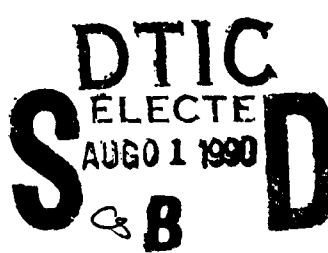


REPORT DOCUMENTATION PAGE

AD-A224 479

Public reporting burden for this collection of information is estimated to average 1 hour per response, including gathering and maintaining the data needed, and completing and reviewing the collection of information. Send collection of information, including suggestions for reducing this burden, to Washington Headquarters Service, Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0707-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 1990		3. REPORT TYPE AND DATES COVERED Thesis/Dissemination	
4. TITLE AND SUBTITLE THE INFLUENCE OF PARITY ON THE OUTCOMES OF PREGNANCY				5. FUNDING NUMBERS	
6. AUTHOR(S) LINDA L. ALDOUS					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AFIT Student at: Univ of Utah				8. PERFORMING ORGANIZATION REPORT NUMBER AFIT/CI/CIA - 90-048	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) AFIT/CI Wright-Patterson AFB OH 45433				10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for Public Release IAW AFR 190-1 Distribution Unlimited ERNEST A. HAYGOOD, 1st Lt, USAF Executive Officer, Civilian Institution Programs				12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)					
					
14. SUBJECT TERMS				15. NUMBER OF PAGES 141	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED		18. SECURITY CLASSIFICATION OF THIS PAGE		19. SECURITY CLASSIFICATION OF ABSTRACT	
20. LIMITATION OF ABSTRACT					

90 070

THE INFLUENCE OF PARITY ON THE
OUTCOMES OF PREGNANCY

by
Linda L. Aldous

A thesis submitted to the faculty of
The University of Utah
in partial fulfillment of the requirements for the degree of

Master of Science

College of Nursing
The University of Utah
June 1990

90 07 31 070

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THE UNIVERSITY OF UTAH GRADUATE SCHOOL

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Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
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A-1	

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ABSTRACT

Birth certificate data over a 3-month period of time were studied to determine the effects of parity on selected outcomes of pregnancy. The two hypotheses were (a) increased parity is associated with increased maternal morbidity and (b) increased neonatal morbidity.

Regression analysis was utilized to determine the predictive birth weights of selected independent variables (including parity) for selected outcomes. Regression analysis indicated that increased parity was not predictive of poor pregnancy outcome in the majority of women. The two hypotheses could not be supported. The exception was in women 35 years and older who entered the pregnancy with previous pregnancy-associated medical risks. Regression analysis did indicate increased risk for poor pregnancy outcomes in overweight women and in smokers.

ABSTRACT

The purpose of this study was to determine the influence of parity on the selected outcomes of pregnancy. The two hypotheses were (a) that increased parity is associated with increased maternal morbidity and (b) increased neonatal morbidity.

Data were obtained from Utah birth certificates over a 3-month period, providing a sample of 5173. The sample was divided into three age groups as a control for the influence of age. Analysis of data included the use of correlations and regression analysis of selected independent and dependent variables.

Significant correlations ($p \leq .01$) for women under 20 years of age indicated that with increased parity there was likely to be increased tobacco use (for those who smoked), decreased gestational age, and decreased educational attainments. Significant correlations for women of increased parity between the ages of 20 and 34 indicated they were likely to have fewer prenatal visits, higher birth weights, and fewer pounds gained. Women over 34 had fewer prenatal visits, decreased educational attainments, higher birth weights, but less tobacco consumption.

Regression analysis ($p = .05$) was utilized to measure the predictive value of several independent variables against selected outcomes of pregnancy. The results did not support the hypotheses. Parity did not increase the maternal or neonatal morbidity. The only exception was in women over 34 years of age with preexisting pregnancy associated risks. Parity did not prove to be the strongest predictor in that sample, but the next to the last in strength. An interesting finding was the effect maternal weight had on the outcomes of pregnancy. Women who began their pregnancy at a heavier weight and continued this during the pregnancy were at greater risk for adverse outcomes.

Suggestions for further study include the use of a ponderal index to further determine the effects of height and weight on pregnancy outcomes. Determining the predictive strength of the interconceptual period and its influence on high parous populations would also be helpful.

The results of this study cannot be generalized to other populations because of the unique nature of the Utah population.

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ACKNOWLEDGMENTS

I wish to express my deep appreciation to Rita Gambrel for providing both the idea and inspiration for this research paper. I also thank Dr. Joyce Foster for her invaluable advice, Jeff Jensen for his statistical assistance, and Dr. John Sullivan for assisting in the interpretation of the data. I acknowledge the help and moral support my brother, Bob Pliley, provided.

CHAPTER I

INTRODUCTION AND REVIEW OF LITERATURE

Introduction

In 1934 Dr. Bethel Solomons studied the grand multiparous woman and coined the phrase 'the dangerous multipara.' He categorized women who fit the definition of grand multipara, those who have delivered five or more viable children, as a risk to themselves and to the children they carry. His study indicated an increased risk for maternal and fetal morbidity and mortality due to hemorrhage, placenta previa, and abruptio placenta, etc. Dr. Solomons' study has had an enormous impact on how multiparous women have been medically managed in the ensuing years.

Problem

Since Solomons' study, the field of medicine and social conditions in the United States have undergone tremendous change. Improved prenatal and medical care, better nutrition, better living conditions, and an increasingly educated community have all contributed to an overall healthier population of women giving birth. In 1935, a year after Solomons' study, there were 12,544

maternal deaths reported in the United States. By 1985, the number reported was 295 (Cunningham, McDonald, & Gant, 1989). Cunningham et al. (1989) state the main cause of maternal death in the United States today is hemorrhage, hypertension, and infection. They also state that high parity, in combination with advanced age, increases the risk of childbearing. The perinatal mortality rate has also decreased over the last 25 years. The deaths that do occur are correlated with the age and parity of the mother; highest rates occurring in the very young mothers and also in the women having their sixth or more child (Cunningham et al., 1989). Other factors associated with increased maternal and perinatal morbidity and mortality include poor social and economic conditions, lack of prenatal care, lack of family planning, poor education, and dietary deficiencies.

The era of litigation has heightened the awareness of health care professionals to risk factors associated with poor outcomes. The belief that increased parity results in a higher incidence of poor outcomes has increased the use of medical interventions. Local hospitals require intravenous lines upon admission. Some require continuous fetal monitoring. Out-of-hospital birth centers in the Salt Lake City area are limited by state regulations to delivery of women who have had five or fewer births.

Pregnant women are becoming educated with regard to their pregnancy, to risk factors, and to probable outcomes. Certainly they desire safe, emotionally satisfying birth experiences. They desire to be able to choose from various birth site alternatives, each of which may concentrate on its own unique philosophy surrounding labor care. In Utah, many women have chosen to have large families, despite the supposed risks.

Purpose

The purpose of this study is to determine in what ways parity influences the outcomes of pregnancy in Utah. This study will explore the extent to which other factors contribute to the outcomes associated with parity. This study will also address the extent to which parity, as one of multiple factors, contributes to poor maternal and fetal outcome.

The following hypotheses are proposed:

1. Increased parity is associated with increased maternal morbidity.
2. Increased parity is associated with increased neonatal morbidity.

This Utah study provides information concerning the influence of parity on the maternal and fetal outcomes of labor and delivery. A study of the influence of parity on the outcomes of pregnancy may help refine risk management

in the care of the grand multiparous woman with regards to protocols and regulations relating to labor management and birth sites. This information may be useful in redefining risk scoring for this population. Additional options may be possible under some circumstances.

Literature Review

The risks of parity have been debated by various researchers since before Solomons' study of 1934 (Peckham 1933). Parity, or the number of fetuses that have reached the stage of viability outside the uterus, has been associated with numerous maternal and neonatal complications. There is no universally accepted definition for grand multipara; however, most authors consider grand multiparity as being established by five or more deliveries of a viable infant.

A review of the literature from 1933 through 1989 revealed 36 English language articles relating to birth outcomes of multiparas (para 2 or greater). Many of these articles considered the grand multiparous woman to be in danger and in need of intensive scrutiny throughout the pregnancy and delivery (Appendix A). Several articles took the opposing view, believing her to be at no greater risk than less parous women. This is perhaps due to the advances of medicine and social programs providing free or low-cost prenatal care. Many articles felt that the risk

of complication in grand multiparous women could be substantially decreased with adequate prenatal care, nutrition, and hospital births (Appendix A).

Throughout the literature review, Solomons' 1934 study was repeatedly referenced and considered the first to address the risks of the grand multiparous woman. Solomons was among the first to describe what he called the 'dangerous multipara.' Solomons decried both the commonly held belief that the grand multiparous woman was a 'safe--tried and proven pelvis' and the apparent casual attitude many adopted in grand multiparous care practices. Solomons' studied the birth outcomes of 8,333 women, over a 4-year period, of whom 59% were multiparous (para 2). Although he never elaborated on his methodology or statistical procedures, his research indicated an increased incidence of hemorrhage, placental previa, abruptio placenta, toxemia, ruptured uterus, disproportion, malpresentation, and an overall increased incidence of maternal morbidity and mortality. Solomons' study also found an increased incidence of malpresentation of the fetus which he attributed to the pendulous abdomen.

Many shared Solomons' (1934) views, finding similar results. Prior to Solomons' study, Peckham (1933) looked at specific variables and studied the effect of parity. His findings were much the same as Solomons'; grand multiparous women were at greater risk for maternal

morbidity and mortality, as were their fetuses. Variables found to increase with greater parity included malpresentation (breech, transverse lie), nephritis, toxemia (greatest in para 1 and para ≥ 10), and multiple pregnancy (greatest in para ≥ 4). Peckham's study found increased risk for primiparous women in fetal mortality, eclampsia, postpartum hemorrhage, pyelitis, puerperal infection and operative delivery. Paras between the two extremes seemed to have the least complications and the best outcomes.

The findings of Solomons (1934) and Peckham (1933) were confirmed by later researchers who also found that with the extremes in parity, there were increased complications. Yerushalmy (1940) found an increase in puerperal morbidity and mortality in the primiparas and the grand multiparas. He saw an increased incidence of septicemia, which was mentioned by Solomons' and Peckhams' studies. Septicemia has become a less general problem with the availability of antibiotics (Pinchuck & Clark, 1984). Nevertheless, Quinlivan in a 1964 report did demonstrate an increase in septicemia in paras 6 or greater.

The increase in malpresentations in the grand multipara was attributed to the pendulous abdomen, which allows the fetus more room to become mispositioned. The most frequent malpresentations found included face, brow, breech, and transverse lie (Baskett, 1977; Fuchs & Peretz,

1961; Fuchs, Peretz, Marcovici, Paldi, & Timor-Tritsh, 1985; George & Power, 1949; Kaltreider, 1959; Peckham, 1933; Quinlivan, 1964; Roopnarinesingh, Wehby, & Matadial, 1971; Schram, 1954; Solomons, 1934; Tanbo & Bungum, 1987). Malpresentations are considered a risk because they make vaginal delivery either impossible or very difficult. The resulting operative delivery exposes those women and their children to the risks associated with surgery (Cunningham et al., 1989).

A constant theme in the majority of the articles was the incidence of postpartum hemorrhage, placenta previa, and anemia (Basket, 1977; Duckman, Chen, Gungon, & Bonura, 1968; Eastman, 1940; Fuchs et al., 1985; George & Power, 1949; Israel & Blazer, 1965; Lolis & Soumplis, 1969; Oxorn, 1955; Peckham, 1933; Petry & Pearson, 1955; Quinlivan, 1964; Radovic, 1966; Roopnarinesingh et al., 1971; Scharfman & Silverstein, 1962; Schram, 1954; Solomons, 1934). Oxorn (1955) suggested increased incidence of postpartum hemorrhage was considered to be caused by the overtired uterus; one which had become fibrous and unable to involute to good effect. Placenta previa has been associated with grand multiparity and advancing age. Apparently, occurrence of placenta previa may be due to atrophic changes or defective vascularization of the decidua (Cunningham et al., 1989). This was especially evident in the article by Petry and Pearson

(1955) who studied the impoverished mountain people of Kentucky. The researchers found a greater incidence of placenta previa and toxemia in the grand multiparous woman than in all other pregnancies combined.

Anemia is found most frequently in indigent pregnant women, although it is found in all populations. Anemia may be more frequent in the grand multiparous women. The very young primiparous population (pregnant teens) often are susceptible to anemia. This may be a result of poor eating habits and lower socioeconomic status (Cunningham et al., 1989).

Another recurring theme is the increased incidence of toxemia and hypertension associated with the extremes of parity (Baskett, 1977; George & Power, 1949; Israel & Blazer, 1965; Kaltreider, 1959; Krebs, 1956; Lolis & Soumplis, 1969; Mwambingu, Meshari, & Akiel, 1988; Oxorn, 1955; Peckham, 1933; Petry & Pearson, 1955; Quinlivan, 1964; Roopnarinesingh et al., 1971; Schram, 1954; Solomons, 1934; Yerushalmy, 1940). Yerushalmy (1940) was able to show toxemia increased in the para 1 and para ≥ 8 . Peckham (1933) also found this to be true in his study. Most other authors found toxemia and hypertension, if not increased in the grand multipara, at least resulting in a more morbid outcome for the grand multipara as compared to the lesser paras.

Ruptured uterus in the grand multiparous woman occurred most frequently in the earlier times. Many of the authors attribute the uterine rupture to the excessive use of pitocin (Duckman et al., 1968; Krebs, 1956; Radovic, 1966; Solomons, 1934). In light of this, several advocate cesarean delivery when there is doubt that the grand multiparous woman may be unable to deliver vaginally (Oxorn, 1955).

Age and Parity

The literature indicates that pregnancy in a teenager becomes an additional burden on a body that has not reached maturity. Compounding this is the common low nutritional status of the teen which, in effect, exposes her to increased complications and poor pregnancy outcomes (Cunningham et al., 1989). Adolescent pregnancies are also associated with psychosocial factors that include poor coping behaviors and poor support systems--emotionally and financially. The combination of psychosocial and nutritional factors increases the vulnerability of the pregnant teen and the fetus she is carrying. Peckham (1933) and Yerushalmy (1940) were able to demonstrate an increase in toxemia in the very young primiparas. To this day, the population most targeted for possible pregnancy-induced hypertension (PIH, also known as toxemia) is the teen and those older than 34

(Cunningham et al., 1989). Hypertensive disorders of this type are also an important cause of perinatal mortality.

