain life without any special technological assistance. Normal newborns usually weigh between 2500 and 4000 grams. And finally, normal newborns have no abnormalities, either congenital malformations or disease entities that would require special medical intervention.

The biggest threat to newborns is low birth weight. Researchers have consistently found that weight below 2500 grams is linked to poor outcomes. Low birth weight is a major contributor to infant morbidity (illness) and mortality (death). Inadequate fetal growth may result from prematurity, intrauterine growth retardation, or both (Institute of Medicine, 1985). The association of congenital anomalies, other newborn medical conditions and low birth weight is generally accepted.

Because medical information about the causes of preterm labor and intrauterine growth retardation is limited, data has been collected about factors associated with low birth weight which have been called risk factors. Most large population studies of birth certificate data indicate an increase of low birth weight in the babies born to adolescent mothers, especially mothers under 18 years of age (Friede et al., 1987; Lee, Ferguson, Corpuz & Gartner, 1988; Zuckerman et al., 1983).

The age cut off for the larger percentage of babies less than 2,500 grams was 17 years for McCormick, Shapiro and Starfield (1984).

Prematurity is also considered a major cause of morbidity and mortality in the first year of life. Some sources treat prematurity as a separate risk factor from low birth weight, believing prematurity is caused by a separate mechanism from intrauterine growth retardation. Teens typically have more premature births than older women. Prematurity is usually higher in non-white races (Friede et al., 1987; Leland, Petersen, Braddock, & Alexander, 1995; Sappenfield et al., 1987).

Part of the research problem with predicting the cause of low birth weight and/or prematurity is interpreting the true interaction of a number of biological, psychosocial and economic factors. Age and race are highly correlated with both low birth weight and prematurity, but in some studies take a lesser place than measures of socioeconomic status or utilization of prenatal care (Horon, Strobino & MacDonald, 1983). A variety of ways of organizing research projects and the use of statistical techniques have been incorporated to address this problem. In their summary of the low birth weight problem, the Institutes of Medicine (1985) concluded that more research is needed on risk factors, both those that are well established, and others that are beginning to emerge. Researchers were encouraged to distinguish risks for very low birth weight (1,500 grams or less) from risks for moderately low birth weight (1,501 to 2,500 grams) at various gestational ages, because the background and incidence trends of these two classes differ.

Congenital anomalies affect about 19 percent of normal birth weight infants and up to 42 percent of very low birth weight infants. Anomalies are not very easy to describe, since the presence of an extra finger is considered an anomaly in the same way as a severe disability. Those that are severely limiting affect about 2 percent of normal birth weight infants, and about 14 percent of very low birth weight infants. Congenital anomalies were the leading killer of white infants in 1991 (Singh & Yu, 1995). The presence of an anomaly is also associated with increased medical costs and developmental delays.

The most common medical condition in low birth weight babies is respiratory distress syndrome or hyaline membrane disease. Newer medications and intensive care technology have reduced this problem. However, there are many other problems associated with immature development that pose a risk for early morbidity and mortality. Abnormal cardiac conditions are also a common occurrence in low birth weight babies. During the first year of life, about 30% of very low birth weight infants have had an illness requiring hospitalization, as compared with 20% of all low birth weight infants and only 17% of normal birth weight infants (Institutes of Medicine, 1985).

In summary, a healthy newborn is best assured by prevention of low birth weight, prematurity, congenital anomalies and newborn medical conditions. In the next section specific problems associated with race and age are discussed.

Age and Race

The interaction of young age and particular racial disparities will be an important aspect of this research. Particular attention must be paid to controlling for these two variables in order to determine any relationship between other independent variables and the pregnancy outcome.

Black mothers have a much higher percentage of low birth weight babies than white mothers do (Abrams & Newman, 1991; Friede et al., 1987; Leland et al., 1995; Sappenfield, 1987). Only seven percent of the births to white teens in a 20 year study in Utah (Fraser et al., 1995) were low birth weight. Some of the explanation for racial disparity is the fact that black teens give birth more often than white teens – seven times more often according to a national mid 80s study (Leland et al., 1995).

Black mothers were also more likely to have had a previous birth. The impact of previous birth and inadequate prenatal care had more affect on low birth weight outcome than race in the Leland (1995) study. Among black teens there was a higher birth rate, more lived in urban settings, more were not married, had a lower educational level, less prenatal care and more were likely to have been pregnant before. Black infants were more likely to be below weight, premature and small for gestational age. Deaths were significantly higher for black babies during the first month of life related to prematurity and low weight. After the first month the rates between both races were comparable, explained by the relative good health of babies, in general, which survive the first month.

While controlling for race, marital status, education and prenatal care, Fraser et al. (1995) found that mothers 17 years of age and younger had a significantly higher risk than older women, of delivering an infant with low birth weight (relative risk, 1.7), or an infant who was delivered prematurely (relative risk, 1.9). Lee et al. (1988) also determined that age alone was responsible for 3.2 percent of the low birth weight in the 15 year old and younger age group, while the incidence was 2.0 percent in the 20-24 year olds.

The thesis of this paper is that age alone is inadequate to explain the outcomes of pregnancy. It is the combination of other risk factors with young age that is most predictive of poor outcome (Horon et al., 1983; Paneth, Wallenstein, Kiely, & Susser, 1982). Zuckerman et al. (1983) demonstrated with regression analysis that several health and social factors were more independently associated with low birth weight than age. Mothers who gained less weight during pregnancy, weighed less prior to pregnancy, were black, delivered male infants, and smoked marijuana, had low birth weight babies. The mean birth weight for adolescents was 94 grams less than for non-adolescents (Zuckerman et al., 1983).

A major hypothesis for the problem of young age is that young women are still growing after menarche, thereby taking needed resources away from growing fetuses (Fraser et al, 1995; Hollingsworth, Kotchen & Felice, 1983; Naeye, 1981). This belief has supported much of the assumptions about early teenage pregnancy risk. Stevens-Simon and McAnarney (1993), however, found that there was no correlation between young skeletal age and low birth weight. They measured the

bone age of 93 black women, 12-18 years old, and weighed their babies right after birth. Others have found that black babies of young women are heavier than their white counterparts at early gestational ages (Horon et al., 1983).

Weight Gain

Growth is not complete at puberty. Growth may continue for four years after menarche. Story and Alton (1995) found that adolescent mothers tend to gain more weight during their pregnancy than do adult mothers. However, the baby and placenta are smaller in adolescents than adult women. Adolescent mothers tend to be shorter and weigh less at conception than do adult mothers. The greater the amount of uncompleted growth at conception, the greater the nutritional needs of the adolescent. Among young, still-growing pregnant teens, there may be competition for nutrients between mother and fetus. This idea is supported by the authors's observation that fetuses grow more slowly in 10-16 year olds than in older women.

The weight gained by a pregnant woman is carefully monitored as a measure of maternal nutritional status and the growth of the fetus. In a sample of 1400 teens who delivered normal birth weight babies, Scholl and Hediger (1995) found the average weight gain was 31-33 pounds. Contrary to Story's findings, Haiek and Lederman (1988) found that teens in their observations gained less weight overall than their adult counterparts and had lower birth weight babies. Study of total weight gain and birth weight showed a positive linear relationship. Premature delivery, however, seemed to be more related to inadequate weight gain late in pregnancy.

In developed countries weight gain (or caloric intake) was second only to smoking as the most important factor in predicting birth weight (Kramer, 1987). Adequate caloric intake is of primary importance in producing adequate maternal weight gain. Adolescent females have been shown to consume fewer calories in order to avoid gaining weight in pregnancy (Stevens-Simon, Nakashima & Andrews, 1993). Adequate weight gain was attained with a mean caloric intake of 2,232 kilocalories per day (Scholl & Hediger, 1995). The recommended weight gain for young teens is 25-40 pounds depending on pre-pregnancy weight. National data show that almost one fourth of pregnant teenagers gained less than 21 pounds (Story & Alton, 1995). They also found that poor weight gain after mid-pregnancy is associated with at least a 2-fold increase in preterm delivery.

Actual pounds gained may be different than a teen's perception of weight gain. Young moms, between the ages of 13 and 17, each with a child under the age of one year, speaking in focus groups, said they were surprised at the weight they gained, were dismayed about their body sizes and frustrated, and doubtful about their ability to lose weight (Hellerstedt & Story, 1998). Body image is often distorted in teens (Lauber, 1982). Adolescent girls despair of gaining weight and find much frustration in how their body looks.

Prenatal Care

Ambivalence about a pregnancy is characteristic of teenagers especially when the pregnancy is unplanned. Seeking medical care and compliance with changes in

lifestyle are avoided by many teens (Bongiovanni, 1983). In the study cohort of births in Utah from 1970 to 1990, controlling for race and parity, inadequate prenatal care was strongly associated with adverse outcomes (Fraser et al., 1995). Inadequate prenatal care was associated with twice the risk of a low birth weight baby as those who received adequate care and more than twice the risk of a premature baby. Prenatal care was the most predictive variable for outcome in first pregnancies in Elster's (1984) data from Utah, in the late 70s.

Klerman (1993) concluded that more research is showing poor pregnancy outcomes in teens are due to poverty and insufficient prenatal care rather than age, particularly ages 15 and older. She also concludes that early childbearing is not an isolated behavior but is often supported by family and friends. Though not mentioned in this article, social issues may also play a significant role in seeking prenatal care. Lack of health insurance has also been implicated in delay in seeking care. There may be programs and resources for teens, but teens, themselves don't know about them, since outreach activities may not be targeted at teens.

Prenatal Medical Conditions

Pregnancy requires reserves of energy, nutrients, etc. from mothers, who when already stressed by a medical problem, are at more risk of producing babies with poor outcomes. Teens have been shown to more commonly suffer from anemia, cephalopelvic disproportion (baby's head too large for pelvic opening), pregnancy induced hypertension (PIH) and eclampsia (multi-system dysfunction). The

incidence of hypertension is often associated with race, while eclampsia and anemia are related to poverty, and cephalopelvic disproportion to young gynecological age.

U.S. birth certificate data for 1994 (Centers for Disease Control and Prevention, 1998) indicates that teenagers under age 20 had elevated rates of gestational anemia (27.9 per 1,000) compared with women 20-24 years of age (22.5 per 1,000). Black women (38.2 per 1,000) were more likely to become anemic than white women (22.5 per 1,000). In the same data set, teenage mothers had elevated rates for PIH (32.4 per 1,000) over women in their 20s (26.5 per 1,000).

Smoking

Teenagers, who smoke during pregnancy, are typically white, unmarried, and have inadequate prenatal care (Davis, Tollestrup & Milham, 1990). American Indian youth showed the largest increase in smoking prevalence over time, though teenagers who smoke are generally decreasing across the country (Davis et al., 1990).

Women who smoke during pregnancy can, on the average, expect to have twice the risk of nonsmokers of a low birth weight baby (Abrams & Newman, 1991; US Dept. of Health Education and Welfare, 1973). The outcome also seems to be related to the number of cigarettes smoked. To test these theories prospectively, Sexton and Hebel (1984) applied a smoking cessation intervention to an experimental group of women and measured the outcomes of both the experimental and the control group. The experimental group smoked consistently fewer cigarettes than the control group. The percentage of women who reported not smoking by the 8th month of

pregnancy was twice as high for the experimental group, and the birth weights of this group were 92 grams more than controls. The greatest effect of not smoking happened in the third trimester.

Previous Pregnancies

Multiple pregnancies put an adolescent mother at risk because of depletion of nutritional stores, and the failure of the mother's body to return to the pre-pregnant condition. The younger the teenager, the more likely she was to have a second or even more pregnancies during the adolescent years (Leland et al., 1995). Thirty one percent of those 16 or younger had closely spaced second births in data gathered in a large survey in 1979 (Kalmuss & Namerow, 1994). Seventy eight percent of 15-16 year olds in Elster's study (1984) had repeat pregnancies. Though the data is becoming old now, it was one of the larger studies that found a significant relationship between the number of times a teen had been pregnant and the outcome, despite the age and amount of prenatal care. Factors associated with more frequent childbearing were less education, black and hispanic race, and poverty.

Education

Education has also been linked with poor pregnancy outcomes. A teenage mother who attained her normal educational grade level for age in combination with other factors was less likely to have a low birthweight or premature baby (Lee et al., 1988). Researchers have not determined what it is about education that is predictive

of pregnancy outcome. Some suggest that education reflects the social and/or intellectual maturity of the adolescent, thus influencing the ability or desire to follow prenatal advise.

Social Support

Social support has been implicated in poor pregnancy outcomes, particularly in regard to reducing the effects of stress (Rogers, Peoples-Sheps & Suchindran, 1996). Many public programs are based on providing social support, such as Michigan's Maternal Support Services Program. However, the effectiveness of most programs has not been evaluated, and shows no relationship to the outcome of pregnancy (Rogers et al., 1996). Some researchers have used marital status as a measure of social isolation, assuming that marriage indicates the commitment of another to parenthood, and some integration into adulthood. When used as an independent variable, marital status did not have a significant relationship with outcomes by itself (Ketterlinus, Henderson & Lamb, 1990; Lee et al., 1988; Leland et al, 1995).

A report of the Teen Parent Program in 1997 (Michigan Family Independence Agency) indicated that 10 percent of the teens in the program (327) were living independently and 2 percent were homeless. About 11percent were living with a partner or spouse. Enrollees in this program are referred for services from Children's Protective Services, a social service agency that deals with abused and/or neglected children.

A concern among health care providers is the subject of unintended pregnancy. Though a pregnancy may be unintended no matter what age the mother, a large percentage of teenage pregnancy is unintended. Dr. Leon Eisenberg, chair of the Institutes of Medicine Committee on Unintended Pregnancy and Sarah Brown of IOM (Institutes of Medicine, 1995) found that 80 percent of teenage pregnancies were unintended, and that fact alone jeopardized the health and well being of those newborns and their parents. Unintended pregnancy is associated with less prenatal care, continued smoking or drinking during the pregnancy and child abuse after birth. These newborns tend to have lower birthweight and have a greater risk of dying in the first year of life.

Source of Insurance

Increased need for health services for the high-risk parent and the high-risk infant is a serious concern for the cost of teenage pregnancy. If a teen gives birth to a low birth weight baby or one with an anomaly or serious medical condition, the intensive care investment is extensive. Infants weighing between 2,001 and 2,500 grams average 7 days in hospital while 89 days is expected for those less than 1,000 grams (IOM, 1985). In addition many low birth weight infants are re-hospitalized during the first year, particularly if they have an anomaly or a medical condition as well. The average number of physician visits is also higher for low birth weight babies, averaging 14-16, while normal weight babies averaged 10 visits (McCormick, et al., 1981). The authors also note that the greater the number of visits, the stronger

the socioeconomic disadvantages and surveillance by providers and parents.

High-risk families experience financial stress in many ways. Though insurance may cover in-hospital expense, much of the outpatient expense is born out of pocket by families. Teen mothers generally do not finish school and are less likely to work at a job that pays more than minimum wage. Medicaid recipients consistently experience poor birth outcomes compared with women whose births are financed through private insurance (Ullman, 1996). Adolescent mothers who become welfare dependent are more likely to remain so for longer than older women. This may be because younger women are less likely to have completed school (Klerman, 1993).

Women on welfare suffer from many disadvantages. They score low on tests of verbal and mathematics skills; they have little work experience; most with preschool children are not employed; about one-fifth have a health problem and about one-fourth report alcohol-related problems; and they are prone to depression. Klerman (1993) concluded that women on welfare are different from non-poor women--and poverty is related to adolescent childbearing. In 1988, Klerman found that 59 percent of women who received AFDC payments were age 19 years or younger when their first child was born. Only one-quarter of non-poor mothers gave birth that early.

Poverty seems to form a cycle. The children of teen mothers continue the same behaviors that put their parent at risk. Children of teen mothers are more likely

to face health problems, are more likely to drop out of school, become teen parents themselves, and are at a greater risk for social impairment (Hayes, 1987).

An interesting case is made recently that economic factors may be as important as psychosocial or developmental issues in the rate of adolescent childbearing. Economists generally believe that economic forces drive personal behavior. Because pregnancy and child bearing have costs, in a rational society even adolescents should be expected to forego such costs. But if the costs of pregnancy are reduced by available insurance, and receiving welfare reduces the costs of child rearing, they reason that such experiences might be appealing. As public policy puts more restrictions on welfare for adolescent mothers, it will be important to see if changes in the incidence of teenage pregnancy result, or if the demographics of the population change. Michigan's teenage birth rate declined in 1996 by 4 percent. Comparison of data from each of the last six years may indicate some further areas of study related to this hypothesis.

Residence

The fact that an adolescent lives in a small, rural community has been linked to poor pregnancy outcomes. The isolation from medical centers and subsequent limited access to care is part of the picture that helps to interpret this finding. A more interesting hypothesis is that early fertility may be conventional in rural settings, and that socioeconomic disadvantages are associated with rural residences (Geronimus, 1986). This study found a slightly higher percentage of the youngest age groups lived

in rural communities than the older age groups. There was also a higher percentage of white women in rural communities than black women in all age categories. Though the affect of this variable alone appears to be small, in combination with other variables, it has merit for observation.

Income

Poverty has been linked with poor health in diverse ways and used as a demographic descriptor in most studies of health related issues (Abrams & Newman, 1991; Leland et al., 1995; Paneth et al., 1982). Socioeconomic status has a variety of components, one of which is actual household income. Teens typically have no income or minimum wage earnings.

The breadth of literature regarding adolescent pregnancy is extensive, thus offering a good background for the new information gained from this study. Healthy newborns are expected as the outcome of most teen pregnancies, however, the literature shows that significant study of the precursors of low birth weight, prematurity, perinatal death, congenital anomalies and abnormal newborn conditions is important to reducing this public health problem.

CHAPTER III

METHODS

Research Design

A secondary analysis of data collected from birth certificates in the state of Michigan was used in a population study design to determine:

1. What factors best predict a healthy birth outcome for a teenage pregnancy;

2. Is there an interaction between the independent variables which helps to predict a healthy outcome for teenage pregnancy; and

3. What effect does declining birth rates have on the prediction of birth outcome in teenage pregnancy.

Three broad areas of risk, or vulnerability (developmental, psychosocial and economic), were selected to examine their relationship to the subsequent birth outcome. The chi square statistic was used to identify the relationship between variables and outcomes. A ratio of risk to non-risk behavior was calculated for each variable to further clarify the strength of the relationship.

To determine the part each risk behavior plays in the prediction of healthy pregnancy outcomes, a logistic regression model was developed incorporating all independent variables and mediating variables. This model produced an odds ratio of risk for each outcome.

Finally, the outcomes for each of the eight years of the study were graphed against the number of live births for each year. A corresponding change in the incidence of a variable indicated that change was occurring in relationship to the declining birth rate.

Study Population

Between 15,000 and 20,000 women under age 20 gave birth to live infants in each of the last eight years in Michigan. These 136,000 teenage pregnancies in Michigan during 1990 through 1997 served as the study population for this project. Data sets were derived from birth certificates.

To further clarify the impact of teen pregnancy, a group of young adults was used as a comparison. The cohort of 20-24 year olds who gave birth in 1993 (the middle year of the study) was analyzed in the same manner as the cohort who was under 20 years.

Instruments

Birth certificates are universally used sources of information, standardized across the United States. Information collected from the birth certificate is a combination of client self report and health provider documentation (See Appendix A). Prior to 1989 an open-ended question format was used and was poorly completed, making it difficult to analyze. The 1989 revision of the standard birth

certificate replaced the open format with a checkbox format to simplify and improve the reporting of information.

Death certificates were matched with birth certificates and Reports of Fetal Death were added and cited in a field called, "Perinatal Death", so that a yes or no category was produced. Perinatal deaths are those that occur after the 20th week of gestation, weigh at least 400 grams and those that are born alive but die in the first week of life.

Variables in the Study

Figure 3 diagrams the relationship of the variables in this study. The developmental vulnerabilities, psychosocial vulnerabilities and the economic vulnerabilities are expected to interact and should affect outcomes in the newborn depending on the age and race of the mother. This diagram helps to demonstrate that the study of teenage pregnancy outcomes should have a multi-factorial approach.

Measurement of the Outcome Variables

Birth Weight

Birth weight of the newborn is recorded on the birth certificate in grams. For this study a birth weight below 1,500 grams is considered very low birth weight (VLBW) and is most associated with infant morbidity and mortality. A birth weight of between 1,500 and 2,500 grams is considered low birth weight (LBW) and is also associated with infant morbidity and mortality. A normal birth weight is considered

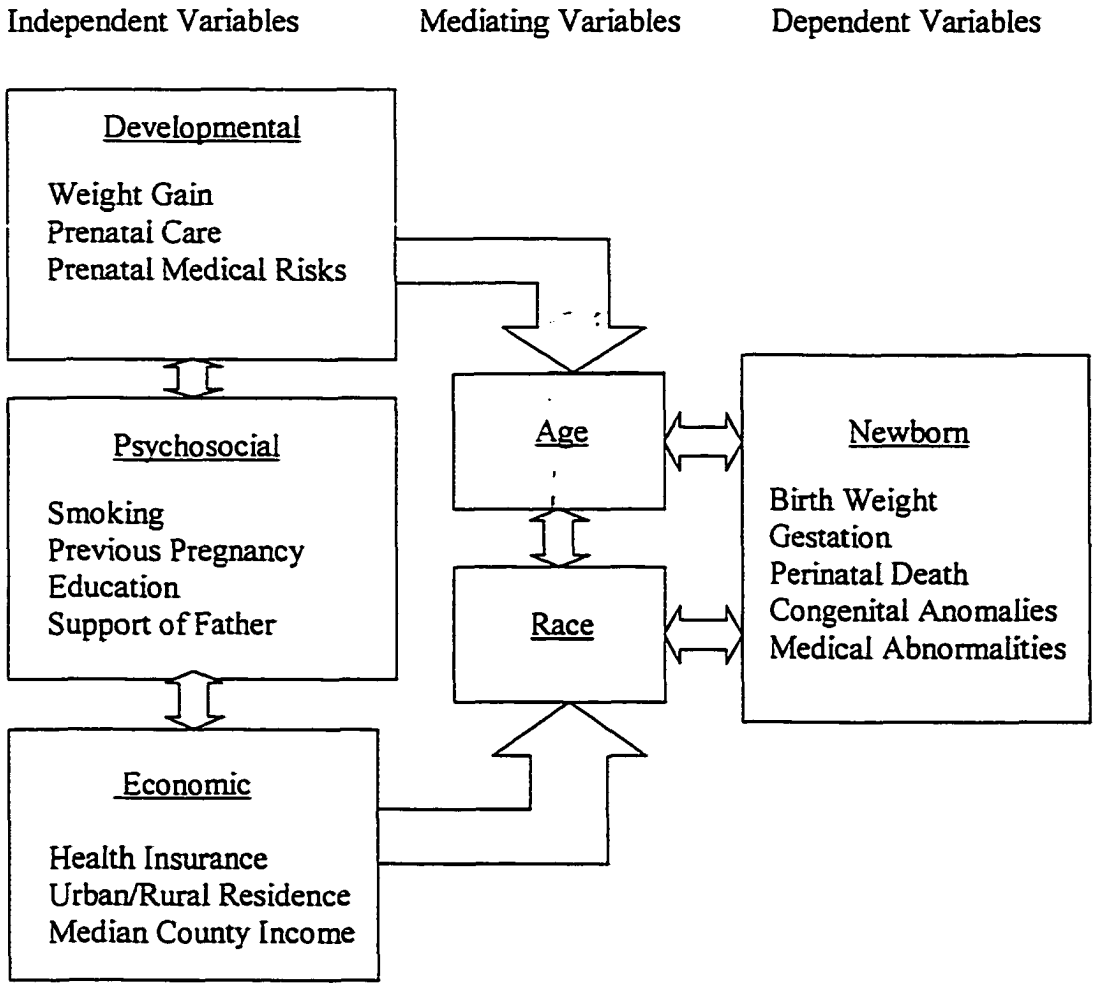


Figure 3. Predictors of Newborn Outcomes in Teenage Pregnancies.

to be 2,500 grams or higher. Low birth weight was coded as a dichotomous variable and was considered present if the weight at birth was less than 2500 grams.