The other extreme is the pregnant woman over 34 years of age. Age-related ailments such as cardiovascular disease, chronic hypertension, and diabetes become aggravated by pregnancy (Cunningham et al., 1989). Pregnancy-induced hypertension is common in multigravidas who have the above conditions. Several researchers have found that regardless of parity, increased age leads to an increase in operative delivery and fetal death (Erickson & Elliott, 1988; Fonteyne & Isada, 1988; Hogue, Buehler, Strauss, & Smith, 1987; Kaltreider, 1959; Kiely, Paneth, & Susser, 1986; Kirz, Dorchester, & Freeman, 1985; Lolis & Soumplis, 1969; Schram, 1954; Utian & Kiwi, 1988).

Opinions vary as to the effect of maternal age on fetal weight. Lee, Ferguson, Corpuz, and Gartner (1988) state there are more low weight infants born to older mothers than to younger mothers. This, they feel, is due to the decreased potential for fetal growth as a result of the biologic aging of the maternal tissues and systems. Others disagree and find the older grand multiparous woman to have larger infants, often as a result of gestational and diabetes mellitus (Camilleri & Cremona, 1970; Radovic, 1966; Seidman, Armon, Roll, Stevenson, & Gale, 1988; Simpkins, 1968).

Penrose (1939) demonstrated that with increased maternal age there is a significant increase in the number of 'central' type placenta previa as opposed to marginal and latent placenta previa seen with increased parity.

Fonteyn and Isada (1988) believe the older mother to be better able to physically and emotionally deal with pregnancy because she is in a more stable economic condition, married, and most often will have planned the pregnancy.

Prenatal Care and Parity

Prenatal care is considered one of the key factors in influencing the outcomes of pregnancy. Cunningham et al. (1989) states the objective of prenatal care is to assure that every wanted pregnancy culminates in a healthy baby without trauma or harm to the mother. Prenatal care is designed to prevent adverse conditions and to intervene early enough to effect a good outcome. This is done through appraising risk and identifying those behaviors that may compromise the outcome of the pregnancy. Prenatal care includes nutritional counseling, referring to community programs (Women, Infants, & Children--WIC), education about pregnancy and parenting, increasing self-esteem, and reducing stress.

It has been demonstrated by Hogue, Buehler, et al. (1987) that infants born to mothers who obtained prenatal

care beginning in the first trimester of pregnancy experienced substantially lower infant mortality rates. Similarly, a lack of prenatal care is associated with an increased risk of infant mortality. The idea that prenatal care can make a difference is supported by Camilleri and Cremona (1970), Department of Health and Human Services (1989), Eidelman, Kamar, Schimmel, and Bar-On (1988), Israel and Blazer (1965), Roopnarinesingh et al. (1971), Scharfman and Silverstein (1962), and Seidman et al. (1988). Bakketeig and Hoffman (1979) also suggested that with adequate prenatal care and spacing of children, there may be no increase in risk to either the grand multiparous woman or neonate.

Korenbrod, Showstack, Loomis, and Brindis (1989) utilized this concept in their inner-city pregnant teen program. This program provided comprehensive and consistent prenatal care to impoverished teens, and consequently was able to improve birth weights and infant outcomes compared to the overall population of pregnant teens in the city.

Tobacco and Alcohol Use

The effects of smoking on the fetus and placental function are well documented. Cigarette smoking in pregnancy is associated with small placentas and small babies (Kleinman, Pierre, Madaus, & Schwann, 1988;

Korones, 1986). Smaller placentas and smoking places the mother at risk for a higher rate of miscarriage, premature rupture of membranes, abruptio placenta, placenta previa, low birth weight and sudden infant death syndrome (Hogue, Zahniser, & Dalmat, 1987). The Journal of Occupational Medicine (1988) reported the effects of smoking with pregnancy, again confirming low birth weight, increased cesarean sections, increased fetal distress, and congenital malformations.

The teratogenic effects of alcohol on pregnancy are well documented. Chronic alcohol use in pregnancy is associated with congenital malformations, dysmorphic features, prenatal and postnatal growth retardation, and impaired mental development. Abel and Sokol (1988) state that alcohol is the leading known teratogen in society today. Fetal alcohol syndrome (FAS) results from the overuse of alcohol during pregnancy (Korones, 1986; Thompson & Thompson, 1986). The perinatal mortality is approximately 20% in FAS (Korones, 1986). Cunningham et al. (1989) was able to demonstrate a linear relationship between alcohol consumption and fetal damage.

Socioeconomic Status

Socioeconomic status (SES) encompasses a number of factors: educational level, marital status, and income level. Traditionally, the lower the SES the higher the

incidence of poor pregnancy outcomes. This is due in part to conditions associated with poverty and either the lack of, or inaccessibility, of prenatal care. Single parents having little education and living in poverty are associated with higher infant death (Shapiro et al., 1980).

Ziel (1962) and Petry and Pearson (1955) studied poor women in the Kentucky mountains and found a higher incidence of complications. These women were described as impoverished, with poor diets, nonexistent oral hygiene, long and hard work-days, and failing to practice birth control. The authors felt the biggest factor that contributed to the poor outcomes of these women was their SES. Other studies confirm the effects of low SES on the outcomes of pregnancy; specifically Czeizel (1981) in Hungary. He found low SES women had poorer outcomes than their more educated, higher SES counterparts.

Several studies (Eidelman et al., 1988; George & Power, 1949; Mwambingu et al., 1986; Scharfman & Silverstein, 1962; Seidman et al., 1988) were able to demonstrate that, with stable SES, the amount of complications was not significant. They found where complications attributed to parity become a problem with low SES, this disappears with increased SES.

Fetal/Neonatal Outcomes

There is an association between low birth weight and an increased incidence of neonatal morbidity and mortality. Low birth weight infants are found in women who are of low SES, have chronic disease, malnutrition, smoke cigarettes, and/or use alcohol (Korones, 1967). Parity is not mentioned as a risk factor for low birth weight infants.

Throughout the literature review, several researchers found fetal/neonatal morbidity and mortality was increased with the extremes of parity. Teens and older women (<16 and >34) have low birth weight infants and a higher neonatal morbidity and mortality (Cunningham et al., 1989; Fuchs et al., 1985; Quinlivan, 1964; Radovic, 1966; Tanbo & Bungum, 1987). Korenbrot et al. (1989) was able to reverse this trend in young teens by providing prenatal care, nutritional counselling, and referral services with the result of effecting optimal birth weights for these young women.

There is also an association between large birth weight infants and grand multiparous women (Karn & Penrose, 1953; Seidman, Gale, Ever-Hadani, & Harlap, 1987; Simpkins, 1968), that is linked with greater weight gain by the mother, increased incidence of gestational diabetes in the older grand multipara, and a better uterine blood

as a result of successive pregnancies (Camilleri & Cremona, 1970).

Summary

The literature review revealed two schools of thought on the effect of parity on the outcome of pregnancy. The first and traditional school of thought states that with increased parity there will be increased complications (see Appendix A). The second school of thought suggests caution in dealing with the grand multiparous woman, to recognize that other factors may impinge on parity making her a higher risk, but not necessarily a 'danger' (see Appendix A). The purpose of this study is to provide information on the effects of parity in the homogenous Utah population where pregnancies are, for the most part, desired and planned.

CHAPTER II

METHODOLOGY

Design

The study of the influence of parity on the outcomes of pregnancy is based on ex post facto design. Data on past events have been obtained from 1989 Utah birth certificates.

Methodology

State of Utah birth certificate data were obtained from the Bureau of Vital Records, covering a time period of 3 months: January 1, 1989-March 31, 1989. Data were provided on a computer tape from which variables were examined and processed using descriptive statistics. Correlations were used to establish relationships among key variables. Regression analysis was utilized to determine the independent effect of parity on the outcome of pregnancy. The variables examined are listed in Appendix B.

Instruments

The use of birth certificates for data collection has proven to be an invaluable tool (Cunningham et al., 1989; Taffel, Ventura, & Gay, 1989). The 1989 Utah birth

certificate is based on the newly revised United States Standards Certificates and Reports birth certificate format, which is widely recognized as a model format.

The old system utilized open-ended sentences which proved to be too cumbersome for data recording and computerization. The new version has utilized a check-box list which has increased compliance, ensuring accurate and complete recording of demographics, risks, and birth data. Taffel et al. (1989) indicate the new version reflects current obstetric interventions and care. The new form details life style factors, substance use (tobacco and alcohol), medical risks, antepartum procedures, complications of labor and delivery, abnormal conditions and congenital anomalies of the newborn.

Birth registration is required by state legislation, with the responsibility resting on hospitals, birth centers, and birth attendants. The official birth certificate is derived from a 3-page work sheet that is filled out by the health care providers (birth attendant and pediatrician) and by the mother (Appendix C). The medical records department of each institution transposes the information onto a birth certificate form, which is then sent to the State Bureau of Vital Records for processing. The State Bureau of Vital Records reviews the information for accuracy and places the information into the computer system, and it is reviewed for accuracy once

more. The record is tagged if errors are found and the birth data reviewed. The institutions are then contacted for chart retrieval and review to obtain the missing data or to correct the inaccuracies.

Limitations of Data

Birth certificates are regarded as reliable and valid sources for research data, but they are not without limitations. The collection of this data has four very critical assumptions. The first is that the care provider (the nurse-midwife, doctor, or pediatrician) filled out the birth certificate work sheet correctly and accurately. The second assumption is that the parent filled out the work sheet correctly, accurately, and truthfully. The third assumption is the birth data was transcribed without error onto the official birth certificate record. The fourth assumption is the information was then entered into the computer correctly.

The data procured from the Bureau of Vital Records is not without problems. Missing data became evident for a few cases for the variable 'method of delivery.' On a few records variables such as maternal height and weight had very extreme if not impossible values. However, the number of records with these discrepancies were very small, with the majority of cases having believable values.

Sample

Utilization of Utah birth certificate data for the first 3 months of 1989 provided a total population of 8487 cases. Restricting the population to single births and nonchronic medical disease cases provided a sample size of 5173. Cases selected out of the sample include those with preexisting conditions, i.e., cardiac disease, chronic hypertension, acute or chronic obstructive lung disease, genital herpes, diabetes, renal disease, Rh sensitization, rubella, hemoglobinopathy, eclampsia, incompetent cervix, and uterine bleeding as these constitute obvious and indisputable risk factors.

Variables retained in the study include mother's age, education, marital status, height, weight, tobacco and alcohol use, prenatal care, gestation, previous number of live births, terminations, antepartum procedures, method of delivery, complications of labor and delivery, infant weight, apgar, medical complications of infant, and fetal anomalies.

Population Characteristics

The population in Utah is ideal for this study, as there are many large families and women who fit the definition of grand multiparity, i.e., having their fifth or greater child. Unique to this population is the concept of desired and planned large family size. The desire for

large families is due in part of the influence of the Church of Jesus Christ of Latter-day Saints (also known as 'LDS' or 'Mormon') which has a large following in Utah. Lyon and Nelson (1987) report that over 37% of the United States Mormon population resides in the state of Utah. There is also a substantial Catholic population in Utah, whose views on the desirability of large families echo those of members of the dominant church.

LDS Church doctrine advocates large families based on the belief that the purpose of having children is to provide mortal bodies for the spirit children of heaven, so they can experience earth life (McConkie, 1979). As a consequence of this belief, Mormons have consistently had birth rates 50-60% above the national average (Lyon & Nelson, 1988).

Unique to this population is its observation of improved health behaviors. Religious doctrine exerts control over the diet and behavior of the members of the LDS Church through a directive known as 'The Word of Wisdom,' which counsels against tobacco use, and consumption of alcohol, coffee, and tea, and which has the status of scripture. Lyon and Nelson (1988) report the number of Mormon female cigarette smokers in the state of Utah as 7.2%, compared to non-Mormon female residents at 39.7%. Alcohol usage among Mormon women is 17% and non-Mormon women at 60%.

In summary, this population is ideal for this study due to the large number of women who fit the category of grand multiparity, the planned nature of these large families, and the overall health of the population.

Protection of Human Rights

Data obtained from birth certificates is regarded as the public domain by legislative mandate. To protect the participants of this research, all the identifying information was removed such as name, address, telephone numbers, maiden names, etc. The only identifier was the state serial number which would be utilized in obtaining a record to verify information. This research has received approval from the University of Utah Institutional Review Board.

CHAPTER III

RESULTS AND DISCUSSION

Data were obtained from Utah birth certificates from January 1, 1989 to March 31, 1989, and evaluated to determine the influence of parity on the outcome of pregnancy. A sample size of 5173 was studied. Most variables were mutually exclusive, such as marriage, age, education, etc. Others were not. Consequently, among the responses some percentages were greater than 100%. This was seen in variables where more than one response was appropriate (method of delivery, complications, etc.).

Analyses of the data included simple descriptive statistics with frequency distributions, measures of central tendency, measure of variability, and cross-tabulations. Correlation and regression analyses were used to determine association of parity to pregnancy outcomes.

Demographics

Between January 1, 1989 and March 31, 1989, there were 8487 single births. After removal of cases for chronic medical illness, multiple births, and incomplete data, there remained a sample size of 5173. The grand

multiparas made up 592 (11.4%) of the sample. Primiparas made up 1662 (32.1%) of the sample. The majority of the sample, 2919 (56.5%) was made up of women having their second, third, or fourth infant.

Maternal Age

The maternal age range for the sample of 5173 cases was from 15 to 46 years of age. The majority (94.4%) were between the ages of 20 and 34, 479 (9.3%) were over 34, and 329 (6.4%) under 20 years of age. The average age was 27 (Tables 1 and 2).

Maternal Education

The range of education for this sample was from 0 to 17 years, with a sample average of 13 years of education. Twenty-one cases reported never having had any education. There may be migrant agricultural workers, or an error produced by improper coding of the computer. There were 669 (12.9%) women who did not have a 12th grade education, while approximately 36% of the sample had completed 12 years of education. The majority, 2610 (50.5%), had more than 12 years of education (Table 1).