Gestational Age

Gestational age is recorded on the birth certificate as a calculation of the length of the pregnancy in weeks based on the date of the last menstrual period. A gestational age of 37 weeks or longer is considered a normal gestational age. Pre term birth was coded as a dichotomous variable and was considered present if the gestational age at birth was less than 37 weeks.

Perinatal Death

Death in the perinatal period is considered most directly related to circumstances of the prenatal period, and therefore most affected by maternal age, race, and the independent variables under study. A perinatal death is the combination of all fetal deaths and deaths which occur in the first week of life. In Michigan a fetal death is the expulsion of a fetus with no signs of life which has reached at least 20 weeks gestation and weighs at least 400 grams. Perinatal death was coded as a dichotomous variable, yes- present, or no- not present.

Congenital Anomalies

The presence of an anomaly indicates the presence of one of a number of birth defects that are considered abnormal and usually require some measure of medical and/or surgical intervention. The birth certificate records conditions diagnosed at birth such as: (a) anencephalus, (b) spina bifida, (c) hydrocephalus, (d) rectal atresia, (e) cleft palate, (f) tracheo-esophageal fistula, and (g) Down's syndrome. Congenital

anomaly was also coded as a dichotomous variable, yes- present, or no- not present.

Abnormal Conditions of the Newborn

The birth certificate records any other problems of the newborn diagnosed at birth. Such conditions have some need for intervention during the newborn period. Anemia, birth injury, fetal alcohol syndrome, hyaline membrane disease, meconium aspiration syndrome, and seizures are some of the conditions that may be diagnosed. Abnormal condition of the newborn was coded as a dichotomous variable, yes- present or no- not present.

A healthy newborn is one that is born with a normal birth weight, at term, which survives the first week, and is without congenital anomalies or medical problems. Babies born with problems in any of these areas may be "healthy" in the popular understanding of that word, and experience no adverse development or future problems. However, babies with low birth weight, prematurity, and a recognized birth defect or medical problem at birth are statistically more likely: 1) to remain hospitalized for some time after birth, 2) to need special care which is costly to the parents and the health care system, and 3) even more likely to die or have significant health problems in the first year. Healthy, in the context of this study, means the absence of any abnormal findings at birth.

Measurement of the Independent Variables

Developmental Risks

Weight gain during pregnancy is the number of pounds gained by the pregnant woman. Low weight gain was coded as a dichotomous variable and considered present if weight gained was less than 15 pounds.

Prenatal care consists of visits to a specially trained health care provider who performs particular tests, measurements, exams and patient history in order to diagnose problems early while correction is possible. The Kessner Index calculates the number of visits and timing of the visits for an assessment of "Adequate, Intermediate or Inadequate". Inadequate prenatal care was coded as a dichotomous variable and considered present if the Kessner Index was calculated to be Inadequate.

Prenatal medical complications are any pre-existing diseases or medical problems or ones that may develop during the pregnancy and threaten the health of the mother or baby. A medical complication during pregnancy was coded as a dichotomous variable, yes- present, no- not present.

Psychosocial Risks

The smoking of cigarettes during pregnancy affects the oxygen supply to the fetus. Smoking has been implicated in risk of preterm delivery, low birth weight and infant death. Smoking was coded as a dichotomous variable, yes- present, no- not present.

Number of pregnancies refers to prior pregnancies that may have been terminated, miscarried or delivered. Previous pregnancy in the adolescent years was coded as a dichotomous variable, yes- present, no- not present.

Education is the school grade attained by the pregnant woman. Pregnant women with less than a high school education are considered at risk. Inadequate education was coded as a dichotomous variable and considered present if the recorded grade level of the mother was less than eighth grade.

Support of the baby's father is an important part of the support system for teens during pregnancy. Lack of support was coded as a dichotomous variable and considered present if the father was not identified on the birth certificate.

Economic Risks

Three proxies for socioeconomic status were used in this study, because they were readily available on the birth certificate. Poverty is highly linked with poor pregnancy outcomes. The source of payment for the prenatal and hospital health services was one indicator. At risk by insurance source was coded as a dichotomous variable and considered present if, the mother was covered by Medicaid.

Residence refers to the status of the county of the mother's home as either urban or rural. Some studies have shown a risk of living in a rural area, associated with access to care problems and poverty. Rural residence was coded as a dichotomous variable and considered present if the mother lived in a county with a population of less than 250,000 at the 1990 census.

Another measure of poverty was derived from median county income. Low median county income was coded as a dichotomous variable and considered present if, the income was less than $28,000 per household.

Mediating Variables

Age

There is evidence that women younger than 20 have poorer outcomes of pregnancy. Mother's age is recorded as maternal date of birth on the birth certificate, and is converted by calculation to age. Ages for this study ranged from 10 to 19 years. Young age as a risk factor was coded as a dichotomous variable and was considered present if the mother's age was less than 18 years.

Race

Race is recorded on the birth certificate as Asian/Pacific Islander, White, Black, American Indian, Chinese, Japanese, Filipino, Hawaiian and Other Non-white. The birth certificate records the race of both mother and father (when available). For this study the race of the mother was used. Race as a risk factor was coded as a dichotomous variable and was considered present if the mother's race was non-white.

Most studies have found that any one of these independent variables alone is not predictive of a good outcome, but it is the combination of factors that determines the outcome. Age and race are most often used in combination with other factors, thus their inclusion as mediating variables in this model.

Data Analysis

The Statistical Package for the Social Sciences (SPSS) was used to conduct all of the statistical analyses for this study.

Univariate Analysis

Frequency and percentage of each vulnerability, race and age distribution, and birth outcomes described the study population. The comparison group was described in like manner except for the age factor.

Distribution of Outcome by Vulnerability

A bivariate analysis was conducted between each of the vulnerability factors and the five outcomes to determine which factors best predict a healthy birth outcome (Question 1). Pearson's Chi Square statistic was used to test for significance. For instance, the developmental vulnerability, was tested in a 2x2 table of *weight gain (<15 pounds, ≥15 pounds)* against *low birth weight (<2500g, >2500g)*. This produced a percentage of the population, which corresponded to each cell of the output. The table presentation of this analysis shows the two cells corresponding to the poor outcome, low birth weight. Only relationships that were deemed significant at p=<.05 were recorded in the table. To further clarify the difference between the vulnerability, a ratio of risk behavior *(<15 pound weight gain)* to no risk behavior *(≥15 pound weight gain)* was calculated. Figure 4 is an example of the table presentation of this analysis.

Relationship of Vulnerabilities to Poor Outcomes, Teen Group, 1990-1997

	LBW
DEVELOPMENTAL	
Wgt Gain <15	23.0
≥15	7.7
Ratio	**3:1**

Figure 4. Example of Bivariate Analysis.

A multi-variate analysis was conducted between each of the vulnerability factors, age, and the five outcomes to detetmine the difference in outcome associated with age. Pearson's Chi Square statistic was used to test for significance. As an example, the developmental vulnerability was tested in a 2x2x2 table of *weight gain (<15 pounds, ≥15 pounds)* against *low birth weight (<2500g, >2500g)* against *age (<18, ≥18)*. This produced a percentage of the population, which corresponded to each cell of the output. The table presentation of this analysis shows the four cells corresponding to the poor outcome, low birth weight for the less than 18 year olds, and low birth weight for the 18 and 19 year olds. Only relationships that were deemed significant at p=<.05 were recorded in the table. To further clarify the difference between the vulnerability, a ratio of risk behavior *(<15 pound weight gain)* to no risk behavior *(≥15 pound weight gain)* was calculated. Figure 5 is an example of the table presentation of this analysis.

Relationship of Vulnerabilities to Poor Outcomes by Age, Teen Group, 1990-1997

	LBW	
	<18	≥18
DEVELOPMENTAL		
Wgt Gain <15	26.8	20.7
≥15	8.6	7.2
Ratio	**3:1**	**2.9:1**

Figure 5. Example of Multivariate Analysis by Age.

A multivariate analysis was also conducted between each of the vulnerability factors, race, and the five outcomes to determine the difference in outcome associated with race. Pearson's Chi Square statistic was used to test for significance. As an example, the developmental vulnerability was tested in a 2x2x2 table of *weight gain (<15 pounds, ≥15 pounds)* against *low birth weight (<2500g, >2500g)* against *race (non-white, white)*. This produced a percentage of the population, which corresponded to each cell of the output. The table presentation of this analysis shows the four cells corresponding to the poor outcome, low birth weight for the non-white teens, and low birth weight for the white teens. Only relationships that were deemed significant at p=<.05 were recorded in the table. To further clarify the difference between the vulnerability, a ratio of risk behavior *(<15 pound weight* gain) to no risk behavior *(≥15 pound weight gain*) was calculated. Figure 6 is an example of the table presentation of this analysis.

Relationship of Vulnerabilities to Poor Outcomes by Race, Teen Group, 1990-1997

	LBW	
	NW	W
DEVELOPMENTAL		
Wgt Gain <15	25.5	20.2
≥15	10.3	6.1
Ratio	**2.5:1**	**3.3:1**

Figure 6. Example of Multivariate Analysis by Race.

For the continuous variables, birth weight and gestational age, a comparison of mean outcome was conducted by age group, and by racial group, to determine any statistically significant differences. The *t*-test statistic was used to determine the significance of relationships.

The comparison group was analyzed in a similar manner: a) univariate descriptive data for each variable, b) bivariate analysis of independent variables, mediating variable, and outcomes, c) multivariate analysis of independent variables, race and outcomes. Age was not used as a mediating variable in this analysis since women 20-24 years of age are considered at low risk for poor birth outcomes. An analysis was also done between the mean for birth weight and gestational age by race for this group.

A comparison was done between outcomes and risk factors for the less than 20 year old study group and the 20-24 year old group, indicating the percent of difference. Figure 7 demonstrates the comparison of frequencies.

Comparison of Teen Group and 20-24 Age Group, Percent Presence of Outcomes

	<20	20-24	%Difference
LBW	8.9	6.8	31

Figure 7. Example of Comparison Data.

A comparison was also done between the ratio outputs of the relationship between independent and dependent variables for the two groups. An additional comparison was done by race. Figure 8 illustrates this procedure.

Comparison of Teen Group and 20-24 Age Group,
Ratio of Vulnerabilities to Poor Outcomes

	LBW	
	Teen	Adult
Weight Gain	3	2.9
Prenatal Care	1.7	1.8

Comparison of Teen Group and 20-24 Age Group by Race,
Ratio of Vulnerabilities to Poor Outcomes

NON-WHITE		
	LBW	
	Teen	Adult
Weight Gain	2.5	2.5
Prenatal Care	1.5	1.5

Figure 8. Example of Comparison of Ratios.

Predictors of Birth Outcome

Logistic regression analysis was used to determine the interaction between factors which help to predict the likelihood of a healthy outcome of pregnancy (Question 2). For this analysis the dependent variables were expressed as dichotomous responses. The effect is expressed as the probability of a good outcome versus a bad outcome. The intercept in a logistic model is the "baseline" log odds for a person or group when the independent variables are ignored. The coefficient for a specific variable represents the change in the log odds that would result from a one-unit change in the specific independent variable when all other independent variables are fixed. This transformation yields the odds ratio, which is an approximation of the relative risk of the poor outcome (Hosmer & Lemeshow, 1989).

The odds ratio provides an estimate of the relative risk of developing a condition upon exposure to some factor. Therefore, in this study, the odds of each poor outcome: (1) low birth weight, (2) pre term birth, (3) perinatal death s, (4) congenital anomaly and (5) newborn medical conditions in the presence of each independent variable was calculated.

Relative risk expresses the ratio between the incidence of low birth weight, or other poor outcome, in the population of those with the risk factor and the corresponding incidence in the population of those without the risk factor. It is therefore a measure of the strength of the association between risk factor and outcome (Hosmer & Lemeshow, 1989). The relative risk is calculated in the following process:

$$\text{Incidence density (rate) ratio} = \frac{\text{Incidence rate among exposed } (I_i)}{\text{Incidence rate among non-exposed } (I_o)}$$

The strength of the association is considered to be strong if the ratio is 3.0 or higher. A ratio of 1.0 indicates no greater risk for the exposed over the non-exposed. Figure 9 is an example of the odds ratios (OR) for low birth weight in the study population. A confidence interval (CI) of 95% was used.

Significant Odds Ratio (OR) of Poor Birth Outcome, Teen Group, 1990-1997

LBW	OR	95% CI
<15 lbs weight gain	3.48	(3.29-3.68)

Figure 9. Example of Odds Ratio.

Establishing Trends

To answer Question 3, the outcome data from each year's cohort was compared by line graph presentations. The percent of the population with a poor outcome or risk factor was plotted by year. Using the opposite Y axis, the number of live births was plotted for each year, and superimposed on the same graph. This produced a trend line for each variable that was visually compared.

CHAPTER IV

FINDINGS

The data analysis is organized according to each of the three research questions. Each response contains a description of birth outcomes, age and race characteristics, and risk factors for the adolescent study group, followed by the 20-24 year old comparison group. The statistical relationship between outcomes and risk factors will also be discussed in each response.

Research Question 1: What specific factors are associated with a poor birth outcome?

Adolescent Study Group

Birth Outcomes

Preliminary evaluation of the data was done by combining all the records of live births to women under age 20 in the years 1990 through 1997. This resulted in a population of 136,973 cases. Table 1 lists the outcome variables. The great majority of teenage mothers had healthy pregnancies and healthy babies. Over the eight years of the study the birth weight of 91 percent of the babies was normal. Over 81 percent of the babies were carried to term. Ninety four percent survived past the critical first week of life. Ninety seven percent of the babies were free of congenital anomalies, while ninety percent had no newborn medical abnormalities.

Table 1

Pregnancy Outcomes and Mediating Variables, Teen Group, 1990-1997
N=136,973

OUTCOME VARIABLES			MEDIATING VARIABLES		
Birth Weight in Grams			Mother's Age		
	Frequency	Percent		Frequency	Percent
<1500g	2487	1.8	10	3	0.0
1501-2500g	9781	7.1	11	5	0.0
2501-4000g	115447	84.3	12	73	0.1
>4000g	9006	6.6	13	477	0.3
Missing	252	0.2	14	2307	1.7
			15	7113	5.2
Weeks of Gestation			16	15090	11.0
	Frequency	Percent	17	26103	19.1
16-36 wks	18070	13.2	18	38036	27.8
37-42 wks	100824	73.6	19	47766	34.9
43-52 wks	10278	7.5			
Unknown	7801	5.7	Mother's Race		
				Frequency	Percent
Perinatal Death			Asian/PI	592	0.4
	Frequency	Percent	White	82264	60.1
Yes	6353	4.6	Black	52186	38.1
No	128246	93.6	Am Indian	1329	1.0
Unknown	2374	1.7	Chinese	25	0.0
			Japanese	23	0.0
Congenital Anomalies			Filipino	123	0.1
	Frequency	Percent	Hawaiian	27	0.0
Yes	1767	1.3	Other	61	0.0
No	132739	96.9	Unknown	343	0.3
Unknown	2467	1.8			
Newborn Medical Abnormalities					
	Frequency	Percent			
Yes	11047	8.1			
No	128246	90.2			
Unknown	2374	1.7			

The poor birth outcomes, however, make teen pregnancy a public health concern. Eighty babies weighed less than 250 grams, a weight usually inconsistent with life, and 12,188 more were low birth weight. Over 18,000 births were premature, while 6,000 babies died in the first week. Seventeen hundred had congenital anomalies, and 2,400 had medical conditions that required medical intervention. Of the total population studied, 31,653 babies (23.1%) had at least one poor outcome.

Age and Race Characteristics

The mediating variables in Table 1 illustrate that very young teens are getting pregnant each year and having babies. Almost 3,000 babies were born during the study period to teenagers aged 10 to 14 years. In the study period 12,193 (9%) of the population had low birth weight babies, while 13% of 10-14 year olds had low birth weight babies. The whole group had 18,070 (13%) premature, while 24 percent of 10-14 year olds had premature births. Five percent of births to all ages died during the first week of life, but the deaths among 10-14 year olds was 6 percent. Babies were born with congenital anomalies to 1.2 percent of 10-14 year olds, and to 1.3 percent of the older teens. Babies were born with abnormal conditions of the newborn to 9 percent of 10-14 year olds and 8 percent of older teens.

About 60 percent of teen mothers are White and 38 percent are Black. American Indian and Other Asian/Pacific Islander groups make up about 1 percent of the pregnancies. The low birth weight for babies was 12 percent for Black babies,

Table 2

Risk Factors, Teen Group, 1990-1997 (N= 136,973)

DEVELOPMENTAL			PSYCHOSOCIAL			ECONOMIC		
Weight Gain			Smoking			Source of Insurance		
	Frequency	Percent		Frequency	Percent		Frequency	Percent
None	1665	1.2	Yes	30211	22.1	Medicaid	87970	64.2
<15 lbs	8308	6.1	No	104192	76.1	Private	43470	31.7
15-40 lbs	85682	62.6	Unknown	2570	1.9	Other	232	1.1
>40 lbs	26964	19.7						
Missing	14354	10.5	Support (Father Named)			County Population		
				Frequency	Percent		Frequency	Percent
Prenatal Care			No	80982	59.1	<250,000	58102	42.4
	Frequency	Percent	Yes	56021	40.9	≥250,000	78854	57.6
Inadequate	19633	14.3				Missing	17	0.0
Intermediate	40896	29.9	Previous Pregnancy					
Adequate	75545	55.2		Frequency	Percent	Median County Income		
Unknown	811	0.6	None	78963	57.6		Frequency	Percent
Missing	88	0.1	One	28475	20.8	<$28,000	9922	7.2
			>One	28550	20.8	>$28,000	122697	89.6
Medical Risk			Missing	589	0.4			
	Frequency	Percent						
Yes	23884	17.4	Education					
No	111373	81.3		Frequency	Percent			
Unknown	1231	0.9	<8th Grade	2895	2.0			
Missing	485	0.4	8-12th Grade	126726	92.5			
			>12th Grade	6033	4.3			

7 percent for White babies, 6 percent for American Indian and 9 percent for Asian/Pacific Islanders. Nineteen percent of births to Black mothers were premature, 19 percent of Asian/Pacific Islanders, 12 percent of American Indian and 11 percent of White babies. The entire population had 5 percent who died. About 5 percent of each race, White, Black and Asian/Pacific Islander died. Only 3 percent of American Indians babies died. Only 1 percent of the population had congenital anomalies. Of White babies, 1.5 percent had anomalies; of Black babies, 1 percent had anomalies; of American Indian babies, 1.6 percent had anomalies and of Asian/Pacific Islanders, less than 1 percent had anomalies. About 8 percent of Black babies and 8 percent of White babies had abnormal conditions of the newborn. Almost 7 percent of Asian/Pacific Islanders had abnormal conditions and about 6 percent of American Indian babies had abnormal conditions.

Risk Factors

Some teens had significant risks associated with their pregnancies as demonstrated in Table 2, which lists the selected independent variables characteristic of this population. Developmentally, about 7 percent of teen moms gained too little weight during the pregnancy. Unfortunately the data collection for weight gain was missing for 10 percent of the population. Forty four percent of teens had less than adequate prenatal care. Seventeen percent of teens had medical conditions themselves that put their pregnancy at risk.

With respect to psychosocial factors, 22 percent of the population continued to

smoke during pregnancy. Sixty percent of teens appeared to lack the support of the child's father. Forty two percent of teens had previous pregnancies-- about 20 percent more than one. About one percent of teens had less than an eighth grade education, while 147 (0.1%) reported no school education.

In considering economic factors, about 1 percent of the population had no insurance while 64 percent were covered by Medicaid. About 32 percent of teens had private insurance. Over 42 percent lived in counties with fewer than 250,000 people. Almost 90 percent of the population lived in counties with a median income of greater than $28,000.

It was stated earlier that 31,653 (23.1%) of the study population had at least one poor outcome. It was also found that of the group with poor outcomes, 195 had no risk factors. Of the group with no risk factors, 148 (74.7%) were 18 or older, and 185 (94.9%) were white.

Association of Individual Risk Factor with Birth Outcome

The statistical significance of the findings was tested by cross tab evaluation of the relationship of each risk factor to each outcome variable, using a chi square statistic with a p value of <.05 or less. Because all calculations were in a 2x2 table there was 1 degree of freedom (Table 3). Most outcomes had p values of <.01. Outcomes with a p=<.05 are indicated with an asterisk (*). Those outcomes with no statistically significant relationships are indicated with the symbol (ϕ). For significant relationships, a ratio of at risk to no risk behavior was calculated.

Table 3

Relationship of Risk Factors to Outcomes, Teen Group, 1990-1997 (N= 136,973)

		LBW	PreTerm	Death	Anom	AbnNB
Wgt Gain	<15	23.0	27.0	10.1	1.3ϕ	14.9
	≥15	7.7	12.9	4.3	1.3ϕ	7.7
	Ratio	**3:1**	**2.1:1**	**2.4:1**	-	**1.9:1**
PNC	Inadeq	14.0	22.0	6.6	1.5*	10.7
	Adeq	8.1	12.8	4.4	1.3*	7.8
	Ratio	**1.7:1**	**1.7:1**	**1.5:1**	**1.2:1**	**1.4:1**
Med Risk	Yes	14.3	18.2	7.3	2.2	13.1
	No	7.7	13.0	4.2	1.1	7.1
	Ratio	**1.9:1**	**1.4:1**	**1.7:1**	**2:1**	**1.9:1**
Smoking	Yes	10.0	12.2	5.2	1.6	9.1
	No	8.6	14.5	4.6	1.2	8.0
	Ratio	**1.2:1**	**-1.2:1**	**1.1:1**	**1.3:1**	**1.1:1**
Prev Preg	Yes	9.5	15.1	4.9*	1.2*	8.3ϕ
	No	8.5	13.2	4.6*	1.4*	8.1ϕ
	Ratio	**1.1:1**	**1.1:1**	**1.1:1**	**-1.2:1**	-
Education	<8th	10.7	17.3	4.7ϕ	1.1ϕ	8.3ϕ
	≥8th	8.8	13.9	5.0ϕ	1.3ϕ	8.2ϕ
	Ratio	**1.2:1**	**1.3:1**	-	-	-
Support	No	9.6	15.0	4.9	1.2	8.3
	Yes	6.4	10.4	4.1	1.6	7.7
	Ratio	**1.5:1**	**1.4:1**	**1.2:1**	**-1.3:1**	**1.1:1**
Insurance	MA	9.0*	13.7	4.4	1.3ϕ	7.7
	Priv	8.7*	14.5	5.3	1.3ϕ	9.0
	Ratio	**1:1**	**-1.1:1**	**-1.2:1**	-	**-1.2:1**
Residence	Rural	7.7	12.1	3.0	1.5	6.4
	Urban	9.8	15.4	6.0	1.2	9.5
	Ratio	**-1.3:1**	**-1.3:1**	**-2:1**	**1.3:1**	**-1.5:1**
Income	<$28,000	6.4	11.1	2.9	1.9	7.2
	>$28,000	9.2	14.3	4.9	1.2	8.4
	Ratio	**-1.4:1**	**-1.3:1**	**-1.7:1**	**1.6:1**	**-1.2:1**
Age	<18	10.0	16.4	4.9ϕ	1.3ϕ	8.4*
	18-19	8.3	12.5	4.6ϕ	1.3ϕ	8.1*
	Ratio	**1.2:1**	**1.3:1**	-	-	**1:1**
Race	NonWhite	11.9	18.6	4.7ϕ	1.0	8.2ϕ
	White	7.0	11.0	4.7ϕ	1.5	8.2ϕ
	Ratio	**1.7:1**	**1.7:1**	-	**-1.5:1**	-

* p=<.05. ϕ No significance, no ratio calculated.

Table 3 demonstrates that all variables had a significant relationship to birth weight and prematurity. Individual variables had significant relationships with some outcomes but not with others, which will be detailed below.

Developmental Factors

A woman who gains less than 15 pounds during the pregnancy has the greatest chance of having a low birth weight baby. The risk of a low birth weight baby is 3 to 1 for the mother who gains less than 15 pounds versus the mother who gains over 15 pounds (p=<.01). The risk of a pre term birth, a perinatal death or an abnormal condition of the newborn is about twice as likely for the mother who gains less than 15 pounds (p=<.01). There is no statistically significant relationship between weight gain and congenital anomalies.