Marital Status

The query regarding marital status had four possible responses: yes, no, inferred yes, and inferred no. Inferred yes and inferred no are coding instructions that

Table 1
Maternal Data
Residents: Utah, January-March 1989
N = 5173

	Mean	S.D.	Range
Age	27.148	5.297	15-46
Education	13.055	2.017	0-17
Height	64.850	2.668	51-78
"Yes" tobacco #/day	11.944	8.074	1-60
"Yes" alcohol #/week	1.672	1.413	1-8
Pre-pregnancy weight	144.511	30.906	81-360
Weight gained	30.178	10.850	0-80
Full term weight	174.689	32.084	102-372
Month prenatal care began	2.65	1.298	1-9
Number of prenatal visits	10.435	3.051	0-36

Table 2
Parity, Age, Education, and Marriage

Parity											
		0		1		2-3		4+		Total	
		N	%	N	%	N	%	N	%	N	%
Age											
<19 years 20-34 >34		294	5.7	30	.6					329	6.4
		1326	25.6	1315	25.4	1363	26.3	361	7.0	4365	84.4
		42	.8	70	1.4	136	2.6	231	4.5	479	9.3
Total		1662	32.1	1415	27.4	1504	29.1	592	11.4	5173	100.0
Education											
<12 years 12 >12		299	5.8	156	3.0	163	3.2	51	1.0	669	12.9
		609	11.8	540	10.4	557	10.8	188	3.6	1894	36.6
		754	14.6	719	13.9	784	15.2	353	6.8	2610	50.5
Total		1662	32.1	1415	27.4	1504	29.1	592	11.4	5173	100.0

Table 2 Continued

Parity										
		0		1		2-3		4+		Total
		<u>N</u>	%	<u>N</u>	%	<u>N</u>	%	<u>N</u>	%	<u>N</u>
Married										
Yes		1338	25.9	1292	25.0	1391	26.9	569	11.0	4590
No		324	6.3	123	2.4	113	2.2	23	.4	583
Total		1662	32.1	1415	27.4	1504	19.1	592	11.4	5173
		100.0								

Note. Parity: 0 = 1
 1 = 2
 2-3 = 3-4
 4+ = 5

are applied when the mother leaves the marital status query unanswered. Inferred yes implies a relationship between the mother and the father of the baby when the mother lists the last name of the child as the same as the father. Inferred no is when the mother leaves the father's name blank or the father's last name is different from the infant's. Combining the yes and inferred yes responses resulted in 4590 (88.70%) of the sample being married or presumed married. Therefore, 11% of the sample were considered unmarried.

Population Characteristics

Maternal Height

Maternal height, weight, and substance use was also explored. The range of heights was from 51 inches to 78 inches. The average height of the subjects was 64.84 inches. Most, 87%, were between 61 and 68 inches (Table 3).

Maternal Weight

Maternal weight has been divided into three categories: prepregnancy weight, weight gained during pregnancy, and full-term weight gain. The prepregnancy range of weights varied from 81 to 360 pounds. The average weight was 144 pounds, 1590 (30%) were equal to or less than 125 pounds, and 273 (5.2%) were greater than 200

Table 3

Height, Prepregnancy Weight, Weight Gain and Full-Term Weight

Parity									
	0		1		2-3		4+		Total
	N	%	N	%	N	%	N	%	N
Height									
<61 inches	77	1.5	82	1.6	75	1.4	28	.5	262
61-68	1425	27.5	1227	23.7	1336	25.8	520	10.1	4508
>68	160	3.1	106	2.0	93	1.8	44	.9	403
Total	1662	32.1	1415	27.4	1504	29.1	592	11.4	5173
Prepregnancy Weight									
<101 pounds	49	.9	49	.9	33	.6	4	.1	135
101-125	487	9.4	400	7.7	424	8.2	144	2.8	1455
126-150	609	11.8	510	9.9	515	10.0	229	4.4	1863
151-200	451	8.7	378	7.3	451	8.7	167	3.2	1447
201-250	62	1.2	66	1.3	71	1.4	41	.8	240
>251	4	.1	12	.2	10	.2	7	.1	33
Total	1662	32.1	1415	27.4	1504	29.1	592	11.4	5173
									100.0

Table 3 Continued

Parity									
	0		1		2-3		4+		Total
	N	%	N	%	N	%	N	%	N
Weight Gain									
0-19 pounds	150	2.9	176	3.4	203	3.9	96	1.9	625
20-34	867	16.8	818	15.8	872	16.9	321	6.2	2878
35-49	509	9.8	348	6.7	354	6.8	141	2.7	1352
>49	136	2.7	73	1.4	75	1.4	34	.7	318
Total	1662	32.1	1415	27.4	1504	29.1	592	11.4	5173
Full-Term Weight									
101-125 pounds	29	.6	38	.7	31	.6	6	.1	104
126-150	365	7.1	309	6.0	341	6.6	105	2.0	1120
151-200	984	19.0	828	16.0	847	16.4	355	6.9	3014
201-250	243	4.7	203	3.9	248	4.6	111	2.1	805
>251	41	.8	37	.7	37	.7	15	.3	130
Total	1662	32.1	1415	27.4	1504	29.1	592	11.4	5173

Note. Parity: 0 = 1
 1 = 2
 2-3 = 3-4
 4+ = 5

pounds. Most women weighed between 100 and 200 pounds (Table 3).

Weight gained during the pregnancy ranged from 0 to 80 pounds. The average weight gain was 30 pounds. The majority (55.6%) of women gained between 20 and 34 pounds. Almost 33% gained more than 35 pounds. Approximately 12% gained less than 20 pounds.

Full-term weight upon admission to the hospital ranged from 102 pounds to 372 pounds. The average weight was 175 pounds, 58% weighed between 151 and 200 pounds and 18% weighed more than 200 pounds. Less than 3% were greater than 250 pounds and 2% fell below 125 pounds (Table 3).

Maternal Substance Use

Birth certificates confined substance use to cigarette and alcohol use during pregnancy. Alcohol may be underreported due to the social stigma. Women who drink may feel embarrassed, concerned regarding public opinion, and reluctant to put into writing on an official document how much they consume.

The majority of the cases, 4670 (90.3%), responded 'no' to the use of tobacco with pregnancy. There were 503 (9.7%) women who said they smoked during the time which they were pregnant. The majority of smokers were multiparous women (316) of para 2 through 4. Few, 21

(.4%) of the smokers were grand multiparas, the rest, 167 (3.2%) were primiparas. The average consumption for all smokers was 12 cigarettes per day. Very few (.5%) consumed more than a pack a day (Table 4).

Alcohol consumption was measured by drinks per week during pregnancy. The sample who responded 'yes' (134 cases, 2.6%) to the use of alcohol during pregnancy, most (1.9%) had 1 drink per week. The average amount consumed by all subjects was 1.6 drinks per week (Table 4).

Prenatal Care

Birth certificates list prenatal care by the month in which prenatal care began. A value of 0 means no prenatal care. Less than 1% (9) of the sample received no prenatal care, 4 primiparas, 3 paras 2-4, and 2 grand multiparas. The majority received prenatal care by the second month of pregnancy. Most (83.5%) had initiated prenatal care between the first and third months of pregnancy. Prenatal care was initiated between the fourth and sixth month by 737 (14.25%) women. Less than 116 (3%) initiated prenatal care between the 7th and 9th months (Table 5).

Prenatal care was also determined by the number of prenatal visits a woman had during her pregnancy. The average number of visits recorded was 10. Less than 9 (1%) reported no prenatal visits at all. Most, 4675 (90%), received between 6-15 visits during their pregnancy.

Table 4

Parity, Maternal Substance Use

Parity										
0		1		2-3		4+		Total		
N	%	N	%	N	%	N	%	N	%	
Cigarettes/Day										
1-9	79	1.5	44	.9	36	.7	6	.1	165	3.2
10-14	49	.9	53	1.0	47	.9	6	.1	155	3.0
15-20	36	.7	57	1.1	69	1.2	7	.1	158	3.1
21-30	3	.1	10	.2	6	.1	1	.0	20	.4
30+	--	--	1	.0	3	.1	1	.0	5	.1
Did not smoke	1495	28.9	1252	24.2	1352	26.1	571	11.0	4670	90.3
Total	1662	32.1	1415	27.4	1504	29.1	592	11.4	5173	100.0
Alcohol/Week										
1	26	.5	29	.6	40	.8	3	.1	98	1.9
2-3	9	.2	5	.1	5	.1	3	.1	22	.4
4+	3	.1	5	.1	5	.1	1	.0	14	.3
Did not drink	1624	31.4	1376	26.6	1454	28.1	585	11.3	5039	97.4
Total	1662	32.1	1415	27.4	1504	29.1	592	11.4	5173	100.0
Note. Parity: 0 = 1 1 = 2 2-3 = 3-4 4+ = 5										

Note. Parity: 0 = 1 1 = 2 2-3 = 3-4 4+ = 5

Table 5

Parity, Trimester Prenatal Care Began and Visits

Parity									
	0		1		2-3		4+		Total
	N	%	N	%	N	%	N	%	N
Trimester Prenatal Care Began									
First	1386	26.8	1187	22.9	1259	24.3	479	9.3	4311
Second	229	4.4	299	3.8	210	4.1	99	1.9	737
Third	43	.8	29	.6	32	.6	12	.2	116
No prenatal care	4	.1	--	--	3	.1	2	.0	9
Total	1662	32.1	1415	27.4	1504	29.1	592	11.4	5173
Number of Prenatal Visits									
0	4	.1	--	--	3	.1	2	.0	9
1-5	92	1.8	72	1.4	102	2.0	52	1.0	318
6-10	667	12.9	621	12.0	625	12.1	268	5.2	2181
11-15	842	16.3	675	13.0	732	14.2	245	4.7	2494
16-20	66	1.3	52	1.0	31	.6	12	.2	161
>	5	.1	4	.1	1	.0	--	--	10
Total	1662	32.1	1415	27.4	1504	29.1	592	11.4	5173
100.0									

Note. Parity: 0 = 1 1 = 2 2-3 = 3-4 4+ = 5

An indicator of adequate prenatal care, Kessner Index, is the number of prenatal visits a woman has during her pregnancy and the month prenatal care began (Lee et al., 1988; U.S. Public Health Service Prenatal Report, 1989). Kessner defines adequate prenatal care as beginning in the first trimester and the total number of visits being 9 or more. Kessner defined inadequate care as beginning in the 7th month of gestation or having 4 or fewer prenatal visits. Anything between these two categories Kessner classified as 'intermediate prenatal care.' It would appear from this data that there are a majority, 69%, who received adequate prenatal care. One-fourth of the subjects attained intermediate prenatal care, while 4.3% received inadequate prenatal care (Table 6).

Birth certificate data for prenatal visits may be inaccurate because it is from prenatal records that arrive in the hospital 3-4 weeks before the due date. Any visits the woman has had these last 3-4 weeks of her pregnancy may not be included.

Parity

Parity, for the purpose of this study, is derived from the number of all previous live births. Thus, if the subject fills in '0' for previous live births, then she has just given birth to her first child. The average number of previous live births for this population was

Table 6
Parity and Kessner Index of Prenatal Care

	Parity							
	0	1	2-3	4+	Total			
	N	N	N	N	N	%	%	%
No prenatal care	4	--	3	2	9	.1	.0	.2
Inadequate	75	49	70	31	225	1.4	.6	4.3
Intermediate	391	378	385	185	1339	7.6	3.6	25.9
Adequate	1192	988	1046	374	3600	23.0	7.2	69.6
Total	1662	1415	1504	592	5173	32.1	11.4	100.0

Note. Parity: 0 = 1
1 = 2
2-3 = 3-4
4+ = 5

1.5. The range for previous live births was from 0 to 14. Those who had 1 to 3 previous live births made up 56.4% of the sample; those who had 4 or more, 11% of the sample. Less than 1% had 8 or more previous live births.

Medical Risk Factors

This study considered the choices of medical risk factors to include: none, other, anemia, pregnancy, associated hypertension, oligo/polyhydramnios, previous large-for-gestational age (LGA) infant, previous premature infant, and previous small-for-gestation age (SGA) infant (Table 7). The largest percentage (83.8%) of the cases were categorized as having no medical risks. Seven percent went to the category of 'other,' in which the complication is handwritten and unknown (there was no way to access the computer for this information).

Grand multiparas had the highest incidence of previous anemia (2.4%), previous LGA (6.4%), premature infant (4.4%), and previous SGA (1.5%) compared to all the other paras. Primiparas had the highest incidence of oligo/polyhydramnios (1.1%), and pregnancy associated hypertension (5.7%).

Antepartum Procedures

Antepartum procedures is a category in which selected interventions are utilized during pregnancy and before

Table 7

Note. Parity: 0 = 1
1 = 2
2-3 = 3-4
4+ = 5

N = Number of responses. Categories not mutually exclusive.

delivery. More than one procedure may occur per pregnancy. Antepartum procedures included: amniocentesis, induction of labor, stimulation of labor, no procedures, and low risk procedures.

The majority of all responses (6929, 133.9%) were in a category labeled low risk which included the antepartum use of ultra sounds and electronic fetal monitoring. Amniocentesis occurred in 4.5% of the sample, induction of labor in 15.7%, and stimulation of labor in 18% of the cases. The category of 'none' had only 9.3% of the respondents.

Amniocentesis occurred most frequently in women having their second child. Primiparas had the highest frequency for induction and stimulation of labor, and low risk procedures. Grand multiparas had the fewest antepartum procedures (Table 8).

Complications of Labor and Delivery

Complications of labor and delivery include: fetal distress, meconium, breech/malpresentation, cephalopelvic disproportion (CPD), dysfunctional labor, etc. These are not mutually exclusive. There were no complications in 3397 (65.7%) of the cases (Table 9).

Among the parities, the primiparas were at the highest risk for all the complications except placental accidents, precipitous labor, and cord prolapse.

Table 8
Parity and Antepartum Procedures

Procedure	Parity						Total N	%
	0 N	0 %	1 N	1 %	2-3 N	2-3 %	4+ N	4+ %
None	136	2.6	141	2.7	141	2.7	62	1.2
Amniocentesis	62	1.2	83	1.6	62	1.2	28	.5
Induction of labor	277	5.4	195	3.8	240	4.6	98	1.9
Stimulation of labor	358	6.9	217	4.2	251	4.9	107	2.1
Low risk ^a	2304	44.5	1895	36.6	1992	38.5	738	14.3
							6929	133.9

^a Ultra sound, electronic fetal monitoring.