Inadequate prenatal care as measured by the Kessner Index means four or fewer prenatal visits, no care, or care started in the seventh month or later. Inadequate care puts teen mothers at greater risk of a low birth weight baby (70% higher), a pre term birth (70% higher), or a perinatal death (50% higher)(p=<.01).

A prenatal medical risk for a teen mother could be such conditions as anemia, hypertension, or diabetes. Having a medical risk puts the teen mother at almost twice the risk of a low birth weight baby, a perinatal death, a congenital anomaly or an abnormal condition of the newborn as a mother without a medical risk (p=<.01). The risk of pre term birth was about 40 percent higher in mothers with a prenatal medical risk (p=<.01).

Psychosocial Factors

Smoking during pregnancy is related significantly to all outcomes but produced only slightly greater risk of low birth weight, perinatal death, congenital anomalies or abnormal conditions of the newborn than not smoking (p=<.01). Smoking produced slightly lower risk of pre term birth than not smoking(p=<.01).

Having a previous pregnancy slightly increases the risk of low birth weight (p=<.01), pre term birth (p=<.01), perinatal death (p=<.05), and congenital anomalies (p=<.05). There was no statistically significant relationship between previous pregnancy and abnormal conditions of the newborn.

Education level below the eighth grade was related to birth weight and prematurity with small increased risk of a poor outcome (p=<.01).

Lack of social support is defined as no identified father. There was a significant relationship between lack of support and all outcomes. Lack of support produced 50 percent increased risk of a low birth weight baby (p=<.01), 40 percent increased risk of pre term birth (p=<.01), but lesser risk of other outcomes (p=<.01).

Economic Factors

The type of insurance was statistically significantly related to all outcomes except congenital anomalies. Those insured by Medicaid had a slightly greater risk for low birth weight (p=<.05), and a slightly lower risk for pre term birth, perinatal death and abnormal conditions of the newborn (p=<.01).

The residence of a teen mother was statistically significantly related to all outcomes. Those who lived in urban counties, with a population greater than 250,000, were twice as likely to have a perinatal death (p=<.01) but the risk for other outcomes were 30-50 percent lower (p=<.01).

The median income of the county in which a teen mother lived was also statistically significantly related to all outcomes. Those living in a county with a median income over $28,000 had a 70 percent increase in the risk of a perinatal death (p=<.01), and 20-40 percent higher risk for pre term birth, low birth weight or abnormal conditions of the newborn (p=<.01). Those living in a county with a median income less than $28,000 had 60 percent more risk of a congenital anomaly (p=<.01).

Mediating Factors

Age was statistically significantly related to birth weight (p=<.01), pre term birth (p=<.01) and abnormal conditions of the newborn (p=<.05). There was only a small risk of a poor outcome to those mothers less than 18 years of age. Race was statistically significantly related to birth weight, prematurity and congenital anomalies (p=<.01). Those mothers who were not white had a 70 percent higher risk of a low birth weight baby or a pre term birth. Those mothers who were white had a 50 percent higher risk of a baby with a congenital anomaly.

In summary, the major factors associated with a low birth weight outcome were weight gain less than 15 pounds during pregnancy, inadequate prenatal care,

having a prenatal medical condition, and being non-white. A pre term birth is most likely for mothers who gain less than 15 pounds, have inadequate prenatal care, and are non-white. The risk of perinatal death is high for mothers who gain less than 15 pounds, have inadequate prenatal care, have a prenatal medical risk themselves, and live in an urban county with a higher median income. The risk of congenital anomalies is high for mothers with a prenatal medical risk, who live in a county with a higher median income. Abnormal conditions of the newborn are twice as likely in mothers who gain less than 15 pounds, and have a prenatal medical risk.

Age as a Mediator in the Relationship of Risk Factor With Birth Outcomes

The part that age plays in the relationship of independent variables to the outcomes was tested by cross tab evaluation of each variable, holding age constant. Ratios of the at-risk behavior to the no-risk behavior were calculated for each outcome and for less than 18 and 18 and over age grouping (see Table 4.) All but a few outcomes had a statistical relationship at p=<.01. The other relationships that were significant at p=<.05 are marked with an asterisk (*). Relationships that were not statistically significant are marked with ϕ.

Developmental Factors

There was a statistically significant relationship between weight gain and low birth weight, pre term birth, perinatal death and abnormal conditions of the newborn (p=<.01) for both age groups. The proportion of adverse outcome was about the

Table 4

Percent Relationship of Risk Factors to Poor Outcomes by Age, Teen Group, 1990-1997 (N=136,973)

		LBW		PreTerm		Death		Anomaly		AbnNewborn	
		<18	>18	<18	>18	<18	>18	<18	>18	<18	>18
Wgt Gain	<15	26.8	20.7	32.6	23.7	10.8	9.6	1.3ϕ	1.3ϕ	16.2	14.1
	≥15	8.6	7.2	15.0	11.6	4.4	4.2	1.2ϕ	1.3ϕ	7.8	7.6
	Ratio	**3:1**	**2.9:1**	**2.2:1**	**2:1**	**2.5:1**	**2.3:1**	-	-	**2.1:1**	**1.9:1**
PNC	Inadeq	15.0	13.2	24.8	19.9	6.5	6.7	1.5ϕ	1.5ϕ	10.9	10.6
	Adeq	9.0	7.5	15.0	11.5	4.5	4.3	1.2ϕ	1.3ϕ	7.9	7.7
	Ratio	**1.7:1**	**1.8:1**	**1.9:1**	**1.7:1**	**1.4:1**	**1.6:1**	-	-	**1.4:1**	**1.4:1**
Med Risk	Yes	15.1	13.8	20.2	17.0	7.4	7.2	2.4	2.1	13.4	12.9
	No	8.9	7.0	15.6	11.5	4.3	4.1	1.0	1.1	7.3	7.0
	Ratio	**1.7:1**	**2:1**	**1.3:1**	**1.5:1**	**1.7:1**	**1.8:1**	**2.4:1**	**2:1**	**1.8:1**	**1.8:1**
Smoking	Yes	10.8	9.6	13.3	11.7	5.3*	5.2	1.7	1.5	9.1*	9.0
	No	9.8	7.7	17.1	12.8	4.8*	4.5	1.2	1.3	8.3*	7.8
	Ratio	**1.1:1**	**1.3:1**	**1.3:1**	**1.1:1**	**1.1:1**	**1.2:1**	**1.4:1**	**1.2:1**	**1.1:1**	**1.2:1**
Prev Preg	Yes	10.8	9.0	18.1	14.0	5.1*	4.8*	1.2ϕ	1.2	8.7ϕ	8.1ϕ
	No	9.6	7.6	15.7	11.2	4.7*	4.5*	1.3ϕ	1.4	8.2ϕ	8.0ϕ
	Ratio	**1.1:1**	**1.2:1**	**1.2:1**	**1.3:1**	**1.1:1**	**1.1:1**	-	**-1.2:1**	-	-

Table 4 –Continued

		LBW		PreTerm		Death		Anomaly		AbnNewborn	
Education	<8th	11.7	8.4ϕ	19.7	12.1ϕ	5.5ϕ	4.0ϕ	1.2ϕ	0.9ϕ	8.8ϕ	7.1ϕ
	≥8th	9.9	8.2ϕ	16.3	12.5ϕ	4.8ϕ	4.6ϕ	1.3ϕ	1.3ϕ	8.3ϕ	8.1ϕ
	Ratio	**1.2:1**	-	**1.2:1**	-	-	-	-	-	-	-
Support	No	10.4	9.0	17.1	13.5	5.0	4.8	1.2	1.3	8.5	8.2*
	Yes	7.2	6.2	12.3	9.9	4.1	4.1	1.7	1.6	7.5	7.7*
	Ratio	**1.4:1**	**1.5:1**	**1.4:1**	**1.4:1**	**1.2:1**	**1.2:1**	**-1.4:1**	**-1.2:1**	**1.1:1**	**1.1:1**
Insurance	MA	10.1ϕ	8.4	16.1	12.5ϕ	4.4	4.4	1.3ϕ	1.3ϕ	7.8	7.6
	Priv	9.9ϕ	7.9	17.2	12.7ϕ	5.6	5.2	1.2ϕ	1.4ϕ	9.3	8.9
	Ratio	-	**1.1:1**	**-1.1:1**	-	**-1.3:1**	**-1.2:1**	-	-	**-1.2:1**	**-1.2:1**
Residence	Rural	8.9	7.1	14.3	10.9	3.0	3.0	1.5	1.5	6.6	6.3
	Urban	10.8	9.2	17.9	13.8	6.1	5.9	1.1	1.2	9.6	9.5
	Ratio	**-1.2:1**	**-1.3:1**	**-1.3:1**	**-1.3:1**	**-2:1**	**-2:1**	**1.4:1**	**1.3:1**	**-1.5:1**	**-1.5:1**
Co Income	<$28,000	7.7	5.8	13.0	10.2	3.1	2.9	2.2	1.8	8.0ϕ	6.9
	>$28,000	10.3	8.5	16.8	12.8	5.1	4.9	1.2	1.3	8.5ϕ	8.3
	Ratio	**-1.3:1**	**-1.5:1**	**-1.3:1**	**-1.3:1**	**-1.6:1**	**-1.7:1**	**1.8:1**	**1.4:1**	-	**-1.2:1**

* Significance at p=<.05 ϕ No significance No ratio calculated.

same for both age groups. Age did not affect the outcomes related to pre term birth or the mother's prenatal medical risk.

Psychosocial Factors

Age did not change the relationship of smoking on outcomes. Age did change the significance of education as a risk factor for low birth weight and pre term birth. There was no relationship in the older age group. The risk of low birth weight or pre term birth for mothers, less than 18 years old, with less than eighth grade education was about the same as those with more education. Age did not change any of the relationships associated with lack of support.

Economic Factors

Age changed the significance of the type of insurance on the risk of low birth weight; there is no statistically significant relationship for the under 18 age group. Age also changed the significance of the type of insurance on the risk of pre term birth: there is no statistically significant relationship for the 18 and older group. The ratio of risk for insurance on outcomes remains even no matter what type of insurance the mother has. Age did not change the risk for place of residence on either outcome. Age changed the significance of the median county income as a risk factor for an abnormal condition of the newborn. There is no statistically significant relationship between income and abnormal conditions of the newborn for the under 18 group.

The under 18 group are slightly more at risk of a congenital anomaly if they live in a county with a median income of less than $28,000 (p=<.01), than the older age group.

Race as a Mediator in the Relationship of Risk Factor With Birth Outcomes

The influence of race on birth outcomes was also analyzed by cross tab of vulnerabilities to outcomes while controlling for race (see Table 5). The chi square statistic was used as a measure of significance. For statistically significant relationships, a ratio of at risk to no risk behavior was calculated to demonstrate the power of the relationship. Most outcomes were statistically significant at a p=<.01. Those that were statistically significant at a p=<.05 are indicated by an asterisk (*). Those values that had no statistical significance are indicated by a ϕ.

Developmental Factors

Weight gain continued to have a statistically significant relationship to all outcomes except congenital anomalies when race was controlled. The risk of a poor birth outcome for mothers who gain less than 15 pounds, is somewhat more likely for white mothers (p=<.01). The risk to white mothers of weight gain less than 15 pounds is slightly greater for all but congenital anomalies.

When race is controlled the relationship between poor birth outcomes and inadequate prenatal care is significant for all outcomes. White mothers are slightly more at risk of a low birth weight baby or a pre term birth than non-white mothers (p=<.01). The risk of perinatal death is slightly higher for non-white mothers

Table 5

Percent Relationship of Risk Factors to Poor Outcomes by Race, Teen Group, 1990-1997 (N=136,973)

		LBW		PreTerm		Death		Anomaly		AbNewborn	
		NW	W	NW	W	NW	W	NW	W	NW	W
Wgt Gain	<15	25.5	20.2	31.1	22.0	8.9	11.5	1.0ϕ	1.5ϕ	13.4	16.8
	≥15	10.3	6.1	17.1	10.3	4.2	4.3	1.0ϕ	1.5ϕ	7.7	7.7
	Ratio	**2.5:1**	**3.3:1**	**1.8:1**	**2.1:1**	**2.1:1**	**2.7:1**	-	-	**1.7:1**	**2.2:1**
PnC	Inadeq	15.8	11.6	25.0	18.1	6.9	6.4	1.2*	1.8*	10.8	10.6
	Adeq	10.9	6.4	17.1	10.3	4.1	4.5	1.0*	1.5*	7.6	7.9
	Ratio	**1.5:1**	**1.8:1**	**1.5:1**	**1.8:1**	**1.7:1**	**1.4:1**	**1.2:1**	**1.2:1**	**1.4:1**	**1.3:1**
Med Risk	Yes	17.4	12.2	22.8	15.1	7.5	7.2	1.7	2.6	13.0	13.2
	No	10.1	5.8	17.7	10.0	4.1	4.2	0.8	1.3	7.2	7.1
	Ratio	**1.7:1**	**2.1:1**	**1.3:1**	**1.5:1**	**1.8:1**	**1.7:1**	**2.1:1**	**2:1**	**1.8:1**	**1.9:1**
Smoking	Yes	14.8	9.0	18.3ϕ	11.1ϕ	5.8	5.1	1.2ϕ	1.7*	9.7	8.9
	No	11.5	5.9	18.6ϕ	10.9ϕ	4.6	4.6	1.0ϕ	1.5*	8.1	7.9
	Ratio	**1.3:1**	**1.5:1**	-	-	**1.3:1**	**1.1:1**	-	**1.1:1**	**1.2:1**	**1.1:1**
Prev Preg	Yes	12.2	7.0ϕ	19.4	11.3*	4.9*	4.9ϕ	0.9ϕ	1.5ϕ	8.3ϕ	8.3ϕ
	No	11.5	6.9ϕ	17.7	10.8*	4.5*	4.6ϕ	1.0ϕ	1.5ϕ	8.0ϕ	8.1ϕ
	Ratio	**1.1:1**	-	**1.1:1**	**1.1:1**	**1.1:1**	-	-	-	-	-

Table 5 --Continued

		LBW		PreTerm		Death		Anomaly		AbNewborn	
		NW	W	NW	W	NW	W	NW	W	NW	W
Education	<8th	13.6ϕ	8.7	23.4	13.1	5.2ϕ	5.0ϕ	1.1ϕ	1.1ϕ	9.1ϕ	8.1ϕ
	≥8th	11.8ϕ	6.9	18.5	10.9	4.7ϕ	4.7ϕ	1.0ϕ	1.5ϕ	8.2ϕ	8.2ϕ
	Ratio	-	**1.3:1**	**1.3:1**	**1.2:1**	-	-	-	-	-	-
Support	No	12.1	7.4	18.9	11.5	4.8	4.9	1.0ϕ	1.4	8.3	8.3*
	Yes	9.5	6.0	14.4	9.8	2.8	4.3	1.2ϕ	1.7	6.7	7.9*
	Ratio	**1.3:1**	**1.2:1**	**1.3:1**	**1.2:1**	**1.7:1**	**1.1:1**	-	**-1.2:1**	**1.2:1**	**1.1:1**
Insurance	MA	11.7ϕ	7.1ϕ	18.0	10.7	4.4	4.4	1.0ϕ	1.5ϕ	7.6	7.8
	Priv	12.1ϕ	6.8ϕ	19.9	11.5	5.4	5.3	0.9ϕ	1.5ϕ	9.6	8.7
	Ratio	-	-	**-1.1:1**	**-1.1:1**	**-1.2:1**	**-1.2:1**	-	-	**-1.3:1**	**-1.1:1**
Residence	Rural	11.1	6.9ϕ	17.2	11.0ϕ	2.5	3.2	1.2*	1.5ϕ	5.5	6.6
	Urban	12.1	7.0ϕ	19.0	11.0ϕ	5.3	6.9	1.0*	1.5ϕ	8.9	10.4
	Ratio	**-1.1:1**	-	**-1.1:1**	-	**-2.1:1**	**-2.2:1**	**1.2:1**	-	**-1.6:1**	**-1.6:1**
Co Income	<$28,000	5.8	6.4*	13.6	10.9ϕ	2.2	3.0	1.5ϕ	2.0	5.8*	7.3
	>$28,000	12.0	7.0*	18.7	11.0ϕ	4.8	5.1	1.0ϕ	1.4	8.3*	8.4
	Ratio	**-2.1:1**	**-1.1:1**	**-1.4:1**	-	**-2.2:1**	**-1.7:1**	-	**1.4:1**	**-1.3:1**	**-1.2:1**

* p=<.05 ϕ No significance, no ratio calculated.

(p=<.01). The risk of a congenital anomaly (p=<.05) or an abnormal condition of the newborn (p=<.01) is equal for all races.

A maternal medical risk had a statistically significant relationship to all outcomes based on race. White mothers were slightly more at risk of low birth weight (p=<.01) and pre term birth (p=<.01). Non-white mothers were slightly more at risk of perinatal death (p=<.01). Race did not change the high risk of congenital anomalies (p=<.01) or abnormal conditions of the newborn (p=<.01) for mothers with a prenatal medical risk.

Psychosocial Factors

There was no major difference in the risk of smoking on outcomes based on race. The risk of poor outcomes associated with less than eighth grade education is also minimal. The risk of low birth weight increased in white women with less education (p=<.01).

The effect of lack of support on birth weight (p=<.01) and pre term birth (p=<.01) was reduced by racial consideration, for all races. The risk of perinatal death (p=<.01) associated with lack of support, however, was higher for non-white mothers. Other risks were only slightly different based on race.

Economic Factors

The effect of source of insurance and urban or rural residence were about the same for white or non-white mothers. The effect of median county income on poor

outcomes was changed significantly by race. Non-white mothers are twice as likely to have a low birth weight baby (p=<.05) as white mothers, when they live in a county with a median income above $28,000. Non-white mothers were statistically more likely to have pre term birth (p=<.01) or perinatal death (p=<.01) when in a higher income county. White mothers have a greater risk of congenital anomalies (p=<.01) when in a lower income county.

Additional Relationship Testing

The *t*-test was used to determine statistical differences between the age and racial groups when the variable is continuous. Because birth weight and weeks of gestation are the most significant outcome variables related to mortality and morbidity of newborns and these variables are continuous, this statistical technique was used to provide additional testing of relationships.

Table 6 demonstrates that those mothers less than 18 had a mean birth weight significantly less than those mothers 18 and over (p=<.01). The mothers less than 18 also had a statistically significant lower mean gestational age than the older mothers. Mothers who were non-white also had significantly less mean birth weight and less mean gestational age than mothers who were white.

Table 6

Comparison of Means for Outcomes, Teen Group, 1990-1997
N=136,973

Birth Weight Age	Mean	Sig	Gestation Mean	Sig
<18	3176.98	<.01	38.77	<.01
18-19	3246.12		39.17	
Birth Weight Race	**Mean**	**Sig**	**Gestation Mean**	**Sig**
Non-White	3089.55	<.01	38.46	<.01
White	3307.06		39.38	

Summary of Findings: Risk Factors Associated With Birth Outcome

The story of teen pregnancy birth outcomes is certainly a complex one. A summary of the findings includes the following observations:

The presence of a developmental risk factor (low weight gain, inadequate prenatal care or prenatal medical risk) puts all teens of all ages or race at considerable risk (2-3 times) for a poor birth outcome.

Most psychosocial risk factors (smoking, previous pregnancy, less than eighth grade education) were related to poor outcomes, producing a 10-20 percent increase. Lack of support showed an important risk of a poor birth outcome.

There were unexpected findings associated with the economic risk factors (insurance, rural or urban residence and county median income). Living in an urban

residence and in a higher income county were linked with significant risk for a poor outcome.

Age did not affect outcomes in any statistically significant way. Younger teens were no more likely to have a poor outcome than older teens. Low weight gain was associated with 3 times the risk of a low birth weight baby in both older and younger teens. Low weight gain was associated with twice the risk of a pre term birth, a perinatal death or an abnormality of the newborn in both older and younger teens. Inadequate prenatal care was associated with a 70 to 90 percent risk of a low birth weight baby or a pre term birth in both older and younger teens. A medical condition in the mother was associated with twice the risk of a congenital anomaly in both older and younger teens.

There were also unexpected findings associated with race. White teens had slightly greater relative risk of a poor outcome associated with developmental risk factors. White mothers with low weight gain had 50 percent more risk of a low birth weight baby or abnormality of the newborn, 30 percent more risk of a pre term birth, and 60 percent more risk of a perinatal death than non-white mothers.

The psychosocial risks of smoking, previous pregnancy, and education were unchanged by race. Non-white teens with lack of identified fathers, however, were 60 percent more likely to have a perinatal death than white teens.

The economic risks of source of insurance, urban residence and higher income county residence were unchanged by race, except for one parameter. Non-white teens

who live in higher income counties have twice risk of low birth weight baby, and 50 percent greater risk of a perinatal death than those in lower income counties.

In this section, the characteristics of teen births in Michigan from 1990-1997 have been presented. In addition, the risk factors for poor birth outcomes have been presented with their relationships described by statistical techniques. The mediating effects of age and race have been outlined as well. The next section will present the same process for describing a group of young adult births, and compare the outcomes and relationships of risk factors to the study group.

Comparison Group: Mothers 20-24 Years of Age

A comparison group was derived from the population of births to 20-24 year olds in Michigan during the middle year of the study. There were 35,000 births in mothers of this age during 1993, which were used for this analysis. The descriptions of birth outcomes, age and race characteristics and risk factors will be presented as done for the study group, followed by a table that compares the two groups. Finally the cross tab analysis of outcomes by risk factors will be presented followed by a table that compares the two groups.

Birth Outcomes

Approximately 93 percent of this group had babies with birth weights above 2,500 grams. Only one percent had babies with very low birth weight, below 1,500 grams. About 86 percent delivered at the optimal length of gestation 37 weeks or

more. Less than one percent of babies died within the first week of life. Only one percent of the babies were born with a congenital anomaly and about nine percent with a newborn medical abnormality.

Age and Race Characteristics

The group was distributed evenly between the ages of 20 (18.5%) to 24 (20.2%), with a mean age of 22 years. About 72 percent of the group were white and 26 percent black. Less than two percent were other races, with American Indian being the next largest category at .7 percent and Other Asian/Pacific Islanders at .6 percent. Table 7 summarizes the characteristics of the control group.

Risk Factors

The risk factors for the comparison group were also evaluated (see Table 8).

Developmental

About 64 percent gained an ideal amount of weight during pregnancy, while only 8 percent gained less than 15 pounds. Prenatal care appears to be an important risk factor for this group as well. About 67 percent had adequate prenatal care, as determined by the Kessner Index, and 11 percent had inadequate care. About 17 percent of mothers had a medical risk during their pregnancy.

Table 7

Pregnancy Outcomes and Mediating Variables, 20-24 Age Group, 1993
N=35,000

OUTCOME VARIABLES

Birth Weight in Grams

	Frequency	Percent
≤2500g	2346	6.8
2501-4000g	29279	83.7
>4000g	3322	9.5
Missing	53	0.2

Weeks of Gestation

	Frequency	Percent
16-36 wks	3532	10.1
37-42 wks	27639	79.0
43-52 wks	2432	6.9
Missing	1397	4.0

Perinatal Death

	Frequency	Percent
Yes	158	0.4
No	34844	99.6

Congenital Anomalies

	Frequency	Percent
Yes	392	1.1
No	34235	97.8
Unknown	373	1.1

Newborn Medical Abnormalities

	Frequency	Percent
Yes	3069	8.8
No	31521	90.1
Unknown	410	1.2

MEDIATING VARIABLES

Mother's Age

	Frequency	Percent
20	6481	18.5
21	6874	19.6
22	7370	21.1
23	7207	20.6
24	7068	20.2

Mother's Race

	Frequency	Percent
Other Asian/PI	203	0.6
White	25079	71.7
Black	9248	26.4
Am Indian	262	0.7
Chinese	21	0.1
Japanese	5	0.0
Filipino	39	0.1
Hawaiian	3	0.0
Other Nonwhite	21	0.1
Unknown	119	0.3

Psychosocial

Twenty four percent of mothers smoked. Thirty eight percent had no identified support of a father. Thirty five percent had no previous pregnancy, while 64 percent had one or more pregnancies. Seventy one percent finished high school and 38 percent some college.