Note. Parity: 0 = 1
1 = 2
2-3 = 3-4
4+ = 5

N = Number of responses. Categories not mutually exclusive.

Placental accidents include previa and abruption.

There were a total of 16 (.1%) of placenta previa, half of which occurred in the multiparous women of para 3 and 4. Grand multiparas had a total of 3 cases (.1%).

Abruptio occurred in 38 cases, the majority of which were found in women having their second child (.2%). The overall percentage of occurrence for the entire sample was the same in all the parities, i.e., .2%.

Precipitous labor, not always considered a complication, occurred in 145 cases, of which 56 were in paras 3 and 4. Grand multiparas had 25 cases and the fewest were among the primiparas (19).

Cord prolapse occurred very rarely, 14 cases in all. Half of the cases occurred in women having their third and fourth child. None occurred in the grand multiparas (Table 9).

Method of Delivery

Description of how delivery occurred includes: vaginal birth, vaginal birth after cesarean (VBAC), primary cesarean, repeat cesarean, forceps, and vacuum extraction. These are not mutually exclusive (Table 10). Combining both the vaginal and VBAC births, 81% of the sample had what is termed a 'normal' birth. Almost 90% of the grand multiparous births were vaginal. Just over 75% of the primiparas experienced a vaginal birth, whereas

Table 9
Parity and Complications of Labor and Delivery

Complication	Parity									
	0		1		2-3		4+		Total	
	N	%	N	%	N	%	N	%	N	%
None	934	18.1	961	18.6	1080	26.9	424	8.2	3399	65.7
Febrile	56	1.1	8	.2	11	.2	8	.2	83	1.6
Meconium, moderate/heavy	109	2.1	70	1.4	70	1.4	24	.5	273	5.3
Premature rupture of memb.	78	1.5	35	.7	30	.6	12	.2	155	3.0
Abruptio placenta	8	.2	12	.2	8	.2	10	.2	38	.7
Placenta previa	3	.1	2	.0	8	.2	3	.1	16	.3
Other excessive bldg	29	.6	13	.3	14	.3	8	.2	64	1.2
Precipitous labor	19	.4	45	.9	56	1.1	25	.5	145	2.8
Prolonged labor	41	.8	8	.2	9	.2	4	.1	62	1.2
Dysfunctional labor	105	2.0	41	.8	30	.6	9	.2	185	3.6
Breech/malpresentation	96	1.9	58	1.1	70	1.4	23	.4	247	4.8
Cephalopelvic dispro	136	2.6	53	1.0	29	.6	7	.1	225	4.3
Cord prolapse	3	.1	4	.1	7	.1	0	0	14	.3
Fetal distress	169	3.3	76	1.5	55	1.1	33	.6	333	6.4
Other	184	3.6	130	2.5	132	2.6	49	.9	495	9.6
Specific others	1	.0	--	--	--	--	--	--	1	.0

Note. Parity: 0 = 1 1 = 2 2-3 = 3-4 4+ = 5

N = Number of responses. Categories not mutually exclusive.

Table 10

Note. Parity: 0 = 1
1 = 2
2-3 = 3-4
4+ = 5

N = Number of responses. Categories not mutually exclusive.

paras 2 through 4 experienced between 80-84% vaginal births. Combining primary and repeat cesarean births reveals approximately 17% of the sample had operative deliveries. Few, .5%, of the grand multiparas had to have primary cesarean sections, while 6.1% of the primiparas had primary cesarean sections. Repeat cesarean sections occurred least frequently in the grand multipara (.8%).

Use of forceps occurred in 837 cases or 16.2% of the total sample. Forceps occurred most frequently in the primipara (8.9%) and least often in the grand multipara (1%). Vacuum extraction occurred in 420 cases or 8.1% of the sample. Vacuum extraction was utilized more frequently by the primiparas (4.2%) and least often by the grand multiparas at .4%.

As expected, the entire sample experienced higher vaginal births than any other method. The primiparous woman was at greater risk for primary cesarean section (65.9%), forceps (55%), and vacuum extraction (51.4%) than any other parities. Multiparous women between para 2 through 4 were at greater risk for repeat cesarean sections (88%). Grand multiparous women were at the least risk for any operative deliveries, including the use of forceps and vacuum extractions.

Gestational Age of Infant

Gestational age (21 to 44 week) of the infant was based on the newborn physical exam and reported by the pediatrician on the birth certificate worksheet. The data were divided into four categories: those less than 28 weeks considered nonviable because of inadequate fetal lung tissue, those 28-37 weeks considered viable but premature, those 38 weeks to 42 (term), and 43-44 weeks considered postterm. Less than .5% of the total births occurred before 28 weeks gestation. Approximately 10% of the infants were assessed to be between 28 and 37 weeks gestation. Most, 4616 (89.2%), were considered term and very few, 9 (.2%), considered postterm. The primiparous women had the highest frequency for premature infants (190, 3.7%) and postterm infants (6, .1%). Grand multiparas had the fewest preterm (1%) and postterm (2 cases, .0%) infants. The average gestation for all the births was 39 weeks (Tables 11, 12).

Apgar Scores

Apgar scores are used to measure the well-being of an infant at 1 and 5 minutes after the time of birth. The 1-minute apgar is said to reflect the infant's reaction to the uterine environment immediately prior to birth. The 5-minute apgar reflects more of a long-term condition.

Table 11

Newborn Data

Residents: Utah, January-March 1989

N = 5173

	Mean	S.D.	Range
Weeks gestation	39.179	1.582	21-44
Birth weight	3383.388	487.624	430-5440
Apgars			
1 minute	7.760	1.219	0-10
5 minute	8.873	.679	0-10

Table 12

Parity, Birth Weight, Gestational Age

Parity									
	0		1		2-3		4+		Total
	N	%	N	%	N	%	N	%	N
Birth weight (grams)									
<2500	67	1.3	55	1.1	36	.7	12	.2	170
2501-3000	327	6.3	252	4.9	214	4.1	74	1.4	867
3001-3500	705	13.6	581	11.2	581	11.2	314	4.1	2081
3501-4000	444	8.6	424	8.2	501	9.7	208	4.0	1577
4001-4500	106	2.0	94	1.8	150	2.9	74	1.4	424
>4500	13	.3	9	.2	22	.4	10	.2	54
Total	1662	32.1	1415	27.4	1504	29.1	592	11.4	5173
									100.0
Gestational age (weeks)									
<27	4	.1	3	.1	--	--	1	.0	8
28-37	190	3.7	174	3.4	129	2.5	51	1.0	544
38-42	1462	38.3	1237	23.9	1375	26.6	538	10.4	4612
43-44	6	.1	1	.0	--	--	2	.0	9
Total	1662	32.1	1415	27.4	1504	29.1	592	11.4	5173
									100.0

Note. Parity: 0 = 1 1 = 2 2-3 = 3-4 4+ = 5

Apgar scores are derived when the health care provider assesses the infant's respiratory efforts (cry), heart rate, color, muscle tone, and reflexes. A score of 0-2 is assessed on each of the components resulting in a total from 0 (no heart rate, no cry, no tone, no reflex, no color) to 10 (heart rate >100 beats, vigorous cry, strong muscle tone, pink color and reflexes within normal limits). A score of 7 or greater is desirable. A score less than 7 but greater than 3 may require some limited resuscitation. A score of 3 or less requires full resuscitation.

The majority (4689, 90%) of infants had a 1-minute apgar between 7-10. Few (1.8%) had apgars of 3 or less, while 7.5% were between 4 and 6. The average for the 1-minute apgar was almost 8 (Table 13).

The average for the 5-minute apgar was almost 9. Less than .5% of the 5-minute apgars were 3 or less, and 98.8% had an apgar of 7 to 10. One percent of the apgars were between 4 and 6. The majority of apgar scores of 3 or less occurred in the multiparous women of parities 2 through 4. Primiparas accounted for .1% of apgar scores of 3 or less. Grand multiparas accounted for 1 case (.0%) of 3 or less apgar score.

The population at risk for 5-minute apgar scores of 0-3 appears to be the multiparous woman between parities 2 through 4. The population at risk for apgar scores from 4

Table 13
Parity and Apgars

		Parity							
		0		1		2 3		4+	
		N	%	N	%	N	%	N	%
		Apgar (1-minute)							
0-3	41	.8	20	.4	20	.4	13	.3	94
4-6	163	3.2	87	1.7	100	1.9	40	.8	390
7-10	1458	28.2	1308	25.3	1384	26.8	539	10.4	4689
Total	1662	32.1	1415	27.4	1504	29.1	592	11.4	5173
		Apgar (5-minute)							
0-3	3	.1	4	.1	4	.1	1	.0	12
4-6	28	.5	10	.2	6	.1	7	.1	51
7-10	1631	31.5	1411	27.1	1494	28.9	584	11.3	5110
Total	1662	32.1	1415	27.4	1504	29.1	592	11.4	5173

Note. Parity: 0 = 1
1 = 2
2-3 = 3-4
4+ = 5

to 6 appears to be the primiparous women. Grand multiparas appear to be at least risk for poor apgar scores.

Abnormal Conditions of the Newborn

Abnormal conditions of the newborn included the following items, i.e., birth injury, congenital infection, meconium aspiration syndrome (MAS), assisted ventilation (divided into <30 minutes and >30 minutes), seizures, none, and other (Tables 14, 15). The majority (4783, 92.5%) reported no abnormal conditions of the newborn.

It would appear that the primiparous women, when compared with the rest of the parities, is at increased risk for all abnormal conditions of the newborn. The grand multipara was at decreased risk for all the abnormal conditions of the newborn. It should be remembered that the majority of these abnormal conditions (except 'other') occur very rarely, individually making up less than 1% and combined no more than 3%. The 'other' category, again, is handwritten and not accessible for this study.

Congenital Anomalies

This was comprised of two items, 'present' and 'none.' Of these, 'none' received 4982 (96.3%) of the cases, and 'present' (includes unknown) 219 (4.2%). The 'present' category had cases which were placed into 23 categories detailing congenital anomalies, none of which

Table 14

Parity and Abnormal Conditions of the Newborn

Condition	Parity								Total N	%
	0	1	2-3	4+						
	N	N	N	N	N	N	N	N	N	%
None	1501	1313	1415	554	4783	92.5				
Birth injury	23	10	6	4	43	.8				
Congenital infection	10	3	2	2	17	.3				
Meconium aspiration	13	7	6	3	29	.6				
Assisted ventilation <30 minutes	11	6	8	1	26	.5				
Assisted ventilation >30 minutes	19	11	7	3	40	.8				
Seizures	--	--	1	--	1	.0			1	.0
Others	116	83	69	29	297	5.7				

Note. Parity: 0 = 1 1 = 2 2-3 = 3-4 4+ = 5

N = Number of responses. Categories not mutually exclusive.

Table 15
 Fetal/Newborn Complications
 Residents: Utah, January-March 1989
N = 5173

	<u>N</u> ^a	%
Labor complication		
Fetal distress	333	6.40
Newborn abnormalities		
None	4783	92.50
Birth injury	43	.80
Congenital infections	17	.30
Meconium aspiration syndrome	29	.60
Assisted ventilation <30 min.	26	.50
Assisted ventilation >30 min.	40	.80
Seizures	1	.00
Congenital anomalies		
None	4982	96.30
Present	219	4.20

^aN = Number of responses. Categories not mutually exclusive.

were specified for this study. The majority (1.4%) of anomalies occurred in the primiparous subjects. The least amount of congenital anomalies occurred in the grand multiparas (Table 15).

Pearson Product Correlations

Pearson correlations were used to determine the significant correlation between parity and outcomes of pregnancy. Throughout this study, there was no significant ($p = .01$) correlation between parity and poor outcomes of pregnancy.

Significant correlations did occur between age and parity. This was controlled by dividing the cases into 3 age groups, those 19 and younger, those between 20 and 34, and those 35 and older. Each of these groups were then assessed using Pearson product correlations for any significant associations to parity (Table 16).

Women under 20 years of age had 3 significant correlations with parity: the number of cigarettes consumed per day (.181), gestational age of the infant (-.176), and the maternal education (-.172). The number of cigarettes consumed per day had a positive correlation (.181) that suggested as the parity increased for this age group, so did the cigarette consumption. Very few of this age group smoked (average was less than 1) and those that did consumed on the average 1.5 cigarettes per day.

Table 16
 Parity Correlations^a Significant at
 $\underline{P} \leq .01$

Age					
≤ 19		20-34		≥ 35	
		Operative method of delivery	-.234		
Cigarettes day	.181	No. prenatal visits	-.107	Education	-.228
Gestation age	-.176	Birth weight	.089	No. pre- natal visits	-.183
Education	-.172	Weight gained with pregnancy	-.087	Birth weight	.158
				Tobacco use	-.153
				Cigarettes/ day	-.138

^aPearson Product Correlation

Gestational age was the second strongest correlation ($-.176$). The inverse nature of this correlation suggests that women having their first babies were more likely to carry them to term. Women under 20 years of age having their second or third child were likely to have shorter gestations.

The association of education to parity was significant ($-.172$). This suggests that women who are having their second or third child are less likely to have attended further schooling. The average educational level for this age group was the 10th grade.

These values make sense, suggesting that teens of increased parity are less likely to continue in school. They may drop out in order to secure employment so as to raise their family. Increased parity for this age group suggests short interconceptual periods, with possible resultant shorter gestation periods. The burdens of stress, tobacco use, and immature physiology may shorten the gestation.

Women between the ages of 20 and 34 had 4 significant correlations to parity. These included the operative method of delivery, the number of prenatal visits, birth weights, and the weight gained during pregnancy. The average parity for this group was 1.415. The strongest correlation was the operative method of delivery ($-.234$).

This suggested that with increased parity, there was likely to be fewer operative deliveries.

The second significant correlation for women between 20 and 34 years of age was the number of prenatal visits ($-.107$). The average number of prenatal visits was 10. The inverse nature of this correlation suggests that women having their first baby were likely to have more prenatal visits than those of higher parity.

The third significant correlation for women between 20 and 34 years of age was the birth weight of the infant ($.089$). The average birth weight for this sample was 3387 grams or about 7-1/2 pounds. The positive nature of this correlation suggests that as parity increases, so does the birth weight of the babies.

The last significant correlation for women between 20 and 34 years of age is the weight gained during pregnancy. The average weight gain during pregnancy was 30 pounds. The inverse value ($-.087$) suggests that women having their first babies are more likely to be heavier than women of increased parity.