Economic

Fifty five percent of this group was covered by Medicaid and 41percent by private insurance. Fifty six percent lived in counties with more than 250,000 population. Ninety two percent were in counties with a median family income of $28,000-52,000 annually.

The differences between the birth outcomes of the comparison group and the study group are outlined in Table 9. The study group of teen pregnancies had 31percent more low birth weight babies born, 31percent more pre term births, over 1,000 percent more perinatal deaths, and 18 percent more congenital anomalies. The teen pregnancies, however, had 9 percent fewer abnormal conditions of the newborn. There were also 44 percent more non-white teen mothers than older non-white mothers.

Table 8

Risk Factors, 20-24 Age Group, 1993 (N=35,000)

DEVELOPMENTAL

Weight Gain

	Frequency	Percent
None	514	1.5
<15 lbs	2406	6.9
15-40 lbs	22283	63.7
>40 lbs	6010	17.2
Missing	3787	10.8

Prenatal Care

Frequency	Percent	
Inadequate	3888	11.1
Intermediate	7497	21.4
Adequate	23491	67.1
Unknown	124	0.4
Missing	3	0.0

Medical Risk

	Frequency	Percent
Yes	5871	16.8
No	28864	82.5
Unknown	265	0.8

PSYCHOSOCIAL

Smoking

	Frequency	Percent
Yes	8318	23.8
No	25781	73.7
Unknown	901	2.6

Support (Father Named)

	Frequency	Percent
No	13198	37.7
Yes	21802	62.3

Previous Pregnancy

	Frequency	Percent
None	12279	35.1
One	10744	30.7
>One	19340	55.2
Missing	253	0.5

Education

	Frequency	Percent
<8th Grade	3897	11.1
8-12th Grade	16560	47.3
>12Grade	9933	28.4

ECONOMIC

Source of Insurance

	Frequency	Percent
Medicaid	19186	54.8
Private	14429	41.2
Other	536	1.2

County Population

	Frequency	Percent
<250,000	15555	44.4
>250,000	19442	55.5
Missing		

Median County Income

	Frequency	Percent
<$28,000	2817	8.0
>$28,000	32183	92.0

Table 9

Comparison of Teen Group and 20-24 Age Group by Outcomes

	<20 N=136,973	20-24 N=35,000	Percent Difference
LBW	8.9	6.8	31
PreTerm	13.2	10.1	31
Perinatal Death	4:6	0.4	1050
Congenital Anomalies	1.3	1.1	18
Newborn Medical Abnormalities	8.1	8.8	-9

The differences between the 20-24 year old group and the teen group regarding risk factors are outlined in Table 10. The older group had 14 percent more women who gained less than 15 pounds. The older group also had 8 percent more who smoked, 5 percent more who lived in rural counties and 11 percent more who lived in low income counties. The study group had 29 percent more with inadequate prenatal care, 4 percent more with prenatal medical risks, 57 percent more with no paternal support, 82 percent more with less than an eighth grade education, and 17 percent more on Medicaid.

Association of Individual Risk Factor with Birth Outcome

The comparison group was also analyzed for the significance of the relationship between independent variables and birth outcomes (see Table 11), using

Table 10

Comparison of Teen Group and 20-24 Age Group, Presence of Risk Factors

	<20 N=136,973	20-24 N=35,000	Percent Difference
<15 Weight Gain	7.3	8.3	-14
Inadequate Prenatal Care	14.3	11.1	29
Medical Risk	17.4	16.8	4
Smoking	22.1	23.8	-8
No Support (Father Not Named)	59.1	37.7	57
Previous Pregnancy	41.6	58.1	-40
<8th Grade Education	2.0	1.1	82
Medicaid	64.2	54.8	17
Rural Residence	42.4	44.4	-5
<$28,000 Median Co Income	7.2	8.0	-11

a chi square statistic at p=<.05 or less. For significant relationships, a ratio of at risk to no risk behavior was calculated to demonstrate the strength of the relationship.

Developmental Factors

There was a statistically significant relationship between low weight gain and birth weight (p=<.01), pre term birth (p=<.01), perinatal death (p=<.01) and newborn

Table 11

Relationship of Risk Factors to Poor Outcomes, 20-24 Age Group, 1993 (N=35,000)

		LBW	PreT	Death	Anom	AbNB
Wgt Gain	<15	15.7	25.3	1.6	1.3ϕ	14.6
	≥15	5.4	15.8	0.3	1.2ϕ	8.6
	Ratio	**2.9:1**	**1.6:1**	**5.3:1**	-	**1.7:1**
PNC	Inadeq	11.2	26.2	1.1	1.0ϕ	11.0
	Adeq	6.1	16.1	0.4	1.1ϕ	8.6
	Ratio	**1.8:1**	**1.6:1**	**2.8:1**	-	**1.3:1**
Med Risk	Yes	11.8	22.1	1.0	1.9	14.6
	No	5.7	16.1	0.3	1.0	7.7
	Ratio	**2.1:1**	**1.4:1**	**3.3:1**	**1.9:1**	**1.9:1**
Smoking	Yes	8.9	17.8ϕ	0.3ϕ	1.3ϕ	10.1
	No	6.0	17.0ϕ	0.5ϕ	1.1ϕ	8.7
	Ratio	**1.5:1**	-	-	-	**1.2:1**
Prev Preg	Yes	6.9ϕ	18.4	0.4ϕ	1.1ϕ	8.7ϕ
	No	6.4ϕ	14.8	0.4ϕ	1.2ϕ	9.3ϕ
	Ratio	-	**1.2:1**	-	-	-
Education	<8th	6.0ϕ	16.7ϕ	0.3ϕ	0.6ϕ	11.1ϕ
	≥8th	6.7ϕ	17.1ϕ	0.4ϕ	1.1ϕ	8.8ϕ
	Ratio	-	-	-	-	-
Support	No	8.4	19.9	0.6	1.0	9.0ϕ
	Yes	4.8	14.1	0.3	1.3	8.7ϕ
	Ratio	**1.8:1**	**1.4:1**	**2:1**	**-1.3:1**	-
Insurance	MA	7.3	18.0	0.4ϕ	1.1ϕ	8.2
	Priv	5.8	16.0	0.4ϕ	1.2ϕ	9.7
	Ratio	**1.3:1**	**1.1:1**	-	-	**-1.2:1**
Residence	Rural	5.1	14.7	0.3	1.3	6.5
	Urban	8.0	19.0	0.4	1.0	10.8
	Ratio	**-1.6:1**	**-1.3:1**	**-1.3:1**	**1.3:1**	**-1.7:1**
Income	<$28,000	4.9	13.7	0.5ϕ	1.4ϕ	6.2
	>$28,000	6.8	17.4	0.4ϕ	1.1ϕ	9.1
	Ratio	**- 1.4:1**	**-1.3:1**	-	-	**-1.5:1**
Race	NonWhite	11.1	24.9	0.8	0.8	9.1ϕ
	White	5.0	14.1	0.3	1.3	8.8ϕ
	Ratio	**2.2:1**	**1.8:1**	**2.7:1**	**-1.6:1**	-

* p=<.05 ϕ No significance, no ratio calculated.

medical conditions (p=<.01). A weight gain of less than 15 pounds produced three times more risk of a low birth weight baby and twice the risk of pre term birth and twice the risk of abnormal medical conditions of the newborn. A low weight gain was also associated with five times the risk of perinatal death than a normal weight gain.

Inadequate prenatal care was significantly related to low birth weight (p=<.01), pre term birth (p=<.01), perinatal death (p=<.01) and abnormal conditions of the newborn (p=<.01). The risk of low birth weight and pre term birth was two times greater for mothers with inadequate prenatal care. The risk of perinatal death was three times greater with inadequate prenatal care. The effect of inadequate prenatal care on abnormal conditions of the newborn was about even to that of adequate prenatal care.

There was a statistically significant relationship between prenatal medical risks of the mother and all poor outcomes. A prenatal medical risk produced twice the risk of a low birth weight baby (p=<.01), a congenital anomaly (p=<.01) and abnormal conditions of the newborn (p=<.01). A prenatal medical risk was not an important risk of pre term birth (p=<.01), but it produced a three fold risk of perinatal death (p=<.01).

Psychological Factors

There were statistically significant relationships only between smoking and low birth weight (p=<.01) and abnormal conditions of the newborn (p=<.01).

Smoking produced twice the risk of a low birth weight baby, but was not a significant risk for abnormal conditions of the newborn.

Having a previous pregnancy was only statistically significantly related to pre term birth (p=<.01). The risk of a pre term birth was not increased, however, by having a previous pregnancy.

Education level of the mother was not significantly related to birth outcomes. There was a statistically significant relationship between support of the baby's father and low birth weight (p=<.01), pre term birth (p=<.01), perinatal death (p=<.01) and congenital anomalies (p=<.01). Lack of support was associated with twice the risk of a low birth weight baby and a perinatal death.

Economic Factors

The source of insurance was statistically significant in relation to low birth weight (p=<.01), pre term birth (p=<.01) and abnormal conditions of the newborn (p=<.01). The risk of a poor outcome, however, was not increased by the source of insurance.

County population was statistically significant in relation to all poor outcomes. Living in a county with more than 250,000 people was associated with twice the risk of a low birth weight baby (p=<.01) and abnormal conditions of the newborn (p=<.01). The risk associated with residence was not increased for the other outcomes.

Living in a county with a median income of over $28,000 was statistically significant in relation to low birth weight (p=<.01), pre term birth (p=<.01) and abnormal conditions of the newborn (p=<.01). There was almost twice the risk of abnormal conditions for those in a higher income county, but the effect on other poor outcomes was low risk.

Race as a Mediator in the Relationship of Risk Factor With Birth Outcomes

Race was statistically significant in relation to birth weight (p=<.01), prematurity (p=<.01), perinatal death (p=<.01) and congenital anomalies (p=<.01) (see Table 11). There was twice the risk of low birth weight and pre term birth for non-whites. White mothers were almost twice as likely to have a congenital anomaly. Non-white mothers were almost three times more likely to experience a perinatal death. Age was not considered a risk factor in this control group.

In order to better explain the influence of race on birth outcomes, the vulnerabilities were analyzed for their relationship to outcomes while controlling for race. The chi square statistic was used as a measure of significance. For statistically significant relationships, a ratio of at risk to no risk behavior was calculated to demonstrate the strength of the relationship. Table 12 summarizes the findings.

Developmental Factors

The ratio of weight gain in non-white versus white mothers was calculated for low birth weight, pre term birth, perinatal death and abnormal conditions of the

newborn. Non-white mothers who gained less than 15 pounds were similarly at a three fold risk of a low birth weight baby (p=<.01) as white mothers. The risk of perinatal death (p=<.01) for white mothers with low weight gain was almost seven times, while white mothers who gained less than 15 pounds had five times the risk of those who gained adequate weight. The risk of pre term birth (p=<.01) and abnormal conditions of the newborn (p=<.01) were similar in all races.

The ratio of prenatal care in non-white versus white mothers was calculated for all outcomes except congenital anomalies. The risk of a low birth weight baby (p=<.01), pre term birth (p=<.01) and abnormal conditions of the newborn (p=<.01) were similar for all races with inadequate prenatal care. The risk of perinatal death (p=<.01) for non-white women was two to one while for white women the risk was almost three times those with adequate prenatal care.

A prenatal medical risk was significantly related to all poor outcomes for all races. The risk of low birth weight (p=<.01), pre term birth (p=<.01) and abnormal conditions of the newborn (p=<.01) were not influenced by race. The risk of perinatal death (p=<.01) for non-white mothers with a prenatal medical risk was twice that of mothers without a medical condition. The risk of perinatal death for white mothers with a prenatal medical risk was four times that of mothers without a medical condition. The risk of a congenital anomaly (p=<.01) for non-white mothers was two to one, while white mothers had almost a three-fold risk.

Table 12

Percent Relationship of Risk Factors to Poor Outcomes by Race, 20-24 Age Group, 1993 (N=35,000)

		LBW		Pre Term		Death		Anomaly		ABNewborn	
		NW	W	NW	W	NW	W	NW	W	NW	W
Wgt Gain	<15	22.5	12.2	33.5	20.8	2.3	1.3	0.9ϕ	1.6ϕ	13.9	15.0
	≥15	8.9	4.2	22.6	13.4	0.5	0.2	0.8ϕ	1.3ϕ	8.7	8.6
	Ratio	**2.5:1**	**2.9:1**	**1.5:1**	**1.6:1**	**4.6:1**	**6.5:1**	-	-	**1.6:1**	**1.7:1**
PNC	Inadeq	14.8	8.0	31.7	20.9	1.4	0.8	0.6ϕ	1.3ϕ	11.5	10.7
	Adeq	10.2	4.7	23.3	13.6	0.7	0.3	0.8ϕ	1.3ϕ	8.5	8.6
	Ratio	**1.5:1**	**1.7:1**	**1.4:1**	**1.5:1**	**2:1**	**2.7:1**	-	-	**1.4:1**	**1.2:1**
Med Risk	Yes	18.6	9.4	31.0	18.9	1.5	0.8	1.5	2.0	15.6	14.3
	No	9.6	4.1	23.7	13.1	0.7	0.2	0.6	1.1	7.8	7.7
	Ratio	**1.9:1**	**2.3:1**	**1.3:1**	**1.4:1**	**2.1:1**	**4:1**	**2.5:1**	**1.8:1**	**2:1**	**1.9:1**
Smoking	Yes	15.8	7.4	29.6	15.3	0.6ϕ	0.3ϕ	1.1ϕ	1.4ϕ	12.5	9.5ϕ
	No	10.3	4.0	24.1	13.7	0.9ϕ	0.3ϕ	0.7ϕ	1.3ϕ	8.6	8.8ϕ
	Ratio	**1.5:1**	**1.9:1**	**1.2:1**	**1.1:1**	-	-	-	-	**1.5:1**	-
Prev Preg	Yes	11.1ϕ	4.7*	26.2	14.6	0.9ϕ	0.2*	0.7ϕ	1.3ϕ	8.8ϕ	8.6ϕ
	No	10.9ϕ	5.3*	21.0	13.4	0.7ϕ	0.4*	0.8ϕ	1.3ϕ	9.8ϕ	9.1ϕ
	Ratio	-	**-1.1:1**	**1.3:1**	**1.1:1**	-	**-2:1**	-	-	-	-

Table 12 --Continued

		LBW		Pre Term		Death		Anomaly		ABNewborn	
		NW	W	NW	W	NW	W	NW	W	NW	W
Education	<8th	9.6ϕ	5.0ϕ	28.6ϕ	13.4ϕ	1.2ϕ	0ϕ	1.2ϕ	0.4ϕ	4.9ϕ	13.0*
	≥8th	11.0ϕ	5.0ϕ	24.8ϕ	14.1ϕ	0.8ϕ	0.3ϕ	0.8ϕ	1.3ϕ	9.0ϕ	8.7*
	Ratio	-	-	-	-	-	-	-	-	-	**1.5:1**
Support	No	11.5	5.8	25.3*	15.4	0.9ϕ	0.3ϕ	0.7ϕ	1.2ϕ	9.4	8.7ϕ
	Yes	8.8	4.5	22.3*	13.3	0.7ϕ	0.3ϕ	1.0ϕ	1.3ϕ	7.2	8.9ϕ
	Ratio	**1.3:1**	**1.3:1**	**1.1:1**	**1.2:1**	-	-	-	-	**1.3:1**	-
Insurance	MA	11.0ϕ	5.4	25.0ϕ	14.3ϕ	0.8ϕ	0.3ϕ	0.8ϕ	1.2ϕ	8.5	8.1
	Priv	11.3ϕ	4.4	24.3ϕ	13.8ϕ	0.9ϕ	0.3ϕ	0.6ϕ	1.4ϕ	10.3	9.5
	Ratio	-	**1.2:1**	-	-	-	-	-	-	**-1.2:1**	**-1.2:1**
Residence	Rural	8.4	4.7*	22.2	13.8ϕ	0.6ϕ	0.3ϕ	1.4	1.3ϕ	5.9	6.5
	Urban	11.6	5.4*	25.4	14.5ϕ	0.9ϕ	0.3ϕ	0.6	1.2ϕ	9.7	11.5
	Ratio	**-1.4:1**	**-1.2:1**	**-1.1:1**	-	-	-	**2.3:1**	-	**-1.6:1**	**-1.8:1**
Co Income	<$28,000	6.3ϕ	4.8ϕ	20.1ϕ	13.4ϕ	0.8ϕ	0.5ϕ	1.4ϕ	1.4ϕ	4.9ϕ	6.2
	>$28,000	11.1ϕ	5.0ϕ	24.9ϕ	14.2ϕ	0.8ϕ	0.3ϕ	0.8ϕ	1.3ϕ	9.1ϕ	9.1
	Ratio	-	-	-	-	-	-	-	-	-	**-1.5:1**

* p=<.05 ϕ No significance, no ratio calculated.

Psychosocial Factors

Ratios were calculated for the relationship of smoking to low birth weight (p=<.01), pre term birth (p=<.01) and abnormal conditions (p=<.01) in non-white mothers. Race did not change the risk of low birth weight or pre term birth in smoking mothers. There was a two-fold risk for abnormal conditions of the newborn in non-white mothers who smoked.

Ratios were calculated for the relationship of having a previous pregnancy and birth weight in white mothers (p=<.05), pre term birth in both racial groups (p=<.01), and white mothers with a perinatal death (p=<.05). There was no impact of race on the risk of low birth weight or preterm delivery. The risk of perinatal death was two times greater in white mothers with a previous pregnancy than those without.

A ratio of the risk of education was calculated for white mothers who had an abnormal condition of the newborn (p=<.05). The risk was almost two to one for mothers with a low education level.

Ratios for the risk of lack of support on outcomes were calculated for birth weight (p=<.01), preterm delivery (p=<.05), and newborn medical conditions in non-white mothers (p=<.01). Race had no influence on any outcomes for this variable.

Economic Factors

Race had no influence on the relationship of insurance to birth outcomes. Ratios were calculated for low birth weight in white mothers (p=<.01) and abnormal

conditions of the newborn (p=<.01) and showed no difference.

Ratios were calculated for the relationship between county population and birth weight (p=<.05), pre term birth in non-white mothers (p=<.01), anomalies for non-white mothers (p=<.01) and abnormal conditions of the newborn (p=<.01). Race did not influence birth weight, pre term birth or abnormal conditions for this variable. There was, however, a two fold risk of congenital anomaly for non-white mothers living in rural counties.

A ratio between lower and higher income counties and abnormal conditions of the newborn for white mothers (p=<.01) was calculated. There was almost twice the risk of this outcome for white mothers living in higher income counties.

Additional Relationship Testing

The *t*-test was used to determine statistically significant differences between the racial groups for the control group when the variable is continuous. Birth weight and weeks of gestation was used for the control group too. Table 13 illustrates that non-white mothers had babies that were statistically significantly lower in birth weight than white mothers (p=<.01). Non-white mothers also had babies with statistically significantly lower gestational age than white mothers (p=<.01).

Table 13

Comparison of Means for Outcomes by Race, 20-24 Age Group, 1993
N=35,000

Birth Weight	Mean	Sig	Gestation Mean	Sig
Non-White	3136.01	<.01	38.58	<.01
White	3396.78		39.50	

Comparison of Teen Study Group and 20-24 Age Group

When the ratio of the relationship of risk factor to outcome are charted for the teen study group next to the ratios for the 20-24 age group, several interesting facts are apparent (see Table 14). First, there are more similarities between the groups than differences. For instance all the ratios regarding pre term birth are alike. All the relationships between previous pregnancy and outcomes are the same. The same is true for education and insurance.

Next, the risk for the 20-24 age group is greater than the teen group in several relationships. Note the risk of perinatal death is 5 to 1 for adults who gain less than 15 pounds, while only 2 to 1 for teens. The risk of perinatal death for adults with inadequate prenatal care or with a prenatal medical risk is 3 to 1 while for teens it is 2 to 1. The risk of perinatal death in adults with no identified father is 2 to 1 while for teens there is an even risk. There is increased risk of low birth weight for adults who smoke (1.5 to 1) than for teens (1.2 to 1). There is also increased risk of low birth weight for adults who live in an urban area over teens. The risk of abnormal

Table 14

Comparison of Teen Group and 20-24 Age Group, Ratio of Risk Factors to Poor Outcomes
Teen: N=136,973 Adult: N=35,000

	LBW		Pre Term Birth		Perinatal Death		Anomaly		Abn Condition	
	Teen	Adult	Teen	Adult	Teen	Adult	Teen	Adult	Teen	Adult
<15 lb Wgt Gain	3:1	2.9:1	2.1:1	1.6:1	2.4:1	5.3:1	NS	NS	1.9:1	1.7:1
Inadequate PNC	1.7:1	1.8:1	1.7:1	1.6:1	1.5:1	2.8:1	1.2:1	NS	1.4:1	1.3:1
Med Risk	1.9:1	2.1:1	1.4:1	1.4:1	1.7:1	3.3:1	2:1	1.9:1	1.9:1	1.9:1
Smoking	1.2:1	1.5:1	-1.2:1	NS	1.1:1	NS	1.3:1	NS	1.1:1	1.2:1
Previous Pg	1.1:1	NS	1.1:1	1.2:1	1.1:1	NS	-1.2:1	NS	NS	NS
<8th Gr Education	1.2:1	NS	1.3:1	NS	NS	NS	NS	NS	NS	NS
No Id Father	1.5:1	1.8:1	1.4:1	1.4:1	1.2:1	2:1	-1.3:1	-1.3:1	1.1:1	NS
Medicaid	1:1	1.3:1	-1.1:1	1.1:1	-1.2:1	NS	NS	NS	-1.2:1	-1.2:1
<250,000 Pop.	-1.3:1	-1.6:1	-1.3:1	-1.3:1	-2:1	-1.3:1	1.3:1	1.3:1	-1.5:1	-1.7:1
Low Co Income	-1.4:1	-1.4:1	-1.3:1	-1.3:1	-1.7:1	NS	1.6:1	NS	-1.2:1	-1.5:1

condition of the newborn is 2 to 1 for adults in a higher income area and even for teens.

Teens showed a higher risk for perinatal death in an urban area (2 to 1) over adults who had an even risk. Teens who live in higher income areas also had a 2 to 1 risk of perinatal death over adults whose risk is not significant statistically. Teens who live in lower income areas have a 2 to 1 risk of congenital anomaly while adults have no risk statistically.

Table 15 was created to determine by comparison whether race changes the degree of vulnerability of the teen study group. The risk of low birth weight for mothers who smoke was still even for non-white teens. The risk for non-white adults and white teens and adults is 2 to 1. The risk of low birth weight for white teen mothers who live in higher income counties is negligible, but the risk for non-white teens who live in higher income counties is 2 to 1.

The greater risk for adults of perinatal death is still true no matter what race. However, the risk for white mothers is shown to be even greater than non-white mothers regarding weight gain, prenatal care, prenatal medical risk. The risk of perinatal death for adult mothers who lack support is not statistically significant when controlled for race. Race did not change the greater risk for teens who live in urban areas or who live in higher income areas of perinatal death.