The strongest correlations to parity in women 35 years and older included maternal education ($-.228$), operative method of delivery ($-.207$), number of prenatal visits ($-.183$), birth weight ($.158$), tobacco use ($-.153$), and the number of cigarettes consumed per day ($-.138$). Maternal education was the first significant correlation.

The average educational level for this age group was 14 years. The inverse correlation ($-.225$) suggests that women having their first child are more likely better educated than women having their second or third child. This would seem to make sense as these better educated women may be career oriented and delaying their childbearing due to school or work demands.

The second correlation to parity was the method of delivery. The inverse value ($-.207$) suggests that women having their first baby were more likely to have an operative delivery. Multiparous women were more likely to have vaginal deliveries.

The third significant correlation to parity was the number of prenatal visits ($-.183$). The inverse nature of this value suggests that women having their first baby were more likely to have more prenatal visits. Multiparous women were more likely to have fewer visits.

The fourth significant correlation to parity for women 35 years and older was the birth weight of the infant ($.158$). The positive correlation suggests that with increased parity there is an increase in the birth weights of the babies.

The fifth and sixth significant correlations to parity were tobacco use and the number of cigarettes consumed per day ($-.153$ and $-.138$). The inverse nature of these two variables indicates that with increased parity

there is decreased tobacco use and consumption. This was opposite of what was found in the women under 20 years of age.

Regression Analysis

The ages of the subjects were divided throughout the regression and ran separately to control for the age factor. The ages were divided into those women under 20 ($N = 329$), those women between 20 and 34 years of age ($N = 4365$), and those 35 years and older ($N = 479$). Each age group was run separately against the dependent and the independent variables. The significant beta weights ($p = .05$) would be significant predictors of pregnancy outcomes of all the independent variables studied.

The independent variables selected for this study included parity, gestational age, tobacco use, number of cigarettes per day, maternal education, height, prepregnancy weight, weight gained during pregnancy, full-term weight, month prenatal care began, number of prenatal visits, and infant birth weight.

Each dependent variable was regressed against the independent variable. The dependent variables selected included:

1. Previous pregnancy medical risks (nonchronic)
2. Antepartum procedures (high risk, i.e., amniocentesis, induction, and stimulation of labor)

3. Complications of labor and delivery
4. Method of delivery, operative (included all cesarean sections, forceps and vacuum extraction)
5. Five-minute apgar
6. Abnormal conditions of the newborn
7. Congenital anomalies of the newborn

Previous Pregnancy Medical Risks

Previous pregnancy medical risk factors were those conditions that a woman had prior to this pregnancy. This study excluded all women who had demonstrated chronic medical conditions. That left only those who had pregnancy-related risks, i.e., previous small-for-gestational-age infants, LGA infants, etc. The regression analysis for women under 20 years of age indicated nothing of significance (Table 17).

Regression analysis for women 20-34 years of age indicated several predictors. The strongest predictor was gestational age ($-.118902$, $T = .0000$). The inverse beta weight indicated that with increased medical risk there was shortened gestation. The number of prenatal visits ($.069178$, $T = .0001$) indicated that with increased medical risks, there were more prenatal visits. The weight gained during pregnancy ($.068356$, $T = .0000$) indicated that with increased weight gain, there were more medical risks. Previous pregnancy medical risks were also

Table 17
Dependent Variable: Medical Risks, Pregnancy Associated

		<u><19</u>		20 - 34		<u>>35</u>	
		Sample Age					
R ²		.11459		.17615		.27248	
Adjusted R ²		.01313		.03103		.07424	
N		329		4365		479	
Variable	B	Significance	Variable	B	Significance	Variable	Significance
Nothing significant							
Significant B Weights							
Gestational age	-.118902	.0000	Tobacco use	.280049	.0015		
No. prenatal visits	.069178	.0001	No. cigar-ettes/day	-.195541	.0250		
Weight gained	.068356	.0000	No. prenatal visits	.187471	.0003		
Tobacco use	.061930	.0197	Parity	-.155394	.0013		
Parity	.058337	.0001	Gestational age	-.148379	.0035		
Birth weight	-.054343	.0028					
Prepregnancy weight	.052442	.0011					

associated with increased tobacco use (.61930, $\underline{T} = .0197$), increased parity (.058336, $\underline{T} = .001$), decreased infant birth weight (-.054343, $\underline{T} = .0028$), and heavier prepregnancy weights (.052442, $\underline{T} = .0011$) for the present pregnancy.

Regression analysis for women 35 years old and older with previous pregnancy medical risks indicated significant beta weights for tobacco use. There was a positive beta weight for tobacco use (.280049, $\underline{T} = .0015$) indicating that with previous pregnancy medical risks, there was increased tobacco use during the present pregnancy. An apparent anomaly was the inverse beta weight for the number of cigarettes consumed per day (-.195541, $\underline{T} = .0250$). This indicated there were fewer cigarettes consumed during this pregnancy by women who had previous pregnancy medical risks. These two beta weights seem to contradict each other and may be explained by factors this study did not research.

The next strongest beta weight was the number of prenatal visits associated with increased medical risks (.187471, $\underline{T} = .0003$). This supports the premise that if one enters pregnancy with increased previous pregnancy medical risks, there will be more prenatal visits.

The next to the last significant beta weight for women 35 years and older was increased parity. Increased parity was associated with increased medical risks

(.155394, $T = .0013$). The last significant beta weight for this age group was gestational age ($-.148379$, $T = .0035$). The inverse nature of gestational age suggests that with medical risk factors there was likely to be decreased gestational age of the newborn.

Antepartum Procedures

The women under 20 years of age had nothing significant indicated by the regression analysis. The adjusted R square was .00683 indicating that less than 1% of the antepartum procedures could be explained by the selected independent variables (Table 18).

Women between the age of 20 and 34 had an adjusted R square of .00340, suggesting less than 1% of the high risk antepartum procedures were explained by the selected independent variables. The most significant beta weight was the month prenatal care began ($-.062689$, $T = .0004$). The inverse nature suggests that high risk antepartum procedures were associated with early initiation of prenatal care. The last significant beta weight was the prepregnancy weight (.040806, $T = .0122$). This suggests that high risk antepartum procedures were associated with women of heavy prepregnancy weight. The health risks of obesity appear to be reflected in the increased use of high risk antepartum procedures.

Table 18

35

Women 35 and older had nothing significant occur for antepartum procedures. The adjusted R square indicated that only 1.2% of the antepartum procedures could be explained by the independent variable and none of these were significant.

Complications of Labor and Delivery

Regression of complications for women under 20 years of age indicated nothing of significance. The adjusted R square indicated that 3% of the complications were explained by the independent variables, but none were significant (Table 19).

Regression of complications in women between the ages of 20 and 34 had 5 significant beta weights. The strongest significant beta weight was parity ($-.128978$, $T = .0000$) which had an inverse relationship. This suggested that complications of labor/delivery were associated with decreased parity. Gestational age was the next strongest beta weight ($-.093281$, $T = .0000$), and was also inverse. This suggested that complications of labor/delivery were associated with shorter gestation. Prepregnancy weight was the third strongest significant factor ($.057163$, $T = .0000$). The association was positive suggesting that women who began pregnancy at heavier weights were more likely to experience complications during labor and delivery.

Table 19
Dependent Variable: Complications of Labor and Delivery

		<u><19</u>		20 - 34		<u>>35</u>	
		Sample Age					
R ²		.25376		.18471		.20622	
R ²		.06439		.03412		.04253	
Adjusted R ²		.03193		.03168		.01997	
N		329		4365		479	

Variable	B	Significance	Variable	B	Significance	Variable	B	Significance
Nothing significant								
Significant B Weights								
Parity			Parity	-.128978	.0000	Tobacco use	.231679	.0097
Gestational age			Gestational age	-.093291	.0000	Full term weight	.145687	.0035
Prepregnancy weight			Prepregnancy weight	.067163	.0000	No. cigarettes/day	-.166737	.0599
Height			Height	-.057911	.0003			
Weight gained			Weight gained	.039446	.0105			

a_p = .06

The fourth significant factor was maternal height (-0.057911 , $T = .0003$). The inverse relationship indicated that decreased maternal height was associated with complications during labor and delivery. The last significant beta was weight gain during pregnancy ($.039446$, $T = .0105$). The correlation was positive, indicating that women with heavier weight gains during pregnancy were more likely to have more complications during labor and delivery. The adjusted R square was $.03168$, indicating that 3.1% of the complications of labor and delivery were explained by the independent variables.

The significant beta weights for women 35 and over included tobacco use, full-term weight and, marginally, the number of cigarettes consumed per day. The strongest significant beta weight was tobacco use during pregnancy ($.231679$, $T = .0097$). The positive relationship indicated that for women who smoked during pregnancy, they were more likely to have complications during labor and delivery.

Full-term weight was the next significant factor, also a positive relationship ($.145687$, $T = .0035$). This suggested that women who were heavier at term were likely to have more complications of labor and delivery.

A marginally significant ($.06$ level) value was noted for the number of cigarettes consumed per day. This positive relationship suggests that as the cigarette

consumption per day increased, occurrence of complications during labor and delivery was less likely. This is another apparent anomaly and may be related to a factor not included in this study.

Method of Delivery

Method of delivery was dichotomized into vaginal and operative. Vaginal delivery included all vaginal births including VBAC. Operative delivery included all cesarean sections (primary and repeat) and the use of forceps and vacuum extraction. Regression analysis for the under 20 age group indicated the strongest predictor for operative delivery to be decreased parity ($-.120442$, $T = .0389$). Thus, for this age group, increased parity was more likely to result in vaginal deliveries, and those having their first infant were more likely to have an operative delivery (Table 20).

The above was also true for women between the ages of 20 and 34. The strongest beta weight was for parity ($-.233208$, $T = .0000$). Operative delivery increased as parity decreased. Maternal height was also significant ($-.100433$, $T = .0000$), indicating that shorter women were more likely to have operative births. Those who initiated prenatal care earlier had more operative deliveries ($-.093970$, $T = .0000$). This phenomenon warrants further research to determine possible causes.

Heavy prepregnancy weight in women was also a significant predictor for operative delivery ($.079057$, $T = .0000$). The same was true for the heavier full-term women, who were more likely to have operative deliveries ($.072241$, $T = .0000$).

Height was the strongest predictor ($-.219290$, $T = .0000$) for women over 34 years of age, indicating that the shorter women were likely to experience operative deliveries. Parity was the next strongest predictor ($-.192330$, $T = .0001$). This indicated that with decreased parity, there was likely to be operative deliveries. The last significant beta weight was the full-term weight ($.1175455$, $T = .0144$). Once again, the heavier full-term woman was more likely to experience an operative delivery than her lighter companions.

Five-Minute Apgar

Regression analysis of the 5-minute apgar score in women under 20 years of age indicated the strongest beta weight to be the gestational age ($.22922$, $T = .0017$). Apparently, as the gestational age increased there was likely to be a higher apgar score. Birth weight was the next strongest beta weight for this age group. Birth weight had a positive value ($.20911$, $T = .0071$) which indicated that with increased birth weight, there was likely to be an increase in the apgar scores (Table 21).

Women between the ages of 20 and 34 also experienced these same trends with the gestational age and birth weights. The third strongest beta weight for the 20-34 years old was the prepregnancy weight ($-.066002$, $T = .0000$). The inverse relationship indicted that lighter prepregnancy weights were more likely to have higher apgar scores. Parity was the fourth strongest beta weight ($.045573$, $T = .0027$) which indicated that with increased parity there was likely to be higher apgar scores. The last significant beta weight was for weight gained during pregnancy ($-.041051$, $T = .0074$). The lighter weight women were more likely to have infants with higher apgar scores.

Older women (≥ 35 years of age) had only 2 significant beta weights; gestational age and full-term weight. Gestational age was the strongest and had a positive value ($.151142$, $T = .0035$). This indicated that with gestational ages closer to term, there was an increased likelihood for higher apgar scores. The lighter full-term weight woman ($-.118818$, $T = .0170$) was likely to have infants with higher apgar scores.

Abnormal Conditions of the Newborn

Regression analysis for abnormal conditions of the newborn for women ≤ 19 years old had one significant beta weight. Gestational age was the only significant

Table 21
Dependent Variable: 5-Minute Apgar

		<19		20-34		>35	
				Sample Age			
R ²		.41660		.21248		.20245	
Adjusted R ²		.17355		.04515		.04099	
N		329		.04273		.01840	
				4365		479	
		Variable	B	Significance	Variable	B	Significance
		Gestational age	.22922	.0017	Gestational age	.151142	.0035
		Birth weight	.20911	.0071	Full-term weight	-.18818	.0170
		Significant B Weights					
		Gestational age			Gestational age		
		Birth weight			Full-term weight		
		Prepregnancy weight			Prepregnancy weight		
		Parity			Parity		
		Weight gained during pregnancy			Weight gained during pregnancy		

independent variable ($-.223139$, $\underline{T} = .0028$). The inverse nature suggested that abnormal conditions of the newborn were associated with decreased or shortened gestational age of the newborn (Table 22).

Women between the ages of 20 and 34 had significant beta weights for gestational age, parity, and maternal weight. The strongest beta weight was gestational age ($-.130101$, $\underline{T} = .0000$). The inverse nature of the beta weight suggested that with abnormal conditions of the newborn there was decreased gestational age. Parity also had an inverse relationship ($-.045201$, $\underline{T} = .0000$) indicating that as parity decreased, there was likely to be an increase in abnormal conditions. Maternal height had a positive value ($.036901$, $\underline{T} = .0220$) indicating that abnormal conditions of the newborn were associated with the taller woman. The adjusted R square for this group was .02210 which indicated that 2.2% of the abnormalities of the newborns could be explained by the independent variables.

Education was the only significant independent variable for women ≥ 35 years of age. Education had a positive value ($.096692$, $\underline{T} = .0475$) suggesting that the more educated a woman was, the more likely she was to have an abnormal condition in the newborn. This unusual finding cannot be explained by this study and warrants further research. Less than 1% of the abnormal conditions

Table 22
Dependent Variable: Abnormal Conditions of Newborn

	<19	20-34	>35
R^2	.35948	.15673	.16671
R^2	.12923	.02457	.02779
Adjusted R^2	.09901	.02210	.00489
N	329	4365	479

Variable	β	Significance	Variable	β	Significance
Gestational age	-.223139	.0028	Education age	.096692	.0475
Parity					
Height					

Significant β Weights	β	Significance
Gestational age	-.130101	.0000
Parity	-.045201	.0032
Height	.036901	.0220

of the newborn were explained by the selected independent variables.