The greater risk of teens who live in higher income counties for congenital anomalies is no longer true when race is considered. Now it is evident that non-white adult mothers who have a prenatal medical risk have a 3 to 1 risk of a congenital

Table 15

Comparison of Teen Group and 20-24 Age Group by Race, Ratio of Risk Factors to Poor Outcomes
Teen: N=136,973 Adult: N=35,000

NON-WHITE	LBW		Pre Term Birth		Perinatal Death		Anomaly		Abn Condition	
	Teen	Adult	Teen	Adult	Teen	Adult	Teen	Adult	Teen	Adult
<15 lb Wgt Gain	2.5:1	2.5:1	1.8:1	1.5:1	2.1:1	4.6:1	NS	NS	1.7:1	1.6:1
Inadequate PNC	1.5:1	1.5:1	1.5:1	1.4:1	1.7:1	2:1	1.2:1	NS	1.4:1	1.4:1
Medical Risk	1.7:1	1.9:1	1.3:1	1.3:1	1.8:1	2.1:1	2.1:1	2.5:1	1.8:1	2:1
Smoking	1.3:1	1.5:1	NS	1.2:1	1.3:1	NS	NS	NS	1.2:1	1.5:1
Previous Preg	1.1:1	NS	1.1:1	1.3:1	1.1:1	NS	NS	NS	NS	NS
<8th Gr Education	NS	NS	1.3:1	NS	NS	NS	NS	NS	NS	NS
No Id Father	1.3:1	1.3:1	1.3:1	1.1:1	1.7:1	NS	NS	NS	1.2:1	1.3:1
Medicaid	NS	NS	-1.1:1	NS	-1.2:1	NS	NS	NS	-1.3:1	-1.2:1
<250,000 Pop.	-1.1:1	-1.4:1	-1.1:1	-1.1:1	-2.1:1	NS	1.2:1	2.3:1	-1.6:1	-1.6:1
Low Co Income	-2.1:1	NS	-1.4:1	NS	-2.2:1	NS	NS	NS	-1.3:1	NS

Table 15 –Continued

WHITE

	LBW		Pre Term Birth		Perinatal Death		Anomaly		Abn Condition	
	Teen	Adult	Teen	Adult	Teen	Adult	Teen	Adult	Teen	Adult
<15 lb Wgt Gain	3.3:1	2.9:1	2.1:1	1.6:1	2.7:1	6.5:1	NS	NS	2.2:1	1.7:1
Inadequate PNC	1.8:1	1.7:1	1.8:1	1.5:1	1.4:1	2.7:1	1.2:1	NS	1.3:1	1.2:1
Medical Risk	2.1:1	2.3:1	1.5:1	1.4:1	1.7:1	4:1	2:1	1.8:1	1.9:1	1.9:1
Smoking	1.5:1	1.9:1	NS	1.1:1	1.1:1	NS	1.1:1	NS	1.1:1	NS
Previous Preg	NS	-1.1:1	1.1:1	1.1:1	NS	-2:1	NS	NS	NS	NS
<8th Gr Education	1.3:1	NS	1.2:1	NS	NS	NS	NS	NS	NS	1.5:1
No Id Father	1.2:1	1.3:1	1.2:1	1.2:1	1.1:1	NS	-1.2:1	NS	1.1:1	NS
Medicaid	NS	1.2:1	-1.1:1	NS	-1.2:1	NS	NS	NS	-1.1:1	-1.2:1
<250,000 Pop.	NS	-1.2:1	NS	NS	-2.2:1	NS	NS	NS	-1.6:1	-1.8:1
Low Co Income	-1.1:1	NS	NS	NS	-1.7:1	NS	1.4:1	NS	-1.2:1	-1.5:1

anomaly while a non-white teen's risk is 2 to 1. An urban residence for non-white adult mothers puts them at a 2 to 1 risk of a congenital anomaly while non-white teens have an even risk and white mothers have no statistically significant risk.

The greater risk of abnormal conditions of the newborn for mothers who live in higher income counties is true for white adults but there is no statistically significant risk for non-white mothers, adult or teen. Now it is also apparent that non-white adult mothers who smoke have a 2 to 1 risk of abnormal conditions of the newborn, while non-white teens have an even risk, as do white mothers, teen or adult.

Summary of Findings: Teen Group Versus 20-24 Age Group

Comparison of findings between the study and comparison group concludes with these observations:

Teens have considerably more poor birth outcomes than older mothers. Teens had 31 percent more low birth weight babies and pre term births, 18 percent more congenital anomalies and over a thousand percent more perinatal deaths than older mothers.

There are mixed differences in the presence of risk factors between the teen group and older group: Teens have more incidence of inadequate prenatal care, prenatal medical risk, lack of support, less education, and Medicaid insurance. Mothers who are 20-24 years old have more incidence of low weight gain, smoking, previous pregnancy, rural residence and live in counties with a median income of less than $28,000.

The presence of a developmental risk factor (low weight gain, inadequate prenatal care or prenatal medical risk) puts both teens and adults at considerable risk (2-3 times) for a poor birth outcome. However adults overall, have significantly greater risk of perinatal death associated with developmental risks.

The psychosocial risk factors (smoking, previous pregnancy, education and lack of support) were related to poor outcomes in both groups but did not produce a considerable risk. Smoking produced a greater risk of low birth weight for adults.

The economic risk factors (insurance, rural or urban residence and county median income) produced exactly the same direction of risk in both groups. Living in an urban residence produced a greater risk of low birth weight for adults than teens, but was related to a greater risk of perinatal death in teens than adults. Income was not associated with poor outcome for adults as it was for teens, except for abnormal conditions of the newborn, which were a greater risk for adults.

There are 41 percent more non-white teen mothers than non-white older mothers. Race influenced the risk for perinatal death in certain situations. White adult mothers were 3 times more likely to have a perinatal death when they gained too little weight than were teens. White adult mothers were 2 times more likely to have a perinatal death when they had a prenatal medical risk than were teens. There was also a 2 1/2 times greater risk of perinatal death in non-white adults who gained too little weight.

Interactions Among the Risk Factors

The logistic regression technique improves the ability to predict outcomes by including all the independent variables and the mediating variables in one equation. An odds ratio is derived mathematically by the logistic regression. A ratio of greater than one indicates a statistically greater risk of that event. A ratio of less than one does not suggest a greater risk.

The ratios calculated in the previous section indicate the risk of poor outcome associated with an individual variable. The logistic regression and odds ratio allow the investigator to combine all the variables in a prediction equation. The likely impact of one variable in the presence of numerous risks can be derived. Odds ratios were derived for each outcome: low birth weight, pre term birth, perinatal death, congenital anomalies and abnormal conditions of the newborn (see Table 16).

Developmental Factors

When all factors are considered together, weight gain of less than 15 pounds still produces the greatest risk of poor outcomes, from two times the risk of abnormal conditions of the newborn, to three times the risk of low birth weight, to twelve times the risk of perinatal death. Inadequate prenatal care showed almost twice the risk of pre term birth, perinatal death and congenital anomalies. Having a prenatal medical risk showed almost twice the risk of low birth weight, congenital anomalies and abnormal conditions of the newborn, and over twice the risk of perinatal death.

Table 16

Significant Odds Ratios (OR) of Poor Birth Outcome, Teen Group, 1990-1997
N=136,973

LBW	OR	95% CI	Pre Term	OR	95% CI
<18 years	1.17	(1.12-1.22)	<18 years	1.29	(1.25-1.34)
Non-white	1.59	(1.51-1.66)	Non-white	1.56	(1.50-1.62)
<15 lbs.	3.48	(3.29-3.68)	<15 lbs.	2.30	(2.18-2.42)
PNC	1.33	(1.26-1.41)	PNC	1.53	(1.46-1.61)
Medical risk	1.95	(1.86-2.05)	Medical risk	1.44	(1.38-1.50)
Smoking	1.42	(1.34-1.50)	Prev preg	1.13	(1.08-1.17)
No support	1.23	(1.15-1.30)	No support	1.19	(1.13-1.25)
Low income	0.82	(0.75-0.90)	Medicaid	0.92	(0.88-0.95)

Death	OR	95% CI	Anomalies	OR	95% CI
<18 years	1.43	(1.20-1.72)	Non-white	0.73	(0.65-0.82)
Non-white	1.22	(1.01-1.46)	Medical risk	1.99	(1.78-2.24)
<15 lbs.	11.85	(9.88-14.23)	No support	0.87	(0.77-0.98)
PNC	1.66	(1.35-2.06)	Low income	1.32	(1.12-1.55)
Medical risk	2.19	(1.81-2.65)			

Abn Cond	OR	95% CI
Non-white	0.80	(0.76-0.84)
<15 lbs.	2.12	(1.99-2.26)
PNC	1.09	(1.02-1.16)
Medical risk	1.93	(1.84-2.03)
Smoking	1.10	(1.05-1.16)
Prev preg	0.90	(0.86-0.95)
Medicaid	0.93	(0.88-0.97)
Rural	1.76	(1.67-1.85)
Low income	1.20	(1.10-1.32)

Psychosocial Factors

Smoking, previous pregnancy, lack of support and lack of education were not important predictors of poor outcome.

Economic Factors

The only economic factor that showed some significant risk of poor outcome was residence which has almost twice the risk of abnormal conditions of the newborn.

Mediating Factors

Young age produced some increased risk of poor outcome, 17-43 percent above an even risk, for low birth weight, pre term birth and perinatal death. Non-white race produced almost two times the risk of low birth weight and pre term birth, 22 percent above an even risk for perinatal death. Race was not important in predicting congenital anomalies or abnormal conditions of the newborn.

In summary, the logistic regression indicates that the greatest risk of a low birth weight baby is associated with the non-white mother with prenatal medical risk, and gaining less than 15 pounds during the pregnancy. The greatest risk of a pre term birth is associated with the non-white mother with inadequate prenatal care and gaining less than 15 pounds. The greatest risk of a perinatal death is associated with gaining less than 15 pounds, inadequate prenatal care, and a prenatal medical risk, while the greatest risk of a congenital anomaly is associated with a prenatal medical risk. The greatest risk of an abnormal condition of the newborn is associated with

gaining less than 15 pounds, and a prenatal medical risk and living in a county with a population less than 250,000.

Change Related to Declining Birth Rate

The population of females age 15-19 in Michigan in 1990 was 344,231, and in 1996 it was 334,570, a decline of only three percent. The population actually increased in 1994 and 1995. There was a pregnancy rate in this population in 1990 of 98.5 per 1,000, and in 1996 of 77.2, a decline of 29 percent. The live births in 1990 were 20,224 and in 1996 15,699, a decline of 27 percent. The decline in live births is almost exclusively the result of reduced numbers of pregnancies. During the same period the abortion rate declined by 38 percent, indicating that fewer pregnancies than ever are ending in abortion.

A simple comparison of the data for the teen study group and the number of live births was done. Live birth data was superimposed on graphs of the percentage of each study variable. Graphs display the data by year from 1990 through 1997.

Figure 10 illustrates the trend for live births over the study period. The number of live births declined gradually, except for a dramatic drop in 1995, which is unexplained at this time. This same line for live births is present on each of the subsequent graphs with the scale on the left y axis.

The poor birth outcomes over the study period are compared with live births in Figure 11. The scale for birth outcomes is in percent and is illustrated on the right y axis. The incidence of low birth weight remained stagnant over the eight years at

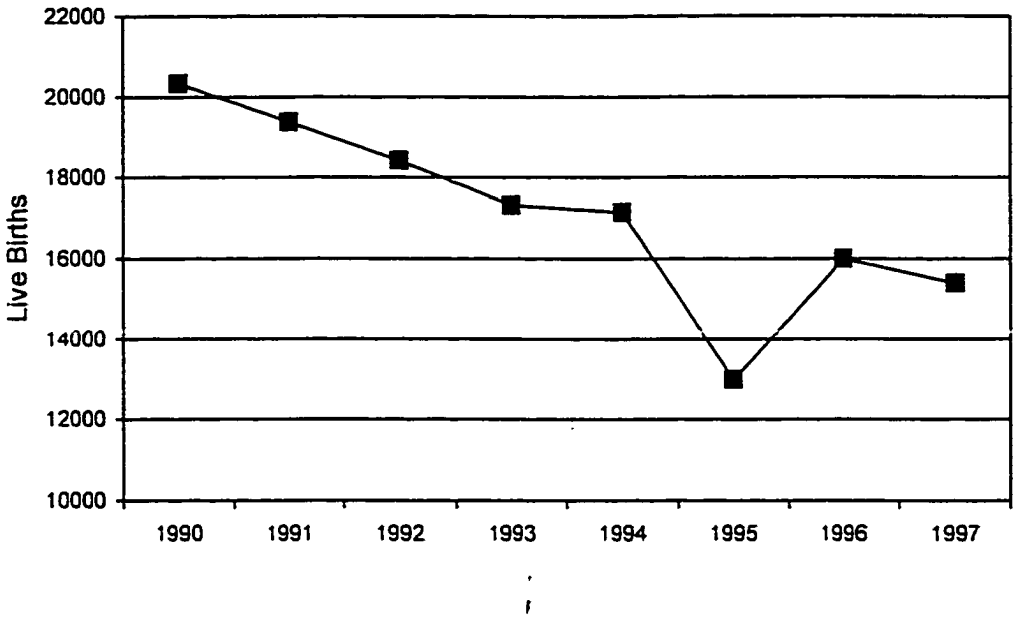


Figure 10. Live Births, Teen Study Group, 1990-1997.

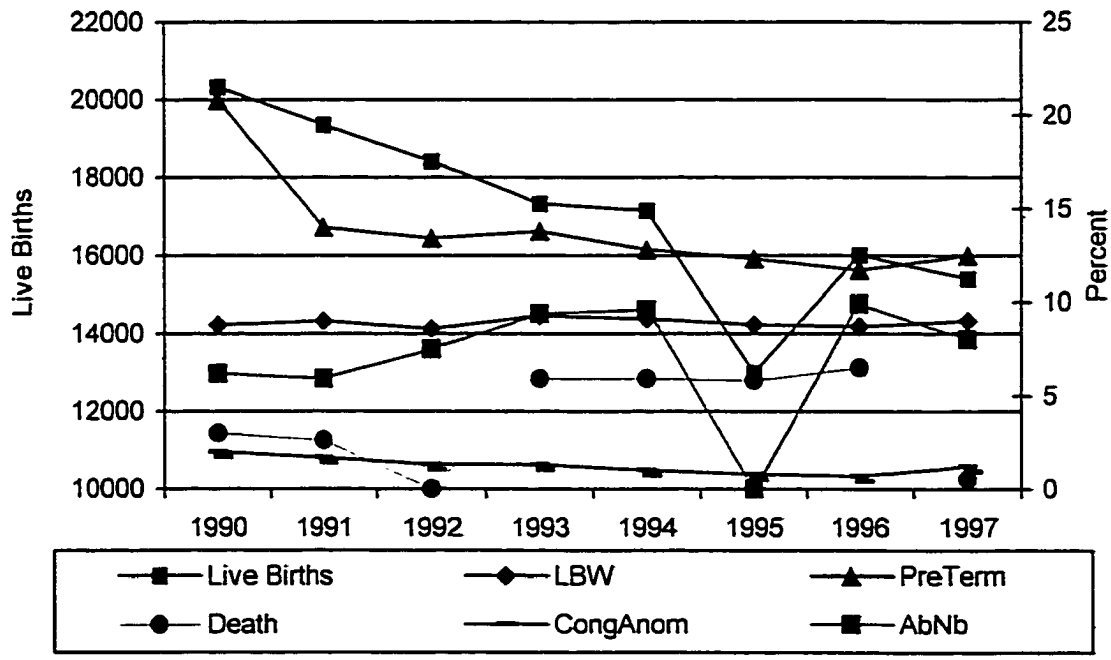


Figure 11. Birth Outcomes vs. Live Births, Teen Study Group, 1990-1997.

about nine percent of births. A dramatic drop in pre term delivery occurred between 1990 and 1991 (from 21% to 14%) and then a gradual decline to 1997. Perinatal deaths had an erratic up and down trend line over the eight years suggesting an aberration due to small numbers. The number of congenital anomalies declined slightly. The incidence of abnormal conditions of the newborn had one drop to zero in 1995 which suggests a data collection change in vital records, since the general trend was an increase over the study period. The shape of the line for abnormal conditions of the newborn follows the line for live births very closely from 1993 to 1997. The other outcomes do not follow the trend at all.

The age distribution (Figure 12) over the eight years showed a stable small percentage of 10-14 year olds. The percentage of 15-17 year olds increased slightly, while the percentage of 18-19 year olds remained stable. The line representing live births appears to be independent of age throughout the study period.

The race distribution (see Figure 13) changed somewhat, starting in 1994, when it showed a smaller proportion of Black births to White births. In 1990 there was a difference of less than 20 percent between Black and White births, but that difference had increased to 30 percent by 1997. The small percentage of all other races remained stable at about one percent over the study period. The trend line for Black race shows a consistent decline which parallels the live birth decline from 1993-1997 except for the dip in 1995. The shape of the live birth line appears to be acting independently of the race except for those instances noted.

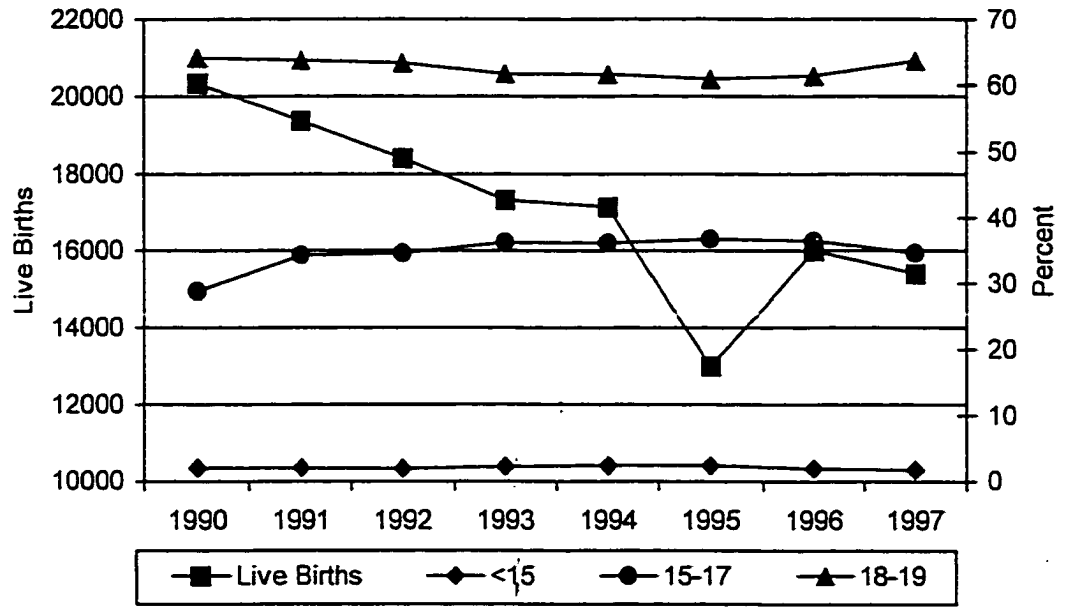


Figure 12. Age Distribution, Teen Study Group, 1990-1997.

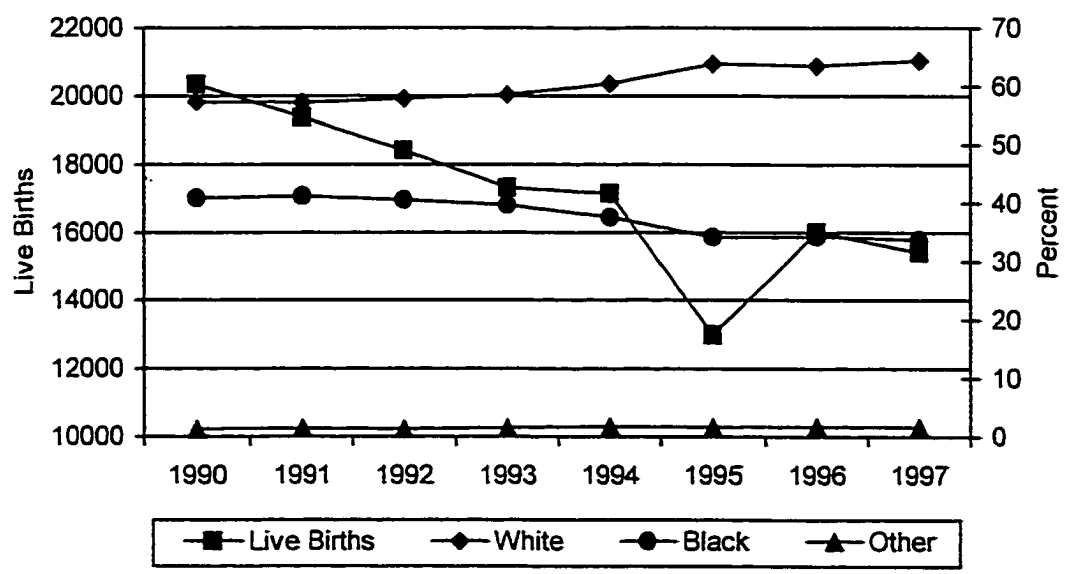


Figure 13. Race Distribution, Teen Study Group, 1990-1997.

There may be an impact of the incidence of some birth outcomes and the incidence of Black teen pregnancy which is linked to the number of live births. To further study this connection, the trend for live births is compared with the independent variables, arranged by category: (a) Developmental Factors, (b) Psychosocial Factors, and (c) Economic Factors.

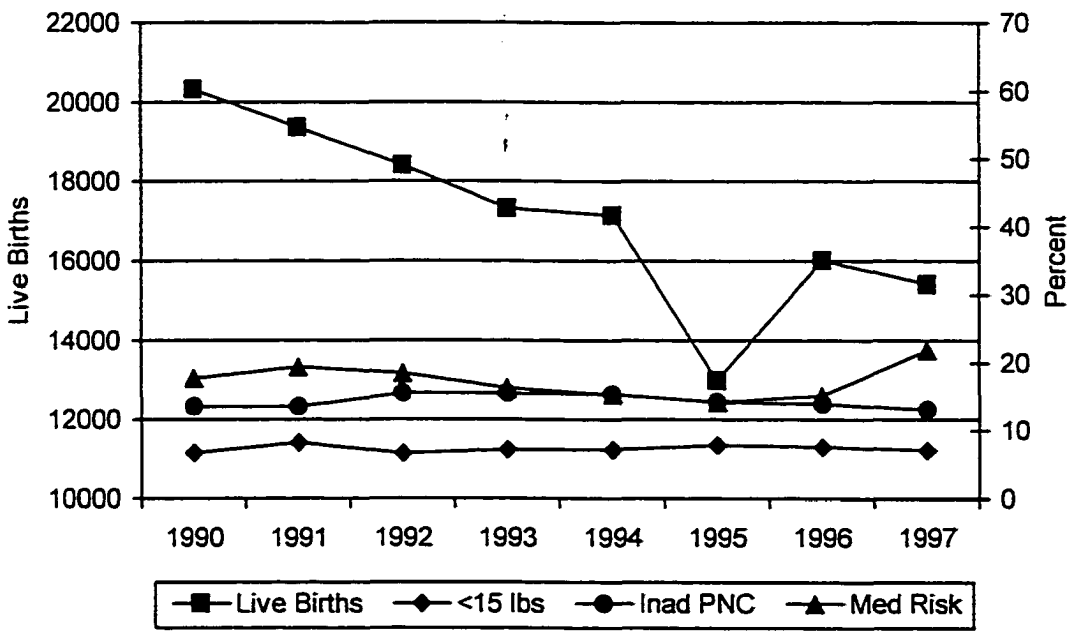


Figure 14. Developmental Factors, Teen Study Group, 1990-1997.

Developmental Factors

The incidence of poor weight gain stayed constant at about nine percent over the study period (see Figure 14). The number of mothers receiving inadequate prenatal care remained stable, but the percentage receiving adequate care improved

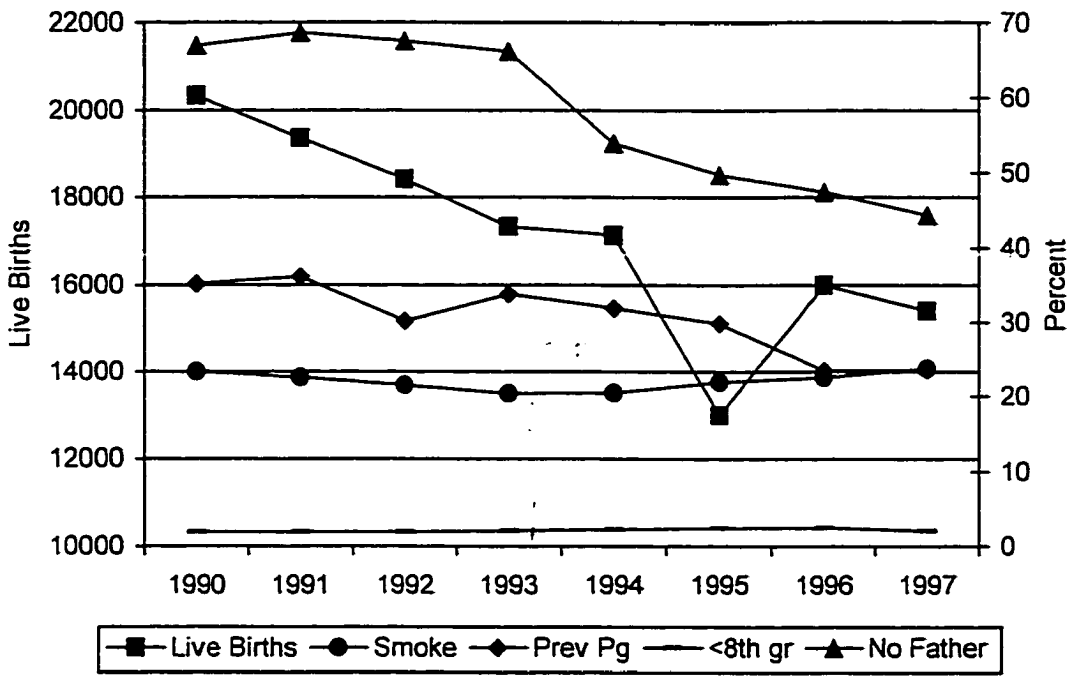


Figure 15. Psychosocial Factors, Teen Study Group, 1990-1997.

by about eight percent over the period. The percentage having a prenatal medical risk began to decline in 1993 but climbed again in 1997, so there was an overall two percent gain. Each of the developmental factors appears to change independent of the number of live births.

Psychosocial Factors

Smoking incidence remained constant (see Figure 15) over the study period. The percentage of previous pregnancies declined about one percent, but the proportion with no previous pregnancies improved by about six percent. Education

levels remained the same. The percentage of mothers who did not identify a father declined rapidly in 1994 from 68 percent to 55 percent and continued to decline to about 45 percent in 1997. Though the shape of the line is roughly similar to the live birth line from 1994 to 1997, there was a reporting change, which could account for the decline. The other variables seem to have changed independent of the number of live births.

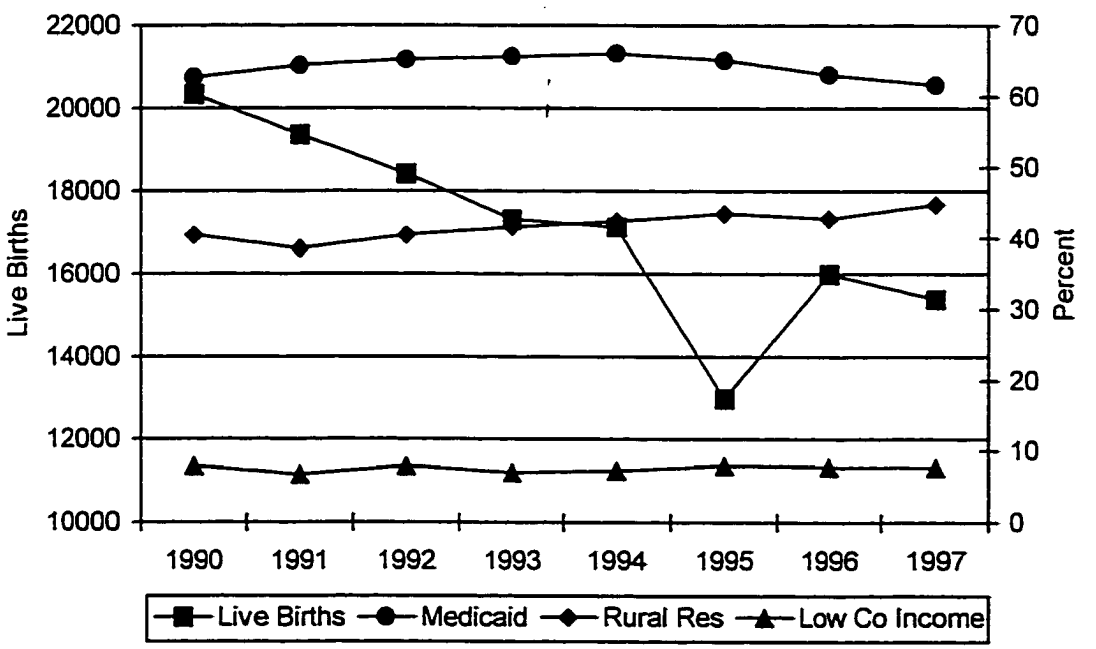


Figure 16. Economic Factors, Teen Study Group, 1990-1997.

Economic Factors.

The proportion of the population with Medicaid increased slightly (see Figure 16) over the eight years. The number of mothers living in rural counties increased by

about five percent. The median county income, however, remained stable. Economic factors seem to also have changed independent of the number of live births.

Assessment of Internal Validity

The impact of this study is to determine target areas for program and policy regarding teen pregnancy. So the analysis does not attempt to show cause-effect relationship but to highlight the relationships that exist between known risk factors and poor birth outcomes in the population. The concern here is to assess any problems with the research design that might affect the observations made. A comparison group of young adult women was chosen to help determine the reliability of the variables observed, though the design is pre-experimental. Each of the variables was chosen because of evidence in the literature regarding its association with poor birth outcomes. Since the information on birth certificates is a mixture of self-report and provider documentation, there is a chance of error in reporting. Over the years of using this instrument, the state Vital Records analysts have determined which information is consistently unreliable. That information was not included in this study.

Assessment of External Validity

Because the standardized birth certificate was the source of data, these results should pose relatively small external validity problems with generalizability to other U.S. states and similar age groups. This study included all live births to women under

age 20 in the state of Michigan over an eight year period.

In summary, the trend data show a possible relationship between the declining number of live births and two variables: (1) the percent incidence of abnormal conditions of the newborn, and (2) the percent incidence of lack of support of the baby's father, since 1994. All other variables showed no similarity to the shape of the trend line for live births.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary of Study Methods

The population for this study of adolescent pregnancy outcomes was derived from live births to women less than twenty years of age, residing in the state of Michigan, occurring between 1990 and 1997. A combination of these records produced a cohort of 136,973 cases. Elements of data from birth certificates and death certificates were obtained from the Office of Vital Records and Health Statistics of the Michigan Department of Community Health. The pregnancy outcomes which served as dependent variables were (a) birth weight, (b) gestational age, (c) whether a perinatal death (a stillbirth or death during the first week of life) occurred, (d) whether a congenital anomaly was present at birth and (e) whether an abnormal medical condition was present in the newborn at birth. Age of the mother and race of the mother were treated as mediating variables. The independent variables were well-recognized risk factors for adolescent pregnancy: (a) weight gain, (b) adequacy of prenatal care, (c) presence of a medical condition prenatally, (d) smoking, (e) support of the father, (f) previous pregnancy, (g) education of the mother, (h) type of insurance, (i) rural or urban residence, (j) median income of resident county.

The chi square statistic, to test the relationship of each independent variable to each outcome variable, was used to answer the research question: "What specific factors are associated with a healthy birth outcome in this population?" A ratio of at risk to no risk behavior was calculated to demonstrate the power of the significant relationships. The part that age and race play in the relationship of risk to outcome was determined in a similar way, using chi square statistical techniques, and calculation of a ratio. Finally the mean of each continuous outcome variable—birth weight and gestational age was compared according to the age and race of mother.

Data from the population of mothers between 20 and 24 years of age with live births during 1993 was treated to the same analysis as the teen group and comprised a comparison group. This group numbered 35,000 and contained the whole population for that year and age group.

A logistic regression model was derived from a combination of all the independent variables and their interaction on each outcome variable to answer the question, "What interactions exist among the risk factors?". This technique produced odds ratios for low birth weight, pre term birth, perinatal death, congenital anomaly, and an abnormal condition of the newborn, in the presence of significant risk factors.

Graphs of the trends for outcomes, and risk factors were compared to the trend for live births to answer the question, "Is there a difference between outcomes corresponding to declining numbers of teen births from 1990 to 1997?".

Conclusions

Research Question 1: What specific factors are associated with a healthy birth outcome?

Most teens, no matter what vulnerabilities were present, had healthy birth outcomes. Six of the independent variables produced a two to one or greater ratio of risk. Age did not add to the risk of any independent variables. Race, however, had a mediating effect on certain variables as described below. A revision of the research framework (Figure 17), shows the significant teen vulnerabilities defined by the study findings, the recommendations for a public administrative response and the better health outcomes anticipated from this approach.

Each of the teen vulnerability findings is reviewed below, followed by a discussion of recommendations for health policy and programming, which are presented according to the public administration responses as seen in the new model (Figure 17). The last section contains future research considerations.

The presence of a developmental risk factor (low weight gain, inadequate prenatal care or prenatal medical risk) puts all teens of all ages or race at considerable risk (2-3 times) for a poor birth outcome. The same risk factors put adults in the comparison group at high risk of a poor outcome. This finding is consistent with the literature (Fraser et al., 1995; Haiek & Lederman, 1988; Klerman, 1993; Kramer, 1987; Story & Alton, 1995). The data is very clear about the association of weight gain and poor prenatal care to low birth weight and prematurity. The data is less clear about the importance of prenatal medical risks in teens in predicting poor birth

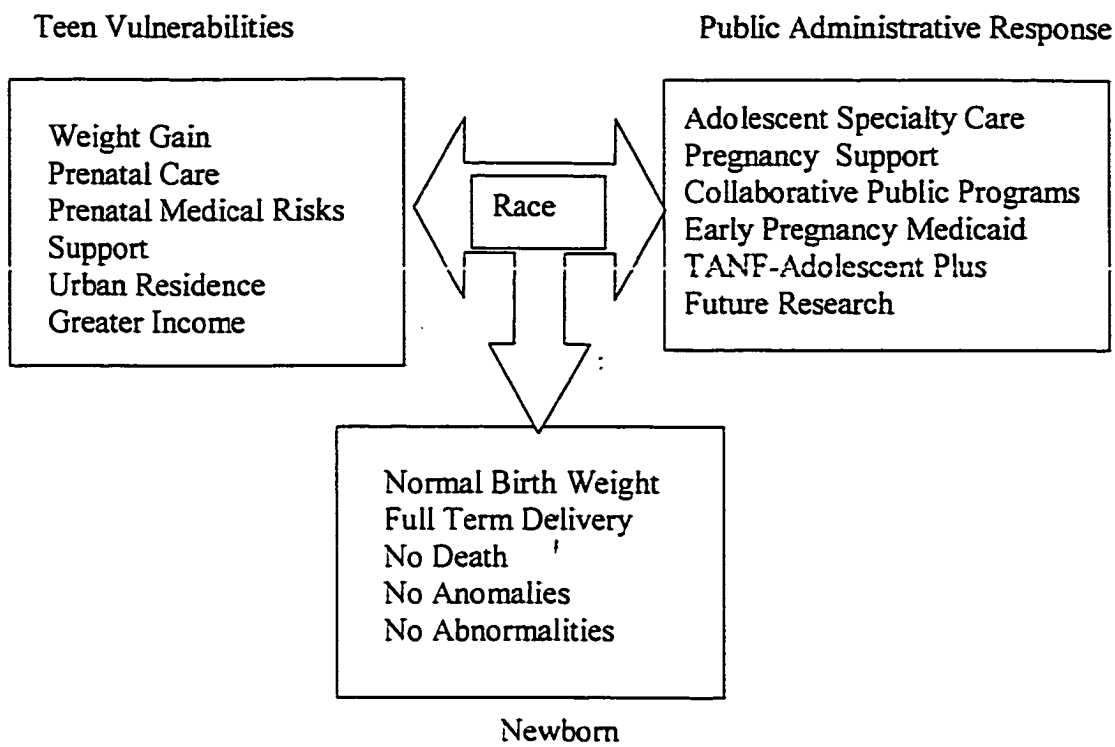


Figure 17. Predictors of Newborn Outcomes in Teenage Pregnancies (Revised).

outcomes. Some other researchers have also found that age and race were not as important in predicting poor outcomes as developmental factors (Klerman, 1993). Strategies directed at improving nutrition, assuring more prenatal care, and assessing and caring for medical problems in the adolescent mother should improve the chances for a healthy newborn.

The theoretical framework of this study suggested that teens operate in a milieu of friends and fads that make sense to themselves. Gaining weight and actually looking pregnant doesn't fit the self image that some teens have of

themselves. Thus it is not uncommon for teens to diet during pregnancy to reduce the amount of weight gain. A visit to a provider for prenatal care involves an acceptance of the pregnancy to some extent, a conclusion that takes longer for a teen who is acutely ambivalent about the whole thing. Not only will the teen need a friend or concerned parent to support early care, but the provider will not gain respect if their attitude is judgmental or condescending.

The interesting finding that prenatal medical conditions in the teen are linked to poor outcomes raises the concern that teens are not regular partakers of health care in general. Typically, acute illnesses may bring a teen in for a quick cure, or active teens may have a sports physical. Conditions like anemia, or hypertension, which may adversely affect a pregnancy, are likely to go undetected unless prenatal care is started. Early treatment is also important, another reason to begin care early in the pregnancy.

Most psychosocial risk factors (smoking, previous pregnancy, less than eighth grade education) were related to poor outcomes but did not produce a considerable risk. Only lack of support showed an important risk of a poor birth outcome. This finding is not consistent with the literature that does show a predictive relationship between these risk factors (Abrams & Newman, 1991; Elster, 1984; Lee et al., 1988; US Dept. of HEW, 1973). Less is known about lack of support than the other factors, so this evidence provides good information to examine this risk factor in future research. The data for each of these factors is almost always obtained by self-

report of the mother on the birth certificate. There is always the problem of honesty and interpretation by the participant about how these questions should be answered.

Lack of support was a variable derived from the lack of an identified father of the baby on the birth certificate. Sometimes this fact actually means that the father is uninvolved or unknown. However, sometimes it means that the father is not identified because of the implications legally or financially or by family prohibition. The exact meaning can't be known for sure. Support, however is consistently a concern for teens in a crisis. It is not known whether support is best gained from the father of the baby, or whether other family and/or friends might provide this need. Two economic risk factors, living in an urban residence and in a higher income county were linked with significant risk for a poor outcome. This finding is also inconsistent with the literature that links poverty and rural residence with poor birth outcomes (Geronimus, 1986; Hayes, 1987; Ullman, 1996). The fact that Medicaid did not significantly predict poor outcomes is encouraging and may relate to improved access to services for Medicaid recipients. These findings also suggest that there are other factors, besides access to care, that are available in urban areas, that affect birth outcomes. It's possible that this variable is more related to other social problems, such as alienation that occurs among teens in the city, or crime, or fear of institutions.

The measure of income, the average household income in the county, demonstrated that urban counties had higher incomes than rural ones generally. Counties with higher income were more of a risk for poor outcomes than the lower

income counties, an unexpected finding. This measure seemed to mirror the measure of population, since urban, higher income counties were found to be more predictive of poor outcomes.

Most adolescent health services are located in larger urban areas, so this finding may make a case for reconsidering the effectiveness of these programs for identifying and getting pregnant teens into prenatal care. The changes in Medicaid, especially for pregnant women is a matter of concern in urban areas, where entry to care may be delayed because of enrollment delays.

Younger teens were no more likely to have a poor outcome than older teens. But all teens have poorer outcomes than mothers in their 20s. The literature routinely predicts lower birth weight and more prematurity in younger teens (Friede et al., 1987; Lee et al., 1988; McCormick et al., 1984; Zuckerman et al., 1983). Most studies support the conclusion that the ideal age for pregnancy is in the 20s (Fraser et al., 1995; Hollingsworth et al., 1983). These results are consistent with most population studies of similar groups, thus supporting the validity of the broad methodology. This finding also supports the need to target the teen population for specific pregnancy program policy and interventions, without neglecting the teens at either end of the spectrum—those under 15 and those over 17.

There were unexpected findings associated with race. White teens had slightly greater risk of a poor outcome associated with developmental risk factors. The literature indicates that prematurity, particularly, is higher among non-white races (Friede et al., 1987; Leland et al., 1995; Sappenfield et al., 1987). Race and age may

have an interaction, since more of the young teens, less than 18 years, having babies are non-white. However, it appears that when developmental risks are lowered or removed, the younger, non-white mothers can have healthy newborns. It is likely that this finding reflects the population demographics, since more white teens have babies than non-white teens. The frequency of developmental risk factors is comparable between the racial groups.

Non-white teens with lack of support were twice as likely to have a perinatal death. The number of perinatal deaths was very small in this population, so this finding is important. Black mothers have been found in other studies to experience an infant loss in the first month much more often than white mothers (Leland, et al., 1995; Sappenfield, 1987). Lack of support from fathers is also a phenomenon more often seen with non-white mothers. Perinatal death is traditionally viewed as a failure of the system to deliver good prenatal care that protects and improves the health of the mother and fetus. In order to change this situation the perinatal system must look at how to provide support for non-white teens which will improve their entry into prenatal care and compliance with health improving behaviors.

Non-white teens that live in higher income counties have a much greater risk of low birth weight outcome than those in lower income counties. These are phenomena that were not seen in other studies. Urban teen residents in Michigan are more often non-white and are poorer than white residents. Apparently economics are less predictive of poor outcome for this study than developmental or psychosocial factors. It is also not clear why non-white teens that live in the city are at a greater risk of low

birth weight, when the risk among the whole population of non-white teens is not predictive.

There were 41% more non-white teen mothers than non-white older mothers. This finding supports the literature that finds the rate of teen pregnancy in non-white is consistently higher than in white teens. There is less previous evidence to suggest that non-whites get pregnant at an earlier age.

Research Question 2: What interactions exist among the risk factors?

The additional statistical technique of logistic regression added weight to the previous conclusions. The advantage of this technique is the ability to predict a particular outcome based on the interaction of all risk factors. The developmental risks, weight gain, prenatal care and prenatal medical risks produced the greatest risk of low birth weight and pre term birth, with non-white race as a major contributor to these poor outcomes. Perinatal death, congenital anomalies, and abnormal conditions of the newborn are all linked to the developmental risks, but without the racial factor.

Logistic regression makes it possible to quantify the amount of risk of each vulnerability. Low weight gain produced twice the risk of pre term birth and abnormal conditions of the newborn, three times the risk of low birth weight and eleven times the risk of perinatal death. If all other variables are equal, low weight gain stands out as the greatest predictor of a poor birth outcome. Interventions focused on reducing this risk are likely to have the greatest rewards in terms of birth outcomes.

Research Question 3: Is there a difference between outcomes corresponding to the declining numbers of teen births from 1990-1997?

There were generally no differences that corresponded to declining numbers of teen births over the study period. The number of abnormal conditions of the newborn had a dip during 1995 which somewhat mirrored the number of live births that year but there is currently no explanation for that phenomenon. Since the declining birth rate is not affecting the rate of poor birth outcomes, interventions designed to reduce teen pregnancy alone are not sufficient to improve the birth outcomes.

Recommendations

Adolescent Specialty Care

Adolescence is the developmental time frame when many pediatricians ask their clients to find adult providers because they are uncomfortable dealing with issues of sexuality and pregnancy. This practice sets teens up for failure to start prenatal care early, failure to change dietary practices to meet demands of a growing fetus, and failure to provide early intervention for medical problems. These failures comprise the developmental risks found in this study to be the greatest predictors of poor birth outcomes. The health care system is an adult institution, which must be modified to appeal to teens, and to offer resources that seem worthwhile to teens.

Pediatricians identify numerous barriers to caring for adolescent patients, such as (a) lack of training in gynecological and pregnancy care, (b) lack of adequate

reimbursement, (c) lack of interest in gynecological/pregnancy care, (d) lack of training in adolescent health problems and (e) difficulty identifying referral sources for psychosocial problems. Other barriers are (a) lack of office accommodations to care for adolescents, (b) difficulty communicating effectively with adolescents, (c) discomfort with issues of confidentiality, and (d) discussing sensitive issues with adolescents (Brindis et al., 1997)

Adolescence is a specialty area of practice that should require special training (Gans Epner, 1996). Even office environments should be modified to reflect the needs of the adolescent client. There should be particular policies to assure confidential health services. Community and referral sources for psychosocial and mental health problems of teens are also needed. Adolescents need age-appropriate educational materials and as much time as possible devoted to promoting behavior change. Providers should also recognize the value of culturally-competent models of care and promote training and continuing education of professionals consistent with its approach. Because support of fathers was also important to the healthy outcome of teen pregnancy, adolescent males need to be included in strategies for services to teens. The urban environment is also a risk for teens who are pregnant, suggesting further collaboration with larger community improvement projects.

Pediatricians who incorporate Guidelines for Adolescent Preventive Services (Elster & Kuznets, 1994) in their practice will not only have a systematic and proven methodology for dealing with sexuality, but will encourage the healthy life style that is necessary to have healthy birth outcomes if that teen should become pregnant.

Among the objectives of this approach are (a) promoting parents' ability to respond to the health needs of their adolescents, (b) promoting adjustment to puberty and adolescence, (c) promoting healthy dietary habits and preventing eating disorders and obesity, (d) promoting healthy psychosexual adjustment and preventing the negative health consequences of sexual behaviors, (e) preventing the use of tobacco, alcohol and other drugs. Preventive health visits are recommended annually between ages 11 and 21, and a complete physical should be done three times during that period. Health guidance or education is considered the most effective strategy for changing behavior. The frequency of visits offers a means to identify health problems early for better management and the establishment of trust with a provider who can facilitate early access to prenatal care if needed.

Adolescent programs that provide age-specific support services are more likely to be effective than programs developed for older women. Comprehensive care that is user-friendly, nonjudgmental and confidential is important. Pregnancy testing, contraceptive care, and prenatal care should be readily available without financial or legal restrictions. Providers of care to adolescents need training for specific health issues, such as consent and confidentiality, coercive sex, counseling techniques, and teen sexuality. Teen pregnancies are considered high risk, a fact that potentially limits care to a smaller group of providers.

Pregnancy Support

Another important strategy is intensive outreach that identifies and links teens with primary care. Teens are unaccustomed to seeking health care. Teen mothers often feel there is a bias towards their age group in service delivery systems. Many teens also deny the responsibility for their own pregnancy, believing that others should provide for them. Focus group discussion with teens revealed that a few teen girls prefer to hide the pregnancy as long as possible for fear of retribution or as an extreme form of denial. Some teens choose to get pregnant because they want the love of a baby and the special attention a baby brings. Respondents thought that teen mothers didn't understand the seriousness of raising a child, and even acted as if having a child gave them an elevated status, or was calculated to help keep their boyfriends. Most respondents agreed that teen parenthood is undesirable, but African American teens seemed to find it acceptable under some circumstances (The National Campaign to Prevent Teen Pregnancy, 1999).

Outreach may best be done where teens spend most of their time-- in school. The Flint, Michigan Healthy Start project created a "Teen Express" card which is small enough to be put in a pocket, but contains phone numbers of resources for free pregnancy testing, information and referral. They are working on another card that will have signs of pre-term labor and other basic cues to seeking health care when pregnant. Peer educators and friends of Healthy Start will pass out cards to their friends and assure a wide distribution, to encourage broader education. An important key to success is involving adolescents directly in the planning and delivery of health

services. Once invested, teens tend to support and advocate for programs that work. Reproducing this program in other urban settings is recommended for improving support for teens.

Access to health care is also facilitated through school-based health clinics and school-linked health centers. Established as age-appropriate services, these settings have been growing in popularity because of their success in providing primary care at low cost and breaking down barriers through building trust and sensitivity on the part of providers.

The Michigan Department of Community Health helps support 19 clinics in the state, assuring high quality health care and health education. The Michigan Department of Education collaborates in this effort by helping to establish health curriculum and promoting the positive assets of adolescents. Training in adolescent development and asset-building strategies improves the ability of teachers to attend to teens with sensitivity and wisdom. Another challenge for school-based health centers is to become part of the evolving managed-care system and enhance access while producing outcomes that control cost.

Health care providers should foster the use of multidisciplinary teams to address the teen's multiple needs. Such is the design of the Maternal Support Services (MSS) program of Medicaid, which offers case management and advocacy from nurse, social worker and nutrition teams to high risk mothers. A resource mothers program which used paraprofessional women to provide social support to pregnant teens through home visiting found that teens were more likely to initiate

prenatal care early, to keep prenatal visits, and to have a term delivery (Rogers et al., 1996).