Congenital Anomalies of the Newborn

Congenital anomalies was a yes/no category, determining only if the anomalies were present or not. There were no significant correlations between anomalies and parity across the age groups (Table 23).

Regression analysis for women under 20 revealed nothing significant. Apparently, none of the independent variables selected had any predictive power for this age group.

Regression analysis for women between 20 and 34 years of age had only 1 significant beta weight. Birth weight ($-.039503$, $T = .0323$) was the strongest beta value and inverse, suggesting that congenital anomalies were associated with decreased birth weight. There would likely be an increased amount of anomalies in infants of decreased gestational age.

Women over 34 years of age had only one significant beta weight, gestational age ($-.125009$, $T = .0163$). The inverse nature suggested that as the gestational age decreases, congenital anomalies were likely to occur.

Regression analysis is among the most powerful statistical tests that can be utilized for this data. A caution must be applied to the interpretation. Regression

tests, as in most statistical tests, do not establish a cause and effect relationship, but one of association. Regression analysis attempts to produce a predictive value for variables. This study included most of the present day predictors for pregnancy outcome, and still had small R values. This suggests that either the variables selected were not strongly predictive, or that pregnancy outcomes were influenced by many factors, none of which is strong by itself, but when combined with others may produce an effect.

Increased parity, often considered a predictor for poor outcomes, was found to be a predictor of good outcomes. The women at most risk for all complications were the primiparas, those having their first child. It appeared that the woman at least risk was the grand multipara.

CHAPTER IV

SUMMARY, IMPLICATIONS FOR NURSING, AND RECOMMENDATIONS

Summary

The purpose of this study was to determine the effects of parity on the outcomes of pregnancy. There were two hypotheses:

1. Increased parity is associated with increased maternal morbidity.
2. Increased parity is associated with increased neonatal morbidity.

The results of the data analyses cannot support either hypothesis.

Data were gathered from birth certificates from the state of Utah from January 1, 1989 through March 31, 1989. The total sample included 8487 single births prior to any exclusions. Cases were excluded for chronic illnesses and missing data. This reduced the sample size to 5173. The data were analyzed with frequency studies, measures of central tendency, cross-tabulations, Pearson correlations for associations with parity, and regression analysis for selected variables. The results were used to determine an

association between increased parity and adverse outcomes of pregnancy.

Pearson correlations indicated that there was a significant association between age and parity. This factor was controlled by dividing the ages into 3 groups, those 19 years old and younger, those between 20 and 34 years of age, and those 35 and older. Although significant, the associations were all weak.

Significant correlations for parity in women 19 years and younger included tobacco use and gestational age. In this age group, women having their first baby were less likely to smoke than those having their second or third child. Gestational age was the next highest correlation with an inverse value. This suggests that the women having their first child were more likely to carry it to term than those who were multiparous (para ≥ 2). The last correlation was that of maternal education, also an inverse relationship. The mean educational level for this age group was 10th grade. Those women who had completed more years of education were more likely to be having their first infants when compared with those having their second or third.

The strongest correlations for parity in women between 20 and 34 was the method of delivery, number of prenatal visits, birth weight of infant, and the weight gained during pregnancy. With increased parity, there is

increased association with vaginal deliveries, decreased number of prenatal visits, increased birth weights, and decreased amount of weight gained during pregnancy.

Several significant correlations were evident in women over 34 years of age. Increased parity was associated with decreased educational attainment of the mother, increased vaginal deliveries, decreased prenatal visits, increased birth weights, and decreased tobacco use.

Regression analysis is one of the strongest statistical tests available for this kind of data. The use of regression analysis has refuted the two hypotheses of this study. The criticism of this regression is that the independent variables, though significant, were not very predictive. The predictive values and the adjusted R squares were small in all instances.

Regression analysis indicated that parity is not a predictor of poor outcomes of pregnancy for most of the sample. The exception was in women 35 years old and older who entered pregnancy with a previous medical risk factor. The combination of increased parity and medical risk factors for the older women proved to be a predictor of a negative outcome for pregnancy.

Increased parity was a positive influence for most of the sample. Regression analysis indicated that with increased parity there were more vaginal deliveries, fewer

complications with labor and delivery, fewer abnormal conditions of the newborn, and better apgars. Increased parity was not associated with congenital anomalies.

The impact of maternal weight on the outcomes of pregnancy was evident throughout this study. Women beginning their pregnancy at heavier weights, those having heavier weight gains with pregnancy, and heavier full-term weights were all associated with increased poor outcomes.

Implications for Nursing

One implication of regression analysis suggests that use of increased parity as a predictor of poor pregnancy outcome is erroneous. State rules and regulations that prohibit out-of-hospital birth centers from delivering the grand multiparas may be doing her and the birth center a disservice. Perhaps a more accurate protocol would be to examine increased parity in combination with previous pregnancy medical risk factors, rather than just increased parity. Regression analysis further suggests that the women at greater risk (and who should, perhaps be limited to hospital births) are those who enter pregnancy obese and remain obese throughout, and those who smoke. The state rules and regulations need to change to reflect this new data. Increased parity in and of itself should not limit women to hospital births.

Recommendations

Recommendations for future study include further analyses of this data. Use of discriminant analysis may produce factors with more predictive value for the outcomes of pregnancy. Another suggestion would be to do a ponderal index of the maternal height, weight, and outcomes of pregnancy. Maternal height and weights added some interesting connotations to this study. Other factors to include in the next study would be the race, socioeconomic status of the parents, and the interconceptual period between pregnancies.

A last comment would be to the use of birth certificate data. It became apparent that many birth certificates are not completed properly or completely by the health care providers. It is important that health care providers be taught how to accurately fill out these data forms. These forms are representative of the population having babies in the Utah area, and may be utilized by other agencies in generating funds for those in need of services. This can have an impact not only on the consumers, but on the health care providers as well.

APPENDIX A

DESCRIPTIVE STUDIES

Problems of Increased Parity

Date, Researcher, Site: 1933
Peckman, C.
New York

Type of Study

Retrospective

Descriptive

To determine the effect of increasing parity on maternal and fetal death rate, and incidence of certain obstetric conditions
1896-1931

Sample Characteristics

29,227 women delivered at either Johns Hopkins Hospital or home
58.5% hospital births, 41.5% home births
52.25% black, 47.75% white

Method

Records reviewed for the following variables: maternal and fetal mortality and morbidity, malpresentation, eclampsia, nephritis, toxemia, placental accidents, hemorrhage, pyelitis, twins, puerperal infection, operative delivery. All were compared against parities of 1, 2-3, 4-5, 6-7, 8-9, ≥ 10 .

Results

Malpresentation, nephritis, placenta previa, toxemia (para ≥ 8), premature separation of placenta (para ≥ 8), postpartum hemorrhage (para ≥ 10), twins (para ≥ 6) are all associated with increased parity.

Primiparas associated with increased risk for eclampsia, toxemia, postpartum hemorrhage, pyelitis, puerperal infection, operative delivery, small infants.

Date, Researcher, Site: 1934
Solomon B.
Ireland

Type of Study

Descriptive
Retrospective
To determine the complications of multiparity
4-year study

Sample Characteristics

8,333 total births
59% (4,975) were multiparous

Method

Reviewed records and descriptive statistics to determine the complications of multiparity. Variables included maternal and fetal morbidity and mortality, malpresentations, uterine rupture, dystocia, etc.

Results

G.M. is at higher risk for malpresentation, CPD and uterine rupture due to pendulous abdomen.

G.M. has higher incidence of hemorrhage, placenta previa, CPD, retained placenta, and uterine rupture.

Maternal mortality is same as with other parities.

Date, Researcher, Site: 1939
Penrose, L.
Britain

Type of Study

Survey

Interview

Descriptive

To investigate the relation of placenta previa to
maternal age and previa

Sample Characteristics

All hospital deliveries

32 cases placenta previa

Mean age 31 years of age

Mean parity = 4

Method

Records of placenta previa were studied and home
visits made to conduct interviews. Information
analyzed to determine relationship of age and parity
on placenta previa.

Results

Demonstrated statistical significance between
increased parity and placenta previa, but less than
with increased maternal age.

Increased parity associated with marginal placenta
previa.

Increased age associated with central placenta
previa.

Date, Researcher, Site: 1940
Eastman, N.
Baltimore

Type of Study

Survey

Retrospective

Descriptive

To inquire into the hazards of pregnancy and labor in the grand multipara

Sample Characteristics

45,514 cases in which pregnancy went to or beyond stage of viability. G.M. (≥ 5)

Excluded abortion

Divided cases into parity:

Para 1 17,497 cases

Para 2-3 14,077 cases

Para 4-5 6,344 cases

Para 6-8 4,783 cases

Para ≥ 9 2,813 cases

Method

Using past records compared the incidence of complications and the parity levels. Variables studied included: maternal-fetal mortality, uterine rupture, hypertension, nephritis, placenta previa, etc.

Results

In women of para ≥ 8 , there is an increased incidence of maternal mortality, stillbirths, ruptured uterus, multiple pregnancy, breech, placenta previa, chronic hypertension, vascular disease.

Author also listed obesity as a handicap of G.M.

G.M. represents a difficult case.

Date, Researchers, Site: 1949
George, J., & Power, H.
Pennsylvania

Type of Study

Retrospective

Descriptive

To demonstrate the danger of the grand multiparas
1941-1946 (5 years)

Sample Characteristics

500 G.M. (para ≥ 6) from Pittsburgh who delivered in
local hospital

500 G.M. delivered 783 infants

Results

G.M. had increased maternal morbidity and mortality
rate (based on length of hospital stay). Causes of
death: infection, emboli, hemorrhage.

G.M. had increased fetal mortality (stillbirth,
premature).

G.M. had increased toxemia, placental accidents,
precipitous labors, and infections.

Date, Researchers, Site: 1953
Karn, M., & Penrose, L.
Ghana

Type of Study

Retrospective

Descriptive

To compare maternal and fetal mortality and complications in relation to maternal age, parity 1935-1946

Sample Characteristics

13,730 singleton birth records; included stillbirths.
Average maternal age 28 years
Average parity was <1

Method

Reviewed the records and made comparisons of birth weight, gestational age, and infant survival on maternal age and parity.

Results

Increased parity associated with increased birth weight.

No relationship between maternal age and gestation length.

Increased infant survival with birth weights above the mean, or between 7.7-8.8 pounds.

G.M. at increased risk for mortality due to postpartum hemorrhage, and operative delivery.

G.M. affects women's health unfavorably.

Contraception should be available to every woman who wants it.

Date, Researcher, Site: 1954
Miller, E.
New Mexico

Type of Study

Retrospective

Descriptive

To show the incidence of complications in pluriparous patients

To compare statistics of home delivery with hospitals 1944-1953 (10 years)

Sample Characteristics

Average age was 35

Total of 2,303 deliveries studied

24.3% (563) were G.M. (para ≥ 5)

Method

Survey of the G.M. in regard to parity, age, stillbirths, twins, malpresentations, duration of labor, hemorrhage, placental accidents, uterine rupture, etc. These were compared with findings from other studies of G.M.

Results

G.M. is at increased risk for malpresentation, placental accidents, hemorrhage, cesarean, prematurity and stillbirths.

G.M. is at decreased risk for maternal mortality, uterine rupture, hypertension, and renal disease.

Date, Researcher, Site: 1954
Schram, E.
Canada

Type of Study

Retrospective

Descriptive

To demonstrate the inherent complications of G.M.

Sample Characteristics

15,333 cases from 3 separate hospitals, 2 in Canada
and 1 in USA

G.M. (>7) was 2.6% of entire cases

Method

Reviewed and compared outcomes of G.M.s from 3
hospitals with general incidence of complications and
outcomes. Variables included: malpresentations,
hemorrhage, placental accidents, maternal and fetal
mortality and morbidity, toxemia, stillbirths, etc.
Also studied combined effects of age and parity.

Results

G.M. is associated with an increase in hemorrhage,
retained placenta, maternal and neonatal mortality,
twins, fetal abnormalities, toxemia, cardiovascular
disease, diabetes, but there is also a minority of
obstetric complications.

The combined effects of increased age and G.M. have
an association with hemorrhage, retained placenta,
premature labor, stillbirths, neonatal deaths.

Date, Researchers, Site: 1955
Petry, J., & Pearson, B.
Kentucky

Type of Study

Retrospective

Descriptive

To determine the obstetrical complications associated
with grand multiparity
1941-1953

Sample Characteristics

6,512 women, 862 were G.M. (parity ≥ 7)

All delivered in community hospital

Mountain women of Kentucky

Average age of G.M. 37

Method

Reviewed all hospital deliveries. Compared
complications and outcomes of non-G.M. and G.M.
Variables included hypertension, placental accidents,
maternal and fetal morbidity/mortality.

Results

G.M. has increased incidence of toxemia,
hypertension, placental accidents, uterine rupture,
infant and maternal mortality, twins, and LGA
infants.

There were no significant increases in
malpresentation and G.M.

Date, Researcher, Site: 1955
Oxorn, H.
Canada

Type of Study

Retrospective
Descriptive
To determine the hazards of grand multiparity
1926 to 1952 (27 years)

Sample Characteristics

63,140 births over 27 years
Of the above, 1,056 were of parity ≥ 8 or 1.6%
80% >35 years of age
All were deliveries at Canadian Maternity Hospital
"G.M. is obese, over-tired, hypertensive woman with a
tendency towards anemia--a woman who has borne more
than her share of children."

Methods

Surveyed records of all G.M. (parity ≥ 8) for
complications: variables included eclampsia,
toxemia, placental accidents, heart disease,
fibroids, cancer, malpresentations, delivery method,
hemorrhage, uterine rupture, cord prolapse, heart
failure, puerperal morbidity, etc.

Results

G.M. is at increased risk for toxemia, antepartum
bleeding, postpartum hemorrhage, fetal and maternal
mortality, ruptured uterus.

Recommendations:

- All G.M. be delivered in a hospital.
- All G.M. be carefully evaluated.
- Avoid false sense of security.
- Liberal use of C/S to avoid uterine rupture.