Comprehensive case management is the preferred program design for such projects as the Pinellas County Preconceptional Health Project in St. Petersburg, Florida (The American College of Obstetricians and Gynecologists, 1999). Teens seen through the pregnancy-testing clinic, who have a negative test, receive health risk assessment to determine the presence of health problems, substance abuse, and nutritional status. Education, counseling and referral services are provided including family planning. Case management is provided to encourage healthier lifestyles for the adolescent girl and her partner. The social support provided by case managers improves pregnancy outcomes by modifying the effects of stress through counseling, expressions of acceptance and understanding and helping women become part of supportive social networks (Rogers et al., 1996).

The National Teen Pregnancy Prevention Research Center team at the University of Minnesota is developing "Prime Time," a program for youth who have a negative pregnancy test. These teens, their parents, and partners are invited to participate in a variety of programs designed to promote healthy development and reduce the likelihood of becoming pregnant (Resnick, 1998). The mainstay of the program is the training of peer educators who act as mentors and role models, helping to build self-esteem, to gain skill in decision-making, to promote success in school, to develop new skills, and to develop new lasting relationships with caring adults. These qualities are expected to help delay unhealthy sexual relationships and foster

wiser decisions about pregnancy and parenting.

The roles of health care practitioners and educators can be complementary regarding improving the future for pregnant and parenting adolescents. School completion assures more options for employment and better decision-making ability. Pregnant and parenting adolescents in Pontiac, Michigan, identified the following barriers to regular school attendance (Guthrie, 1996):

1) Long-term incentives that facilitate economic stability (i.e. linkage to community colleges, universities, or technical schools);

2) Extending class options in Summer school curriculum, self-pacing modules or independent study options, homework hotline or Internet;

3) An ongoing support and monitoring system and access without a battery of questions; and

4) Outreach program for parents of teen mothers and classes on how to raise a healthy child.

A proposed program for these teens will aim at (a) delaying additional childbearing, (b) strengthening decision-making and communication skills, (c) gaining parenting skills that facilitate the healthy development of their children, (d) improving their children's developmental outcomes by providing high quality childcare, (e) providing health promotion and primary health care for teens and their children.

Collaborative Public Programs

The approach to the implementation of programs must be multi-layered. State level responsibilities include setting the policy agenda for teen pregnancy, including broad based initiatives that establish specific goals or guidelines for programs. State support also includes funding opportunities, the mandate for reporting, data collection and analysis. Local or community-based agencies, private providers, and others are the direct service component.

"Teenage pregnancy is a public health issue requiring interventions that address underlying issues—poverty, unemployment, abuse and neglect, and school success." (W.K. Kellogg Foundation, 1998, p. 9.) The strong association of support, urban residence, and non-white race to poor birth outcomes in this study requires action to institutionalize teen pregnancy as a sentinel event, alerting the health care system to a cascade of common societal ills. Thus it is prudent to recommend that teen pregnancy programs be more comprehensive in scope; addressing healthy birth outcomes plus preparation for financial stability, parenting in stressful times, and strategies to complete one's education. Collaboration between various disciplines and governmental entities is necessary to encourage inclusive strategies. Interventions need to start even before puberty to effectively deal with the disadvantaged and dysfunctional family situations that may predispose a teen to early pregnancy (Moore & Sugland, 1996). Prevention is always the best policy.

Comprehensive programs link students to health services, social services, counseling, and parenting education (Bartos & Theriault, 1997) with the goal of

school completion, improving employment, receiving optimum welfare benefits and improving parenting skills. Success demands intensive interaction between professional and teen with positive role models ensuring the best outcome (Marsh & Wirick, 1991). Of course this labor intensive approach is not without a large price tag.

The W.I.C. (Women, Infant, Children) nutrition program is an example of a multi-program collaborative effort. W.I.C. offers high quality education and food supplements to pregnant and parenting teens, since young age is an eligibility factor. Many health initiatives are using the excellent assessment capabilities of the WIC professional staff to monitor growth and development, whether prenatal care has been started, whether health problems are being treated, whether insurance coverage is available, etc. The Corner Health Center, a teen health clinic in Ypsilanti, Michigan, offers WIC services at the clinic to facilitate easy access for teens. The WIC programs in Detroit, Michigan, also provide teen-friendly nutrition services for the teen pregnancy programs in the city and alternative school programs there, including coupon pickup on Saturdays. Most counties also provide WIC services in their school programs for pregnant and parenting teens. Teens may not generally know about these services, so emphasis should be placed on outreach to teens. Information about services for pregnant teens should be part of the school resource packets and bulletin boards, etc.

This study demonstrated that there are differences between vulnerability of adolescent women. Collaborative service structure is important but must be flexible

to match the variety of needs of adolescent women. Customizing interventions to client needs is accomplished through assessment instruments that define the characteristics of an individual. An example of a screening process for teens is available from the Healthy Start Program of the Florida Department of Health. This system assesses psychosocial risk factors during pregnancy, which may adversely affect birth outcomes (The American College of Obstetricians and Gynecologists, 1999). The program also suggests brief interventions corresponding to the areas of concern raised by the screening. Figure 18 is an outline of the questions used to start a discussion with the teen about a variety of issues. Among the issues for teens are the following.

Psychosocial Screening Tool

1. Do you have any problems that prevent you from keeping your health care appointments?
2. How many times have you moved in the past 12 months?
3. Do you feel unsafe where you live?
4. Do you or any members of your household go to bed hungry?
5. In the past 2 months have you used any form of tobacco?
6. In the past 2 months, have you used drugs or alcohol (including beer, wine, or mixed drinks)?
7. In the past year, has anyone hit you or tried to hurt you?
8. How do you rate your current stress level – low or high?
9. If you could change the timing of this pregnancy, would you want it earlier, later, not at all, or no change?

Florida Healthy Start, Florida Department of Health, DH3134, September 1997

Figure 18. Florida's Psychosocial Screening Tool.

"Problems which prevent you from keeping your appointments", or barriers to care, are usually related to transportation difficulties, interference from a partner or parent, sometimes language barriers, and sometimes the perceived attitudes of providers toward teen pregnancy. Safety concerns are a growing problem for women and seriously affect the ability of some teen mothers to comply with prenatal appointments and other health recommendations during pregnancy. Nutrition issues were demonstrated in this study to be a significant factor in birth outcomes. Sometimes the issue is one of poverty and availability of good food. Sometimes the issue is trying to hide the pregnancy by refusing to eat. This tool also addresses tobacco, other substances, partner violence, generalized stress and unintended pregnancy. Each of these issues presents a problem for teens during pregnancy. The use of a tool like this could raise the awareness of the teen and the provider to situations for further intervention that may help improve pregnancy outcomes.

Collaborative programs that are comprehensive will also include pregnancy prevention strategies. Although this study did not demonstrate a significant impact of previous pregnancies on birth outcome, there is a growing interest in preventing another pregnancy for teen mothers, citing the added stress of poverty and parenting. The period of time just after a pregnancy is completed, while the baby is young, seems to be a teachable moment for most teens. As part of a parenting intervention and/or postpartum services, information should be shared on the reasons to delay the next pregnancy, and access to acceptable contraception should be provided.

Postponing further sexual activity when the teen is unmarried and/or the target

pregnancy was unintended, may be a worthwhile strategy. A number of youth remain abstinent during their teenage years, according to Kirby (1997), and the national trend is toward stabilization in the percent of youth who have sex. Consistent and correct use of contraception should also be promoted since sexual activity is often sporadic and youth often have sex without planning to do so. Adults in many different contexts need to address reproductive health issues, using the "teachable moment" concept. The declining pregnancy rate for women under 20 years of age suggests that adolescents may be learning that child rearing before high school completion is detrimental.

The most successful programs for pregnancy prevention engage peers to communicate the message. The most compelling message is the loss of their youth that teen parents experience. Contraceptive information should be available at clinic hours that are convenient to teens. This is usually right after school or on Saturday mornings. It helps if the clinic is located in a building that has some anonymity, such as a shopping mall or health complex. Confidentiality and privacy are the most important determinants of whether a teen will get family planning (Interview with David Dornan, 1999).

An excellent model of a collaborative strategy for teen pregnancy is the Flint, Michigan, Healthy Start project. Through the work of a community health center, and the city school system, a program for adolescent girls was begun with the goals of improving self-esteem, raising awareness of the consequences of pregnancy and parenting, and improving decision-making ability. Girls in middle school are

enrolled in a 15 week curriculum that stresses involvement with the facilitator, elevating ethnic pride, positive and responsible health-related decision-making and life skills, and personal contracting to postpone sexual activity. Girls participate in a graduation celebration at the end of the program to honor their achievement with artwork and a party with peers, parents and other significant adults. Girls who do become pregnant are identified early because of the acceptance of the staff, and helped into prenatal care and enrollment in the Medicaid Maternal Support Services program.

The Kalamazoo, Michigan, Healthy Start project also promotes pregnancy prevention in teens through peer educators, who train intensely on a wide variety of topics, then give assemblies and one-on-one information and referral options to other younger teens. This program also celebrates the successes and engages other teens through parties at the park and other special events.

Early Pregnancy Medicaid

Access to prenatal care may be hampered by availability of insurance for teen pregnancy and other financial constraints. Enrollment in Medicaid is time consuming and teens may wait until a card is issued before seeking care. Managed care requirements in Michigan have also increased the delay in enrollment by several months. An exception to managed care for women who are five months or more into the pregnancy has apparently had the negative effect of prolonging, rather than shortening, the access to coverage. Recent legislative proposals are offering a fee-

for-service option for all pregnant women beginning at any time and continuing until the pregnancy is complete. Incentives to starting prenatal care in the first trimester for teens would be a helpful addition to the legislation. The Medicaid outreach initiatives and MIChild (Michigan's child health insurance program), which covers non-Medicaid eligible teens, should also have incentives for finding pregnant teens in the first trimester.

Legislation has recently been introduced in Michigan to improve access to MSS (Michigan's Maternal Support Services program), by allowing self-referral to the program. This elimination of the necessity of medical referral may speed enrollment, but may not appreciably increase the number of services, due to ignorance on the part of the most at-risk populations, who need the service. The legislature is also considering eliminating the prior approval requirement. This provision may indeed increase services since the non-physicians themselves will have more control over the quantity and duration of services.

Welfare benefits were separated from Medicaid in 1996, but many welfare recipients were unaware that the health coverage was still available through a distinct enrollment process. The public education of this change has been slow, and potentially slows the access to care. Centers that provide adolescent services should continue to remind clientele of the new enrollment process.

TANF- Adolescent Plus

Recent changes in welfare benefits directly affect pregnant and parenting teens. The "Personal Responsibility and Work Opportunity Reconciliation Act of 1996," P.L. 104-193, includes a number of provisions that are directed at teen out-of-wedlock births and other teen behaviors including school participation and living arrangements. Many of the new law's teen provisions are included in Title I, Temporary Assistance for Needy Families (TANF). TANF is a block grant, which replaces the Aid to Families with Dependent Children (AFDC) welfare program. The TANF block grant is a frozen or near-frozen funding stream. It is not a program of cash grants. States implement TANF within certain federal guidelines, several of which are directed towards the reduction of teen births (Levin-Epstein, 1996).

Teen-related provisions in TANF include:

(1) Unmarried minor (through age 17) teen parents are required to live in adult-supervised settings;

(2) Unmarried minor teen parents of a child, 12 weeks or older, are required to stay in school;

(3) A family with an adult who receives TANF is limited to 60 cumulative months of assistance;

(4) The earnings of working students aged 18 and older can be used to limit the food stamp allotment.

Prohibitions on the use of TANF federal funds do not apply to the infant or child born to teen parents. States may exempt single parents with children under the

age of one from the school participation or work requirement. If the child is under six and the parent can not secure child-care, she is exempted from the school and work requirements.

A teen with a child is eligible for welfare only if she is living with a parent or caring adult. Though controversial, and perhaps reducing access to financial resources for some teens, the new policy has recognized the psychological and developmental needs of teens for support. As others have also found, teens who have a connection with parents and families consistently have fewer risky health behaviors such as smoking, alcohol and marijuana use and less violent behavior (Blum & Rinehart,1997). The state has the duty to provide, or assist the unmarried minor teen in locating a suitable living arrangement, when there is no adult parent, legal guardian, or adult relative or when such a placement would harm the teen. There are no funds to support alternative living arrangements, so it is up to the state to determine what is in the best interest of the teen. Exceptions to the adult-supervised setting may be warranted in some situations.

States have some flexibility in administering the stay-in-school requirement. The definition of "participation" and "satisfactory attendance" may be such to provide for equitable arrangements for teens. States also may determine whether the sanctions imposed on minor teens, who fail to meet requirements, will be the same as for older teens. States also determine what type of education is required of the minor teen. States may also choose to waiver the stay-in-school provision. Though child-care is not a requirement, states may opt to improve access for teens, such as giving

incentives for locating child-care in school-based or near-school centers. Transportation is also not part of TANF, but could be added as an access option for teens.

A minor teen mother is only subject to the 60-month limit if she is the head of a household or when she is married to the household head. Teen mothers who are 18 years and full-time secondary school students are exempt from the limits. The state has discretion in defining "head of household." Because heads of households are counted in the participation rate for the state, there is a conflict between numbers and providing the best for the most vulnerable population. Minors who are heads of households may be subject to withdrawal of Medicaid if they default on the work requirement.

Lifetime caps on benefits may further hamper teens in gaining financial security. Though attending school is a desired goal for teens, insensitivity to the problems of parenting teens may limit resources. This study suggests a number of strategies to protect the development and well being of poor adolescents:

(1) Link the availability of Medicaid enrollment and welfare application to make the process less time consuming and difficult;

(2) Food subsidies should be available to assist mothers who are working and going to school to improve the nutritional status of mother and baby;

(3) Prenatal care and parenting classes should be considered appropriate ways to meet work and school requirements;

(4) Adequate supports for transportation and child care should be provided;

(5) Adequate housing to meet the needs of a new baby is essential;

(6) Ensure adolescents full access to comprehensive teen pregnancy programs through a dedicated teen health promoter located in the social service agencies.

Several policy initiatives have been implemented over the last few years and seem to have contributed to an improvement in the risk profile of young women who are having babies. The most common feature of this policy direction is the concentrated focus on the population at greatest risk for adverse pregnancy outcomes. It is designed to impact on the teen's ability to (a) access care, (b) maintain continuous care, and (c) reduce risks while in care. Policy options should acknowledge the complexities of changing behaviors, habits, and expectations, and they should foster coordination and collaboration with communities to address complex problems (W.K. Kellogg Foundation, 1998).

Health policy in the State of Michigan is pulled by federal guidelines for the Title V Maternal Child Health Block Grant, which brings $21M to the state annually, and is bolstered by over $76M of state funds. Application for the funds is made each year through an assessment of the success in meeting a set of health priorities, called Healthy People 2010 objectives. States negotiate a set of additional priorities, which round out the state health agenda. For many years the agenda has defined a goal for reduction of teen pregnancies. The 2010 objective is to reduce pregnancies among females ages 15-17 to no more than 50 per 1,000. Unfortunately the poor outcomes associated with teen pregnancy, and the impact on the social, psychological,

educational and economic future of the adolescent has not been addressed. There are objectives related to low birth weight, pre-term birth and congenital anomalies for all pregnancies. Unfortunately this policy fails to target adolescents.

A policy agenda for adolescent health in Michigan should be built around the identified problem of teen pregnancy, but be comprehensive enough to address healthier lifestyles for all teens as a condition of a healthier adult society.

The framework for improving the outcomes of teen pregnancy requires interpreting events in the context of adolescent development, a psychosocial dynamic. Medical expertise is not enough. Interventions for teens who are pregnant fall short. Health care for adolescents must be comprehensive in nature (Serrano, 1993). Challenges for policy makers include (a) reducing inequalities in opportunities for health and development of adolescents, (b) increasing the levels of prevention services, and (c) strengthening the mechanisms for meeting the biological and psychosocial needs of adolescents. Mechanisms to promote the health, well-being and development of adolescents must include (a) progressively attaining interest in overall health, (b) engaging peers and families of teens in promoting health, and (c) acting on the environments where teens are active (school, recreation, church, etc.) to make them healthier.

Future Research

Several questions were raised by the current study which, if researched further, would help clarify the at risk behaviors of teens. The medical conditions of

teen mothers themselves were found to put their babies at risk. An expanded analysis may help to determine what conditions are most important, and what outcomes are predicted.

In order to further delineate program and policy development, research must examine the content of the services provided for non-pregnant and pregnant teens. This study was unable to determine reasons why teens did not seek prenatal care early and routinely. It was also unable to determine what factors were involved in noncompliance with risk lowering information. More study of attitudes and satisfaction of teens with particular styles and content of services would aid program development strategies.

The measurement of psychosocial vulnerability in teenagers was limited in this study. Since the psychological and emotional nature of teenagers is related to success of their passage through this stage of development, the availability of other measures to assess this impact on pregnancy outcome is warranted.

The availability of social support of the baby's father was an important factor in predicting outcomes of pregnancy in this study. To more clearly understand the dynamics of this phenomenon, further research should be done to sort out why this is true. Dunifon (1999) suggests that fathers tend to be two to three years older than the mothers. Fathers also tend to be poor, the products of teenage pregnancy themselves and have low levels of educational attainment. Half of all teenage fathers live with their children at some time during their childhood, but often these periods of co-residence do not last long. She indicates that little is known, however, about the

psychological influence of the father during pregnancy or after.

Extensive research has been commissioned through the federal government and private foundations regarding teen pregnancy. Most experts agree that we have baseline data about the depth and extent of adolescent health problems. What we need is more information about useful applications of what we know to move decision-makers in communities, organization, and institutions to productive action. Research can inform us of the impact of action and inaction in social and economic programming. Program evaluation of teen pregnancy intervention strategies is lacking (Moore & Sugland, 1996). Process evaluations are helpful to program designers in knowing whether intended services are being delivered, to whom, and in what amounts. An impact (outcome) evaluation, however, is the only evaluation design that can provide information about the effect of a given program. Rigorous experimental design will afford more informed decision-making on how to allocate public resources for adolescent programming.

Having extensive data does not always result in implementing better policies, designing programs differently, or improving the health status of pregnant teens. There must be a stronger connection between research, policy, and programming. Rather than gathering more data to substantiate the depth of teen pregnancy problems, applied research—research that systematically examines community change practices and policies—offers more promising directions.

Table 17 summarizes the research findings of this study and the recommendations made in a chart format. Information gained from this study of teen

pregnancy outcomes in Michigan has helped to identify the most important sources of risk, and to target the interventions for program development and policy implementation. Additional input from the future research as described, will enrich the ability of administrators to plan for and deliver high quality services for pregnant teens. It is encouraging that most teens tend to deliver healthy babies, and that the teen birth rate in Michigan is declining. While we take pride in accomplishments, there is still much that can be done to address the unanswered questions and improve the expectations of giving birth as a teenager.

Table 17

Developmental, Psychosocial and Economic Predictors of Healthy Newborns in Michigan's Teenage Pregnancies

FINDINGS	RECOMMENDATIONS
Teens of all ages or race who have low weight gain, inadequate prenatal care or a prenatal medical condition are 2-3 times more likely to have a poor birth outcome than those without these risks.	• Promote teen specialty practice for physicians and use of GAPS materials. • Link Medicaid enrollment and welfare application to make the process less time consuming and difficult. • Provide teen-friendly nutrition services. • Food subsidies should be available for mothers who are working and going to school. • TANF should allow teens to meet work and school requirements through prenatal care and parenting classes. • TANF should include transportation, child care, and housing support. • Locate a teen health promoter in the social service agencies. • Further study of: 1) reasons why teens d not seek prenatal care early and routinely, 2) factors involved in noncompliance with risk lowering information, 3) attitudes of teens with particular styles and content of services.
Teens without an identified father of the baby are at greater risk of a poor birth outcome than those without this risk.	• Promote school completion to improve economic stability of parenting teen. • Locate suitable living arrangement for teens on welfare.

	• Give incentives to locate child-care in school-based centers. • Add transportation as an optional TANF benefit for teens. • Exempt single teens with infants from the TANF school participation or work requirement. • Find other measures to assess the impact of adolescent development on pregnancy outcome.
Teens who live in counties with denser population and higher median income levels are at greater risk of a poor birth outcome than those who live in less populated counties with lower median income.	• Community improvement projects to focus on teen health. • Policy development to: 1) reduce inequalities in opportunities for health and development of adolescents, 2) increase prevention services, 3) strengthen the means to meet biological and psychosocial needs of adolescents. • Policy development that considers teen's ability to: 1) access care, 2) maintain continuous care, 3) reduce risks while in care, 4) acknowledge the complexities of changing behaviors, habits, and expectations, 5) foster coordination and collaboration with communities.
Teens less than 18 had no worse outcomes than 18-19 year old teens.	• Institutionalize teen pregnancy as a sentinel event for public health intervention. • Link teens to health services, social services, counseling, and parenting education with the goal of school completion, improving employment, receiving optimum welfare benefits and improving parenting skills. • Customize interventions through teen-specific assessment tools. • Develop program objectives related to the social, psychological, educational and economic future of the parenting teen.

White teens that have low weight gain, inadequate prenatal care or a prenatal medical condition are more likely to have a poor birth outcome than non-white teens.	• Train providers in adolescent development and asset-building strategies to improve services to teens. • Provide case management for teens to improve outcomes. • Provide incentives for finding pregnant teens in the first trimester. • Promote a fee-for-service option for pregnant teens to speed Medicaid enrollment. • Target teens in HP2010 objectives for improving these risks.
Non-white teens without an identified father of the baby are more likely to have a perinatal death than white teens.	• Postpartum services should share information on reasons to delay the next pregnancy, and access to contraception. • Eliminate prior approval for MSS/ISS and market to teens. • Further research regarding the psychological influence of the father during pregnancy or after.
Non-white teens that live in counties with a higher median income are more likely to have a low birth weight baby than those who live in lower median income counties.	• Promote school programs to elevate ethnic pride, to improve health-related decision-making and life skills, and to postpone sexual activity. • Program evaluation of teen pregnancy intervention strategies. • Policy development to: 1) promote overall health of teens, 2) engage peers and families of teens in promoting health, 3) act on the environments where teens are active (school, recreation, church, etc.) to make them healthier.