Date, Researcher, Site: 1956
Krebs, J.
Missouri

Type of Study

Retrospective
Descriptive
To survey and appraise the risks associated with
grand multiparity
1949-1954 (6 years)

Sample Characteristics

30,111 deliveries of which 1.7% (537) were G.M.
G.M. (>7)
Hospital deliveries occurred in all
Age: 23-48

Method

Records of G.M. were reviewed at two Missouri medical centers for complications of labor, delivery, and neonatal outcomes. Variables included maternal weight gain, hours of labor, method of delivery, malpresentations, twins, hemorrhage, placental accidents, ruptured uterus, etc.

Results

G.M. is at increased risk for forceps, cesarean, twins, toxemia, hypertension, prematurity, fetal loss, and maternal morbidity and mortality.

G.M. not associated with breech, malpresentations, hemorrhage, or ruptured uterus.

G.M. must be observed carefully for complications and treated vigorously.

Date, Researcher, Site: 1959
Kaltreider, D.
Baltimore

Type of Study

Retrospective
Descriptive
To determine risks associated with the elderly
multigravida
1950-1957

Sample Characteristics

22,973 total deliveries from 22,704 women
1649 (7.3%) were elderly G.M. (women ≥ 35)

Method

Reviewed records of deliveries to determine the incidence of complications. Variables included hypertension, toxemia, heart disease, diabetes, hemorrhage, placental accidents, fibroids, cervical cancer, malpresentation, method of delivery, puerperal morbidity, etc.

Results

Elderly G.M. at greater risk for fetal and maternal mortality due to chronic hypertension.

Heart disease, diabetes, malpresentations, twins, and C/S are increased.

Date, Researcher, Site: 1962
Ziel, H.
Kentucky

Type of Study

Retrospective

Descriptive

To determine the obstetric implications of grand multiparity among the mountain women of Kentucky

Sample Characteristics

3,105 births reviewed, 715 of which were grand multiparas (>6)

Impoverished women from mountains of Kentucky
G.M. divided into para 7-10, and para 10+

Method

Reviewed prenatal and hospital records of all women. Variables studied included birth weight, stillbirths, neonatal deaths, congenital anomalies, weeks gestation, malpresentations, delivery method, maternal medical risks, maternal morbidity and mortality, placental accidents, hemorrhage, prolapsed cord, etc. (Did not describe statistical analysis besides Description.)

Results

Found the following outcomes associated with increased parity: prenatal anemia, postpartum hemorrhage, uterine inertia, diabetes, malpresentation (not breech), increased birth weight, increased NSVD.

Found age-related outcomes to include stillbirths, congenital anomalies, and heart disease.

Date, Researcher, Site: 1964
Quinlivan, W.
Pennsylvania

Type of Study

Retrospective

Descriptive

To determine the predominant causes of maternal mortality in grand multiparas since 1939

Sample Characteristics

3 groups:

7,596 G.M. women from Eastman's study

5,233 G.M. women from 9 studies since 1939

47,314 women of all parities from 3 studies and 1 hospital

Method

Compared the causes of maternal mortality between the 3 groups of women and the changes that have occurred over the years.

Results

Post 1939 maternal deaths in G.M. have decreased, but still remain higher than in the non-G.M.

Post 1939 maternal deaths in G.M. are associated with placental accidents, hypertension, toxemia, heart disease, septicemia, malpresentation, prolapsed cord, uterine rupture, etc.

Date, Researcher, Site: 1966
Radovic, P.
Ghana, Africa

Type of Study

Descriptive

Retrospective

To determine the adverse effects of frequent and high parity

Sample Characteristics

132 women of parity ≥ 4 (G.M.)

220 primiparas

217 multiparas

All hospital births

Method

Compared the 3 groups for outcomes in infant mortality, maternal mortality, and complications of labor and delivery. Variables included CPD, placental accidents, hemorrhage, etc.

Results

G.M. had 6 times the fetal mortality than that of primiparas.

G.M. had twice as many cesareans due to functional dystocia.

Date, Researchers, Site: 1968
Duckman, S., Chen, W., Gungon,
T., & Bonura, F.
New York

Type of Study

Retrospective

Descriptive

To explore the relationship of disproportion in
multiparas and the use of cesareans
1960-1965

Sample Characteristics

13,796 deliveries studied

Of these, 22 were primary cesareans for CPD

Sample consisted of the 22 CPD cesareans

Method

Studied the management of the 22 cases and described
the use of x-ray pelvimetry, birth weights, labor
duration, rupture of membranes, delivery, and
presentation of infant.

Results

CPD in multiparous women maybe more dangerous than in
primiparas due to delay in recognition and reluctance
to do a cesarean on a "proven pelvis."

Encourage more liberal use of cesareans at first
indication of CPD.

Date, Researchers, Site: 1969
Lolis, D., & Soumplis, A.
Greece

Type of Study

Retrospective
Descriptive
To determine the influence of parity in grand
multiparas on labor
1955-1964

Sample Characteristics

66,150 delivered
0.9% (595) were G.M. (para ≥ 7)

Method

Reviewed records of women for obstetric and neonatal
outcomes. Cases divided into 4 groups for
comparison: para 1, para 2-3, para 4-6, para ≥ 7 .

Results

G.M. is associated with increased abruptio placenta,
cord prolapse, malpresentation, uterine rupture,
hemorrhage, uterine inertia, and maternal and infant
morbidity and mortality.

G.M. has increased vaginal discharge.

Date, Researcher, Site: 1977
Baskett, T.
Canada

Type of Study

Retrospective
Descriptive

To review the reproductive performance of the grand
multipara
1968-1973 (6 years)

Sample Characteristics

23,256 deliveries at medical center
4.3% (1005) infants born to G.M. (para ≥ 5)
886 women were G.M.
25% of G.M. received little or no prenatal care

Methods

Records were reviewed for complications and analyzed
using chi-square test of independence.

Results

G.M. has increased incidence of hemorrhage,
hypertension, placental accidents, stillbirths, and
malpresentations.

G.M. has significantly increased maternal and
perinatal mortality.

Date, Researchers, Site: 1978
Roman, E., Doyle, P., Beral,
V., Alberman, E., & Pharoah, P.
England

Type of Study

Survey

Descriptive

To determine the risks of fetal loss among women and the variables of age, pregnancy order, and parity

Sample Characteristics

All female doctors, 3068, registered in England and Wales

Method

Mailed out surveys asking for demographics and pregnancy information. Questionnaires were self-completed and anonymous. Excluded were women who had had 2 or more abortions, gravidity >6, and incomplete records. Chi-square analysis for trend.

Results

Fetal loss increased with increased pregnancy order.

Date, Researchers, Site: 1985
Fuchs, K., Peretz, B.,
Marcovici, R., Paldi, E., &
Timor-Tritsh, I.
Israel

Type of Study

Retrospective

Descriptive

To evaluate the incidence of complications associated
with grand multiparity
1960-1975 (16 years)

Sample Characteristics

50,057 total deliveries

11.6% (5785) were G.M. (parity ≥ 7)

G.M. consisted of immigrants from Morocco (51.6%) and
Iraq (11.8%), Israel born (19.9%), Arabs (14.6%),
Jews (5.2%)

SES: 95% low social class, 5% medium social class

Age: 27.5% < 30 years, 40.9% < 35 , 12.7% > 40

Deliveries occurred at Rambam Medical Center

Method

Compared G.M. with general population for pregnancy
and delivery complications. Variables studied
included method of delivery, breech, hemorrhage, pre-
eclampsia, malpresentations, placental accidents,
prolapsed cord.

Results

G.M. is associated with increased incidence of
cesareans, forceps, vacuum extraction, breech,
postpartum hemorrhage.

No maternal mortality in G.M.

Perinatal mortality same as non-G.M.

G.M. is a medical, social, and economic problem.

Date, Researchers, Site: 1986
Kiely, J.L., Paneth, N., &
Susser, M.
New York City

Type of Study

Retrospective

Description

An assessment of the effects of maternal age and parity of different components of perinatal mortality 1976-1978

Method

Data was retrieved from 3 sources: live births, fetal deaths, and infant deaths from live births, and fetal death certificates. Divided perinatal death into 4 categories: late fetal deaths (occurred before labor), fetal deaths during labor, neonatal deaths, and perinatal deaths attributed to anomalies. Determined the relationship of maternal age and parity to perinatal deaths. Used multiple regression.

Results

Increased maternal age associated with late fetal deaths.

High parity associated with fetal death during labor.

Mothers over 34 having their first birth at high risk for neonatal death.

Date, Researchers, Site: 1987
Tanbo, G., & Bungum, L.
Norway

Type of Study

Retrospective

Descriptive

To determine if there had been any improvement in the management of grand multiparas during the last few years

1974-1983 (10 years)

Sample Characteristics

16,209 total births

154 G.M. gave birth 208 times

Average parity 6.3 (5-16)

Mean age 28.1 years (17-38)

Control group of para 2-3 = 208 women

Methods

Researched the records of all births at community hospital. Compared the G.M. with non-G.M. for complications during pregnancy, labor, and puerperium. Chi-square analysis used.

Results

G.M. had increased incidence of malpresentation which corresponded to pendulous abdomen.

G.M. have high perinatal mortality, 23.5% compared to none in the control group.

There was no difference in G.M. and non-G.M. in frequency of anemia, excess blood loss, or cesarean rates.

Increased Parity and Effects of Prenatal Care

Date, Researchers, Site: 1961
Fuchs, K., & Peretz, A.
Israel

Type of Study

Retrospective

Descriptive

To demonstrate the outcomes of the grand multipara
1949-1958

Sample Characteristics

23,528 deliveries at Rambam Medical Center

7.1% (1677) G.M. (parity ≥ 7)

Age: 26% of G.M. < 30 years of age

64% of G.M. < 35 years of age

6% of G.M. > 40 years of age

Method

Compared to the outcomes of the G.M. and non-G.M.
Variables included toxemia, hypertension,
prematurity, malpresentation, placental accidents,
prolapsed cord, twins, delivery method, and fetal
mortality.

Results

G.M. had increased incidence of malpresentation and
premature separation of placenta.

Infant mortality same for G.M. and non-G.M.

G.M. not predestined to complications, but needs
close observation.

Date, Researchers, Site: 1962
Scharfman, E., & Silverstein, L.
New York City

Type of Study

Retrospective

Descriptive

To study the incidence of complications in the grand
multipara

1951-1960

Sample Characteristics

403 G.M. studied from 1951-1960

G.M. of para ≥ 7

2/3 were para 7-9

X age 34.5 years

44% white

56% nonwhite

Method

Reviewed the records of G.M. who delivered at Coney Island Hospital. Independent variables included length of labor, method of delivery, pitocin, placenta previa, abruptio placenta, postpartum hemorrhage, retained placenta, toxemia, premature birth, malpresentation, fetal morbidity, and mortality. Compared results with what researchers had demonstrated in previous studies.

Results

Placenta previa, postpartum hemorrhage, prematurity significantly increased in G.M.

Medical complications common to older pregnant women not a factor in the G.M.

With proper prenatal care, G.M. not 'dangerous.'

Date, Researchers, Site: 1965
Israel, S., & Blazer, A.
Pennsylvania

Type of Study

Retrospective

Descriptive

To determine the obstetric behavior of grand
multiparas from a composite of hospitals serving
several communities
1958-1960 (3 years)

Sample Characteristics

128,568 total of women of all parities
4.3% (5551) were G.M. of para ≥ 7
66% ≤ 34 years old
60% nonwhite G.M.

Method

Each hospital submitted data on a standard form to
the study. Data consisted of subjects medical
background, prenatal care, labor, delivery, and
complications. Chi-square used to analyze data.
Compared the G.M. with the non-G.M.

Results

G.M. had a statistically significant increase in
anemia, preeclampsia, chronic hypertension, placental
disasters, uterine rupture, and hemorrhage.

If G.M. receives modern medical care, then even with
the complications, she is at no greater risk of life
than any other pregnant woman.

Date, Researchers, Site: 1985
Kirz, D., Dorchester, W., &
Freeman, R., 1985
California

Type of Study

Prospective

Descriptive

To study the risks involved with advanced maternal
age and pregnancy

1981-1983 (3 years)

Sample Characteristics

6,366 women, from Women's Hospital of Long Beach

1,023 of above were >35 years

5,343 of above were 20-25 years (control group)

Divided into nulliparous and parous, healthy

Method

Compared control group and study group using
chi-square analysis. Variables included pregnancy
complications (diabetes, heart disease, etc.), labor
complications (hemorrhage, fever, etc.), delivery
outcomes and neonatal outcomes (birth weight, apgars,
etc.).

Results

Healthy parous women have an increased incidence of
cesareans and macrosomic babies.

Pregnant women of advanced age who are delivered in a
hospital are at no greater risk than younger women.

Date, Researchers, Site: 1988
Eidelman, A., Kamar, R.,
Schimmel, K., & Bar-On, E.
Israel

Type of Study

Retrospective
Descriptive

To study the outcomes of a grand multiparous
population in a modern medical care setting
1982-1983

Sample Characteristics

7,785 cases total; 1.5% (899) G.M. (≥ 5); 6,886
non-G.M.

Race: 70% Ashkenazic Jews; 26% Sephardic Jews; Arab
1%; unknown 3%

Age 31% \geq 35 years of age

Method

Reviewed records for prenatal care, complications and
outcomes. Used chi-square for analysis of data.
Compared outcomes of non-G.M. and G.M.

Results

Non-G.M. had statistically significant increase in
prolonged labor, forceps, vacuum, NICU admissions,
and neonatal deaths.

G.M. had statistically significant increase in
multiple births and congenital anomalies.

Healthy G.M. in an economically stable population
with modern medical care is not a major risk.

Date, Researchers, Site: 1988
Erickson, D., & Elliot, B.
Minnesota

Type of Study

Retrospective

Descriptive

To determine whether age itself is a risk factor of
if other risk factors explain the mature gravidas'
increased risk

Sample Characteristics

170 women pregnant after age 35

135 women pregnant between 20 and 29 years of age

Sample drawn from St. Mark's Medical Center

Grand multiparas excluded, but mentioned

Methods

Reviewed records of births and mother retrospectively
to compare the older pregnant women with younger with
regard to pregnancy and labor complications, delivery
and neonatal outcomes. Pregnancy complications
consisted of premature rupture of membranes,
preeclampsia, diabetes. Labor complications
consisted of precipitous labor and paracervical
blocks. Delivery outcomes included cesareans.
Neonatal outcomes consisted of prematurity, NICU
admission, morbidity, fetal demise, <25 weeks
gestation, ≥25 weeks gestation.