Appendix A

Birth Certificate, State of Michigan

STATE OF MICHIGAN
DEPARTMENT OF PUBLIC HEALTH 49

CERTIFICATE OF LIVE BIRTH

121 - ______ STATE FILE NUMBER
0711084

CHILD

1 CHILD - NAME (FIRST) (MIDDLE) (LAST)

2 SEX M

3a PLURALITY - SINGLE, TWIN, TRIPLET, ETC (SPECIFY)

3b IF NOT SINGLE - BORN 1ST 2ND, 3RD, ETC (SPECIFY)

4a DATE OF BIRTH (Month Day Year)

4b TIME OF BIRTH

PLACE

5a HOSPITAL NAME - (IF NOT HOSPITAL GIVE STREET AND NUMBER)

5b CITY, VILLAGE OR TOWNSHIP OF BIRTH

5c COUNTY OF BIRTH

CERTIFICATION

6a I CERTIFY THAT THE ABOVE NAMED CHILD WAS BORN ALIVE AT THE PLACE AND TIME AND ON THE DATE STATED ABOVE

SIGNATURE ______ DATE ______

6b CERTIFIER'S NAME & TITLE (print or type)

6c NAME AND TITLE OF ATTENDANT IF OTHER THAN CERTIFIER

6d MAILING ADDRESS OF ATTENDANT (STREET NO CITY OR VILLAGE STATE ZIP)

7a REGISTRAR'S SIGNATURE

7b DATE RECEIVED BY LOCAL REGISTRAR - (Month Day Year)

MOTHER

BY AUTHORITY ACT 368, P.A 1978

8a MOTHER'S NAME (FIRST, MIDDLE, LAST)

8b SOCIAL SECURITY NUMBER

8c STATE OF BIRTH - NAME COUNTRY IF NOT USA

8d DATE OF BIRTH (Month Day Year)

8e MOTHER - SURNAME BEFORE FIRST MARRIED

8f RESIDENCE (Check one box and specify) [redacted]

☐ INSIDE CITY OR VILLAGE OF

☐ TWP OF

8g COUNTY

8h STATE

FATHER

9a FATHER'S NAME (FIRST, MIDDLE, LAST)

9b SOCIAL SECURITY NUMBER

9c STATE OF BIRTH - NAME COUNTRY IF NOT USA

9d DATE OF BIRTH (Month Day Year)

B213 (9/90)
MDPH

10a I CERTIFY THAT THE PERSONAL INFORMATION PROVIDED ON THIS CERTIFICATE IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF

SIGNATURE ______
(PARENT OR OTHER INFORMANT)

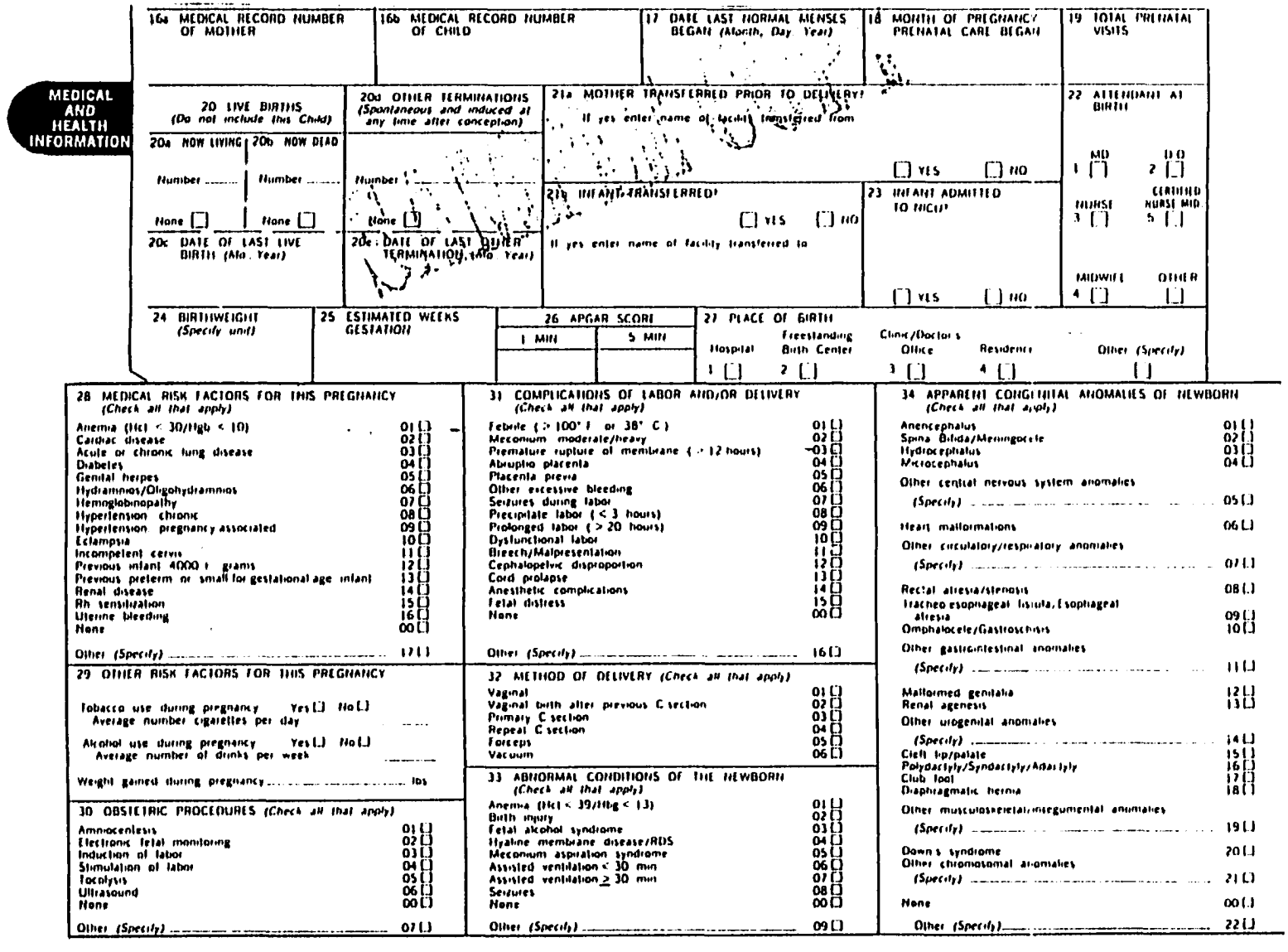
10b THE PARENT(S) REQUEST THAT INFORMATION ON THIS BIRTH BE RELEASED TO THE SOCIAL SECURITY ADMIN FOR ISSUANCE OF A SOCIAL SECURITY NUMBER AND CARD

☐ YES ☐ NO

	11 ANCESTRY - Mexican, Puerto Rican, Cuban, Central or South American, Chicano, other Hispanic, Afro American, Arab, English, French, Finnish, etc (Specify below)	12 RACE - American Indian, Black, White, etc If Asian, give nationality i.e., Chinese, Filipino, Asian Indian, etc (Specify below)	13 EDUCATION (Specify only highest grade completed) Elementary/Secondary (0-12) College (1-4 or 5+)
MOTHER	11a	12a	13a
FATHER	11b	12b	13b

14 EXPECTED SOURCE OF PAYMENT FOR MEDICAL SERVICES (Private Insurance, Medicaid, etc)

15 MOTHER'S MAILING ADDRESS (STREET NUMBER CITY OR VILLAGE STATE ZIP)



MEDICAL AND HEALTH INFORMATION

16a MEDICAL RECORD NUMBER OF MOTHER

16b MEDICAL RECORD NUMBER OF CHILD

17 DATE LAST NORMAL MENSES BEGAN (Month, Day, Year)

18 MONTH OF PREGNANCY PRENATAL CARE BEGAN

19 TOTAL PRENATAL VISITS

20 LIVE BIRTHS (Do not include this Child)

20a NOW LIVING — Number ____ None [ ]

20b NOW DEAD — Number ____ None [ ]

20c DATE OF LAST LIVE BIRTH (Mo., Year)

20d OTHER TERMINATIONS (Spontaneous and induced at any time after conception) — Number ____ None [ ]

20e DATE OF LAST OTHER TERMINATION (Mo., Year)

21a MOTHER TRANSFERRED PRIOR TO DELIVERY? [ ] YES [ ] NO

If yes enter name of facility transferred from

21b INFANT TRANSFERRED? [ ] YES [ ] NO

If yes enter name of facility transferred to

23 INFANT ADMITTED TO NICU? [ ] YES [ ] NO

22 ATTENDANT AT BIRTH

MD 1 [ ] DO 2 [ ]

NURSE 3 [ ] CERTIFIED NURSE MID 5 [ ]

MIDWIFE 4 [ ] OTHER [ ]

24 BIRTHWEIGHT (Specify unit)

25 ESTIMATED WEEKS GESTATION

26 APGAR SCORE — 1 MIN | 5 MIN

27 PLACE OF BIRTH — Hospital 1 [ ] Freestanding Birth Center 2 [ ] Clinic/Doctor's Office 3 [ ] Residence 4 [ ] Other (Specify) [ ]

28 MEDICAL RISK FACTORS FOR THIS PREGNANCY (Check all that apply)

Anemia (Hct < 30/Hgb < 10)	01 [ ]
Cardiac disease	02 [ ]
Acute or chronic lung disease	03 [ ]
Diabetes	04 [ ]
Genital herpes	05 [ ]
Hydramnios/Oligohydramnios	06 [ ]
Hemoglobinopathy	07 [ ]
Hypertension chronic	08 [ ]
Hypertension pregnancy associated	09 [ ]
Eclampsia	10 [ ]
Incompetent cervix	11 [ ]
Previous infant 4000 + grams	12 [ ]
Previous preterm or small for gestational age infant	13 [ ]
Renal disease	14 [ ]
Rh sensitization	15 [ ]
Uterine bleeding	16 [ ]
None	00 [ ]
Other (Specify)	17 [ ]

29 OTHER RISK FACTORS FOR THIS PREGNANCY

Tobacco use during pregnancy Yes [ ] No [ ]
Average number cigarettes per day ____

Alcohol use during pregnancy Yes [ ] No [ ]
Average number of drinks per week ____

Weight gained during pregnancy ____ lbs

30 OBSTETRIC PROCEDURES (Check all that apply)

Amniocentesis	01 [ ]
Electronic fetal monitoring	02 [ ]
Induction of labor	03 [ ]
Stimulation of labor	04 [ ]
Tocolysis	05 [ ]
Ultrasound	06 [ ]
None	00 [ ]
Other (Specify)	07 [ ]

31 COMPLICATIONS OF LABOR AND/OR DELIVERY (Check all that apply)

Febrile (> 100° F or 38° C)	01 [ ]
Meconium moderate/heavy	02 [ ]
Premature rupture of membrane (> 12 hours)	03 [ ]
Abruptio placenta	04 [ ]
Placenta previa	05 [ ]
Other excessive bleeding	06 [ ]
Seizures during labor	07 [ ]
Precipitate labor (< 3 hours)	08 [ ]
Prolonged labor (> 20 hours)	09 [ ]
Dysfunctional labor	10 [ ]
Breech/Malpresentation	11 [ ]
Cephalopelvic disproportion	12 [ ]
Cord prolapse	13 [ ]
Anesthetic complications	14 [ ]
Fetal distress	15 [ ]
None	00 [ ]
Other (Specify)	16 [ ]

32 METHOD OF DELIVERY (Check all that apply)

Vaginal	01 [ ]
Vaginal birth after previous C section	02 [ ]
Primary C section	03 [ ]
Repeat C section	04 [ ]
Forceps	05 [ ]
Vacuum	06 [ ]

33 ABNORMAL CONDITIONS OF THE NEWBORN (Check all that apply)

Anemia (Hct < 39/Hbg < 13)	01 [ ]
Birth injury	02 [ ]
Fetal alcohol syndrome	03 [ ]
Hyaline membrane disease/RDS	04 [ ]
Meconium aspiration syndrome	05 [ ]
Assisted ventilation < 30 min	06 [ ]
Assisted ventilation ≥ 30 min	07 [ ]
Seizures	08 [ ]
None	00 [ ]
Other (Specify)	09 [ ]

34 APPARENT CONGENITAL ANOMALIES OF NEWBORN (Check all that apply)

Anencephalus	01 [ ]
Spina Bifida/Meningocele	02 [ ]
Hydrocephalus	03 [ ]
Microcephalus	04 [ ]
Other central nervous system anomalies (Specify)	05 [ ]
Heart malformations	06 [ ]
Other circulatory/respiratory anomalies (Specify)	07 [ ]
Rectal atresia/stenosis	08 [ ]
Tracheo esophageal fistula, Esophageal atresia	09 [ ]
Omphalocele/Gastroschisis	10 [ ]
Other gastrointestinal anomalies (Specify)	11 [ ]
Malformed genitalia	12 [ ]
Renal agenesis	13 [ ]
Other urogenital anomalies (Specify)	14 [ ]
Cleft lip/palate	15 [ ]
Polydactyly/Syndactyly/Adactyly	16 [ ]
Club foot	17 [ ]
Diaphragmatic hernia	18 [ ]
Other musculoskeletal/integumental anomalies (Specify)	19 [ ]
Down's syndrome	20 [ ]
Other chromosomal anomalies (Specify)	21 [ ]
None	00 [ ]
Other (Specify)	22 [ ]

BIBLIOGRAPHY

Abrams, B. & Newman, V. (1991). Small-for-gestational-age birth: maternal predictors and comparison with risk factors of spontaneous preterm delivery in the same cohort. American Journal of Obstetrics and Gynecology. 164. 785-790.

Adams, G. R., Gullotta, T. P. & Montemayor, R. (Ed.). (1992). Adolescent Identity Formation. Newbury Park, CA: Sage Publications, Inc.

Bartos, J. & Theriault, J.C. (1997). Enhancing the Design of High School Completion Programs for Pregnant and Parenting Teens. Unpublished report, The University of Michigan, Ann, Arbor, MI.

Blum, R.W. & Rinehart, P.M. (1997). Reducing the Risk: Connections that Make a Difference in the Lives of Youth. Monograph of the Division of General Pediatrics & Adolescent Health, University of Minnesota.

Bongiovanni, A. M. (Ed.). (1983). Adolescent Gynecology: A Guide for Clinicians. New York: Plenum Medical Book Company.

Brindis, C.D., Irwin, C.E., Ozer, E.M., Handley, M., Knopf, D.K., & Millstein, S.G. (1997). Improving Adolescent Health: An Analysis and Synthesis of Health Policy Recommendations. San Francisco, CA: University of California. San Francisco. National Adolescent Health Information Center.

Centers for Disease Control and Prevention (1998). PRAMS 1995 Surveillance Report. Atlanta, GA: Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention.

Davis, R. L., Tollestrup, K. & Milham, S. (1990). Trends in teenage smoking during pregnancy. American Journal of Diseases in Children, 144. 1297-1301.

Demaris, A. (1992). Logit Modeling: Practical Applications. Newbury Park, CA: Sage Publications, Inc.

Dornan, D. (2000). Family Planning consultant, Michigan Department of Community Health, Interview.

Dunifon, R. (1999). Recent evidence on adolescent pregnancy has implications for future research. Poverty Research News, 110 (4), 19-22

Elster, A. (1984). The effect of maternal age, parity, and prenatal care on perinatal outcome in adolescent mothers. American Journal of Obstetrics and Gynecology, 149 (8), 845-47.

Elster, A.B. & Kuznets, N.J. (1994). AMA Guidelines for Adolescent Preventive Services (GAPS): Recommendations and Rationale. Baltimore: Williams & Wilkins.

Erikson, E. (1968). Identity, Youth and Crisis. New York: W. W. Norton & Co.

Erikson, E. H. (1982). The Life Cycle Completed: A Review. New York: Norton.

Fletcher, R., Fletcher, S. & Wagner, E. (1988). Clinical Epidemiology, the Essentials, 2nd ed. Baltimore: Williams & Wilkins.

Fraser, A. M., Brockert, J. E. & Ward, R. H. (1995). Association of young maternal age with adverse reproductive outcomes, The New England Journal of Medicine, 332 (17), 1113-1117.

Friede, A., Baldwin, W., Rhodes, P. H., Buehler, J. W., Strauss, L. T., Smith, J. C. & Hogue, C. J. (1987). Young maternal age and infant mortality: the role of low birth weight, Public Health Reports, 102 (2). 192-199.

Gans Epner, J.E. (Ed.), (1996). Policy Compendium on Reproductive Health Issues Affecting Adolescents. American Medical Association.

Geronimus, A. T. (1986). The effects of race, residence, and prenatal care on the relationship of maternal age to neonatal mortality. American Journal of Public Health, 76 (12). 1416-1421.

Gillmore, M.R., Lewis, S.M., Lohr, M.J., Spencer, M.S. & White, R.D. (1997). Repeat pregnancies among adolescent mothers. Journal of Marriage and the Family, 59 (8): 536-550.

Green, M. (Ed.), (1994). Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents. Arlington, VA: National Center for Education in Maternal and Child Health.

Group for the Advancement of Psychiatry (1986). Teenage Pregnancy: Impact on Adolescent Development. New York: Brunner/Mazel Publishers.

Guthrie, B.J. (1996). Pregnancy Task Force Report. School District of the City of Pontiac.

Haiek, M. D. & Lederman, S. A. (1988). The relationship between maternal weight for height and term birth weight in teens and adult women. Journal of Adolescent Health Care, 10, 16-22.

Hayes, C. D. (Ed.). (1987). Risking the Future: Adolescent Sexuality, Pregnancy and Childbearing. Washington. DC: National Academy Press.

Hellerstedt, W. L. & Story, M. (1998). Adolescent satisfaction with postpartum contraception and body weight concerns. Journal of Adolescent Health,19. 39-45.

Hogan, V. K. (1984). An Assessment of the Delivery of Medical and Psychosocial Interventions through Public Prenatal Clinics and Measurement of their Impact on Preterm Birth, Unpublished doctoral dissertation, University of North Carolina, Chapel Hill.

Hollingsworth, D. R., Kotchen, J. M. & Felice, M. R. (1983). Impact of gynecologic age on outcome of adolescent pregnancy. In E. R. McAnarney (Ed.), Premature Adolescent Pregnancy and Parenthood (pp. 168-189). New York: Grune & Stratton.

Horon, I. L., Strobino, D. M. & MacDonald, H. M. (1983). Birth weights among infants born to adolescent and young adult women, American Journal of Obstetrics and Gynecology. 146. 444-449.

Hosmer, D. W. & Lemeshow, S. (1989). Applied Logistic Regression. New York: John Wiley & Sons.

Institutes of Medicine (1985). Preventing Low Birthweight. Committee to Study the Prevention of Low Birthweight. Division of Health Promotion and Disease Prevention. Washington. DC: National Academy Press.

Kalmuss, D. S. & Namerow, P. B. (1994). Subsequent childbearing among teenage mothers: the determinants of a closely spaced second birth. Family Planning Perspectives, 26. 149-153.

Ketterlinus, R. D., Henderson, S. H. & Lamb, M. E. (1990). Maternal age, sociodemographics, prenatal health and behavior: influences on neonatal risk status. Journal of Adolescent Health Care. 11. 423-431.

Kids Count in Michigan 1996 Data Book. (1996). Lansing, MI.

Kist, K. & Forrest J. D. (1995). Intention status of U.S. births in 1988: differences by mother's socioeconomic and demographic characteristics. Family Planning Perspectives. 27. 11-17.

Klerman, L.V. (1993). Adolescent pregnancy and parenting: controversies of the past and lessons for the future. Journal of Adolescent Health. 14. 553-561.

Kramer, M. S. (1987). Intrauterine growth and gestational duration determinants. Pediatrics. 80. 502-510.

Lancaster, J. B. & Hamburg B. A. (Eds.). (1986). School-Age Pregnancy and Parenthood. Hawthorne, NY: Aldine DeGruyter.

Lauber, C. (1982). Body Image in Adolescents, Aged 14-16 Years, Unpublished master's thesis, Michigan State University, East Lansing, MI.

Lee, K., Ferguson, R. M., Corpuz, M. & Gartner, L. M. (1988). Maternal age and incidence of low birth weight at term: a population study. American Journal of Obstetrics and Gynecology. 15 (8). 4-9.

Leland, N. L., Petersen, D. J., Braddock, M. & Alexander, G. R. (1995). Variations in pregnancy outcomes by race among 10-14 year old mothers in the United States. Public Health Reports. 110 (1). 53-58.

Levin-Epstein, J. (1996). Teen Parent Provisions in the Personal Responsibility and Work Opportunity Reconciliation Act of 1996. Washington, DC: Center for Law and Social Policy.

Lindsay, L. & Rodine, S. (1989). Teen Pregnancy Challenge: Strategies for Change. Buena Park, CA: Morning Glory Press.

Maynard, R.A. (1997). Kids Having Kids: Economic Costs and Social Consequences of Teen Pregnancy. Washington, DC: Urban Institute Press.

Marsh, J.C. & Wirick, M.A. (1991). Evaluation of Hull House teen pregnancy and parenting program. Evaluation and Program Planning. 14. 49-61.

McCormick, M., Shapiro, S, & Starfield, M. (1984). High risk young mothers: infant mortality in four areas in USA. American Journal of Public Health. 74. 18-23.

McKinney, F., Lorion, R. P. & Zax, M. (1976). Effective Behavior and Human Development. New York: Macmillan Publishing Co., Inc.

Moore, K.A. & Sugland, B.W. (1996). Next Steps and Best Bets: Approaches to Preventing Adolescent Childbearing. Washington, DC: Child Trends, Inc.

Naeye, R. L. (1981). Teenaged and pre-teenaged pregnancies: consequences of the fetal-maternal competition for nutrients. Pediatrics. 67 (1). 146-150.

O'Campo, P. & Rojas-Smith, L. (1998). Welfare Reform and Women's Health: Review of the Literature and Implications for State Policy. Baltimore: Women's and Children's Health Policy Center, Johns Hopkins University.

Paneth, N., Wallenstein, S., Kiely, J. L. & Susser, M. (1982). Social class indicators and mortality in low birth weight infants. American Journal of Epidemiology. 116 (3). 364-375.

Resnick, M.D. (1998, Winter). Prime time: getting help to youth in time. ...psst*. 1, 4-5.

Rogers, M. M., Peoples-Sheps, M. D. & Suchindran, C. (1996). Impact of a social support program on teenage prenatal care use and pregnancy outcomes. Journal of Adolescent Health. 19. 132-140.

Sappenfield, W. M., Buehler, J. W., Binkin, N. J., Hogue, C. J., Strauss, L. T. & Smith, J. C. (1987). Differences in neonatal and postneonatal mortality by race, birth weight, and gestational age. Public Health Reports. 102 (2).182-191.

Scholl, T. O. & Hediger, M. L. (1995). Weight gain, nutrition, and pregnancy outcome: findings from the Camden study of teenage and minority gravidas. Seminars in Perinatology. 19 (3). 171-181.

Serrano, C.V. (1993). A conceptual framework for understanding "problems" in adolescence and youth. Journal of Adolescent Health, 14. 613-618.

Sexton, M. & Hebel, R. (1984). A clinical trial of change in maternal smoking and its effect on birth weight, Journal of the American Medical Association. 251 (7). 911-915.

Shi, L. (1992). The impact of increasing intensity of health promotion intervention on risk reduction. Evaluation and the Health Professions. 15 (4). 3-24.

Singh, G. K. & Yu, S. M. (1995). Infant mortality in the United States: Trends, differentials, and projections, 1950 through 2010. American Journal of Public Health. 85. 957-964.

Stevens-Simon, C. & McAnarney, E.R. (1993). Skeletal maturity and growth of adolescent mothers: relationship to pregnancy outcome. Journal of Adolescent Health, 13, 428-432.

Stevens-Simon, C., Nakashima, I. I. & Andrews, D. (1993). Weight gain attitudes among pregnant adolescents. Journal of adolescent Health, 14. 369-372.

Story, M. & Alton, I. (1995). Nutrition issues and adolescent pregnancy. Nutrition Today. 30 (4). 142-151.

Super, C. M. (1986). A developmental perspective on school-age parenthood. In J. B. Lancaster and B. A. Hamburg (Eds.); School-Age Pregnancy and Parenthood: Biosocial Dimensions (pp. 379-386). .New York: Aldine De Gruyter.

The American College of Obstetricians and Gynecologists. (1999, November). Psychosocial risk factors: perinatal screening and intervention. ACOG Educational Bulletin, 255. Washington, DC: The American College of Obstetricians and Gynecologists.

The National Campaign to Prevent Teen Pregnancy (1999). Where Are the Teens? Research on What Teens Say about Teen Pregnancy. A Focus Group Report. Washington, DC: Author.

Ullman, F. (1996). Enhanced prenatal care services and medicaid managed care. Issue Brief of the National Governors Association: 1-5.

US Dept. of Health Education and Welfare (1973). The Health Consequences of Smoking. Washington, DC: Public Health Service, chapter 4.

US Dept of Health, Education and Welfare (1979). Smoking and Health: A Report of the Surgeon General (DHHS Publication No. 79:50066).Washington, DC: Public Health Service.

Waterman, A. S. (1992). Optimal psychological functioning, In G.R Adams, T.P Gullotta & R. Montemayor (Eds.). Adolescent Identity Formation (pp. 50-72). Newbury Park, CA: Sage Publications.

Watkins, M. L., Edmonds, L., McClearn, A., Mullins, L., Mulinare, J. & Khoury, M. (1996). The surveillance of birth defects: the usefulness of the revised US standard birth certificate. American Journal of Public Health. 86 (5). 731-734.

W.K. Kellogg Foundation (1998). Safe Passages Through Adolescence: Communities Protecting the health and Hopes of Youth. Battle Creek, MI.

Zuckerman, B., Alpert, J. J., Dooling, E., Hingson, R., Kayne, H., Morelock, S. & Oppenheimer, E. (1983). Neonatal outcome: is adolescent pregnancy a risk factor? Pediatrics. 71 (4). 489-493.