Results

Pregnancy complications--indicated no significant
difference among the two groups of women.

Labor complications--precipitous deliveries
significantly higher in older multiparous women.

Delivery outcomes--no significant difference.

Neonatal--older primiparas at higher risk for
prematurity.

*Prematurity associated with maternal age, not
parity.

Date, Researchers, Site: 1988
Mwambingu, F., Meshari, A., &
Akiel, A.
Saudi Arabia

Type of Study

Retrospective
Descriptive
Reviews the outcomes of grand multiparas at the
university hospital
1983-1985 (3 years)

Sample Characteristics

4,819 deliveries, 13.4% (646) grand multiparas (>5
births)
Mean age 33, 30% >35 years

Method

Compared G.M. and non-G.M. in regards to age, glucose
intolerance, hypertension, rheumatic heart disease,
anemia, pregnancy and perinatal outcomes.

Results

G.M. has increased incidence of diabetes,
hypertension, heart disease, hemorrhage, and breech
presentations.

G.M. has increased normal vaginal delivery, large
infants, and fewer by half perinatal mortality.

G.M. is a risk factor in poor SES and inadequate
health service areas.

G.M. at no greater risk than any other woman if
afforded adequate prenatal care, nutrition, and
better SES.

Date, Researchers, Site: 1988
Seidman, D., Armon, Y., Roll,
D., Stevensen, D., & Gale, R.
Israel

Type of Study

Retrospective
Descriptive

To evaluate the obstetric/neonatal outcomes of grand
multiparas without the effects of race, SES
1984-1986

Sample Characteristics

5,916 deliveries
13% (8,930) were G.M. (parity ≥ 7)
Age: 58% G.M. <35 years of age
Education: 4/5 had attended high school; 25% had
attended college

Method

Records reviewed and analyzed from hospital. Cases
divided into G.M. and non-G.M. (para 2-6). Variables
included maternal obstetric complications and
neonatal complications. Chi-square analysis utilized.

Results

G.M. had significant increase in meconium stained
fluid and neonatal jaundice.

G.M. had fewer cesareans, but larger babies.

G.M. not associated with major increased risks to
mother or baby.

Most adverse effects are associated with low SES.

Parity, Birth Weight, and Other Factors

Date, Researcher, Site: 1968
Simpkiss, M.J.
Uganda, Africa

Type of Study

Retrospective

Descriptive

To compare birth weight, maternal age and parity among the African population of Uganda

Sample Characteristics

1,905 infants and mothers

Males to females 1.12:1

Bantu infants 1,528

Non-Bantu 377

Method

Reviewed records of 2,068 consecutive births, from which data was drawn from 1,905 births. Descriptive statistics used to determine mean birth weights, maternal age, parity between the two groups (Bantu, non-Bantu). Stillbirths also explored in relation to maternal age and parity.

Results

Demonstrated an increased birth weight with increased parity.

Bantu infants heavier than non-Bantu, which is attributed to better nutrition of Bantu mothers.

No correlation found between stillbirths and parity.

Date, Researcher, Site: 1969
St. George, J.
Trinidad

Type of Study

Retrospective

Descriptive

To indicate the facts that predispose women to high
parity

1965-1967

Sample Characteristics

2,582 G.M. (parity >6) women

Religion: 33% Catholic, 24.7% Protestant, 14.6%

Hindu, 4.1% Muslim, 23.3% none

Race: East Indian 15.4%, Negro 9.7%, mixed 10.5%

Method

Compared demographic, SES, and psychosocial factors
of G.M. and non-G.M.

Results

Factors associated with high parity include:

Early start and late finish of reproductive career

Illegitimacy (40% of births)

Lack of religious beliefs

East Indian race

Lack of interest in contraception

Date, Researchers, Site: 1970
Camilleri, A., & Cremona, V.
Malta

Type of Study

Retrospective

Descriptive

To determine the effect of parity on birth weight
1965

Sample Characteristics

2,517 births or 44% of all births in Malta in 1965

290 births from earlier years to women of para ≥ 5

Average age of all mothers 27 years

Method

Records reviewed and analyzed comparing birth weight
outcomes among the G.M. and non-G.M. women.

Results

Demonstrated an increased birth weight with increased
parity, up to parity 10.

Birth weight decreased after parity 10.

Date, Researchers, Site: 1971
Roopnarinesingh, S., Wehby, M.,
& Matadial, L.
Jamaica

Type of Study

Retrospective

Descriptive

To evaluate the reproductive efficiency of grand
multiparous Negro women afforded good prenatal care
1968-1969

Sample Characteristics

100 great G.M. (>10 births)

100 non-G.M. (parity 1-4)

100% black, same social backgrounds, low SES

Method

Compared great G.M. and non-G.M. for complications of
pregnancy, labor, delivery, and fetal outcome.

Results

Great G.M. had increased incidence of hypertension,
anemia, malpresentation, premature rupture of
membranes, and hemorrhage.

Great G.M. had larger infants.

No significant difference between great G.M. and
non-G.M. in time and method of delivery.

Maternal complications more common in great G.M.,
but risks to fetus no different than in women of
lesser parity.

Date, Researchers, Site: 1986
Boylan, P., & Frankowski, R.
Texas

Type of Study

Descriptive

To demonstrate a practical approach to analysis of
dystocia and use of cesareans
January 1985 to June 1985

Sample Characteristics

Subjects come from three practices in Texas
2,324 total births, 747 nulliparous and 1,577
multiparous

Method

Compared nulliparous and multiparous women who had to
have cesareans to determine causes. Variables
considered were dystocia, fetal distress, breech,
repeat cesarean, and other.

Results

Dystocia more frequent in nulliparas.

Breech more frequent in nulliparas.

Fetal distress same in nulliparas and multiparas.

Repeat cesarean more frequent in multiparas.

Date, Researchers, Site: 1987
Seidman, D., Gale, R.,
Slater, P., Ever-Hadani, P., &
Harlap, S.
Israel

Type of Study

Prospective
Interview and Survey
Descriptive
To determine if grand multiparity affects fetal
outcome
1974-1976 (26 months)

Sample Characteristics

16,320 women of which 1,248 were G.M. (parity ≥ 7)
Average number of births/woman = 3.5
Average age 23 with 3% ≥ 40 and 3% ≤ 20
Education: 75% had attended high school, 35% had
college education

Methods

Postpartum interviews of mothers on first or second
postpartum day. Utilized cross-sectional and
longitudinal study to determine the effect of grand
multiparity on low birth weight and stillbirths.

Results

G.M. are not at increased risk for low birth weight,
but do have a higher frequency of stillbirths.

Low birth rate highest incidence in primiparas.

Stillbirths are more frequent with first born,
decreases with second and third child, and rises
dramatically with increased parity.

Date, Researchers, Site: 1988
Lee, K., Ferguson, R., Corpuz,
M., & Gartner, L.M.
Chicago

Type of Study

Retrospective

Descriptive

A population study to determine association between
maternal age and incidence of low birth weight at
term
1980-1984

Sample Characteristics

184,567 singleton births
40 weeks gestation mothers
16.7% black
83.8% white

Method

Examined birth certificate data on 184,567 singleton
births over a 5-year period of time (1980-1984).
Utilized descriptive statistics and multiple logistic
regression analysis to determine independent effects
of maternal age. Parity was included in analysis, as
well as race, education, marital status, prenatal
care.

Results

Low birth weight associated with teens (≤ 17) and
older women (≥ 34).

Low birth weight associated with unmarried status,
low educational attainment, parity of 0 or ≥ 3 , and
inadequate prenatal care.

Date, Researchers, Site: 1989
Korenbrod, C., Showstack, J.,
Loomis, A., & Brindis, C.
San Francisco

Type of Study

Prospective

Descriptive

To compare birth weight outcomes in a teenage pregnancy case management project with birth weight outcomes of teens not in the project

Sample Characteristics

411 teen mothers in TAPP program

>200 teen mothers not in TAPP, prior to TAPP's development

Method

The Teenage Pregnancy and Parenting Program (TAPP) was designed to remedy service gaps in San Francisco. The 411 TAPP births were compared to the $\geq 2,000$ San Francisco teen births that occurred prior to the TAPP program. Regression analysis was used in the independent variables of race, infant gender, parity, maternal age.

Results

Average weight of infants born to TAPP teens higher than non-TAPP teens ($p > 0.0001$).

Participation in TAPP prior to delivery was strongly associated with better birth weight outcomes than was race, age, parity, or gender.

APPENDIX B

COMPUTER CODE AND VARIABLE LABELS

Computer Codes	Birth Certificate Stem	Variable Labels
V3	17	Date of birth (mother's age)
V4	29a	Education of mother (highest grade completed)
V5	30	Mother married (at birth, conception, or any time between)
V6-A	32	Mother's height (inches)
V6-B	32	Mother's prepregnancy weight (lbs.)
V6-C	32	Mother's weight gained during pregnancy
V6-D	32	Mother's full-term weight
Substance Use:		
V7-A	33	Tobacco use during pregnancy
V7-B	33	Number of cigarettes/day
V8-A	33	Alcohol use during pregnancy
V8-B	33	Number of alcoholic beverages/week
Medical Risk Factors:		
V9-0	35.00	None
V9-1	35.01	Anemia
V9-7	35.07	Oligo/polyhydramnios
V9-9	35.09	Hypertension, pregnancy-associated
V9-12	35.12	Previous infant 4000+ grams
V9-13	35.13	Previous preterm infant
V9-14	35.14	Previous small-for-gestation-age infant

Computer Codes	Birth Certificate Stem	Variable Labels
V9-19	35.19	Other
Infant Birth Weight:		
V10-2	37.00	Infant birth weight
Prenatal Care:		
V12-A	40.00	Month pregnancy prenatal care began
V12-B	41.00	Number of prenatal visits
Gestation Age:		
V13	42.00	Clinic estimate of gestation
Aggar Scores:		
V14-A	43.00	Apgar score--1 minute
V14-B	43.00	Apgar score--5 minute
Previous Live Births:		
V15-A	46a	Number of previous live births
Antepartum Procedures:		
V17-0	47.00	None
V17-1	47.01	Amniocentesis
V17-3	47.03	Induction of labor
V17-4	47.04	Stimulation of labor
Method of Delivery:		
V18-1	48.01	Vaginal
V18-2	48.02	Vaginal birth after previous cesarean
V18-3	48.03	Primary cesarean
V18-4	48.04	Repeat cesarean

Computer Codes	Birth Certificate Stem	Variable Labels
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V18-5	48.05	Forceps
-------	-------	---------

V18-6	48.06	Vacuum
-------	-------	--------

Complications of Labor and Delivery:

V19-0	49.00	None
-------	-------	------

V19-1	49.01	Febrile (>100°F or 38°C)
-------	-------	--------------------------

V19-2	49.02	Meconium, moderate/heavy
-------	-------	--------------------------

V19-3	49.03	Premature rupture of membranes
-------	-------	--------------------------------

V19-4	49.04	Abruptio placenta
-------	-------	-------------------

V19-5	49.05	Placenta previa
-------	-------	-----------------

V19-6	49.06	Other excessive bleeding
-------	-------	--------------------------

V19-8	49.08	Precipitous labor (<3 hours)
-------	-------	------------------------------

V19-9	49.09	Prolonged labor (>20 hours)
-------	-------	-----------------------------

V19-10	49.10	Dysfunctional labor
--------	-------	---------------------

V19-11	49.11	Breech/malpresentation
--------	-------	------------------------

V19-12	49.12	Cephalopelvic disproportion
--------	-------	-----------------------------

V19-13	49.13	Cord prolapse
--------	-------	---------------

V19-15	49.15	Fetal distress
--------	-------	----------------

V19-16	49.16	Other
--------	-------	-------

Abnormal Conditions of the Newborn:

V20-0	50.00	None
-------	-------	------

V20-2	50.02	Birth injury
-------	-------	--------------

V20-5	50.05	Congenital infection
-------	-------	----------------------

V20-7	50.07	Meconium aspiration syndrome
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V20-8	50.08	Assisted ventilation <30 minutes
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Computer Codes	Birth Certificate Stem	Variable Labels
V20-9	50.09	Assisted ventilation >30 minutes
V20-10	50.10	Seizures
Congenital Anomalies of Child:		
V21-0	51.00	None
V21-25	51.25	Unknown

APPENDIX C

BIRTH CERTIFICATE WORKSHEET

**UTAH BIRTH CERTIFICATE WORK SHEET
FOR MATERNAL CARE ATTENDANT**

INSTRUCTION FOR MATERNAL CARE ATTENDANT
Items 47 through 49 are to be completed
by the physician or other attendant
at the delivery. These data may be abstracted
from the delivery summary sheet.

MOTHER'S NAME _____ CHILD'S TIME OF BIRTH _____
CHILD'S NAME _____ ATTENDANT'S NAME _____
CHILD'S DATE OF BIRTH _____
CHILD'S SEX _____

**UTAH BIRTH CERTIFICATE WORK SHEET
FOR MATERNAL CARE ATTENDANT**

47. ANTEPARTUM PROCEDURES DURING THIS PREGNANCY

(Check all that apply)

- ☐ 01 Amniocentesis
- ☐ 02 Electronic fetal monitoring
- ☐ 03 Induction of labor
- ☐ 04 Stimulation of labor
- ☐ 05 Tocolysis
- ☐ 06 Ultrasound
- ☐ 00 None
- ☐ 07 Other *(Specify)* _____

48. METHOD OF DELIVERY *(Check all that apply)*

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

**UTAH BIRTH CERTIFICATE WORK SHEET
FOR MATERNAL CARE ATTENDANT**

49. COMPLICATIONS OF LABOR AND/OR DELIVERY

(Check all that apply)

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

UTAH BIRTH CERTIFICATE WORK SHEET
FOR NEWBORN CARE ATTENDANT

INSTRUCTION FOR NEWBORN CARE ATTENDANT
Items 50 and 51 are to be completed
by the physician or
other attendant for the newborn.

ATTENDANT'S NAME _____

MOTHER'S NAME _____

CHILD'S NAME _____

CHILD'S DATE OF BIRTH _____

UTAH BIRTH CERTIFICATE WORK SHEET
FOR NEWBORN CARE ATTENDANT

50. ABNORMAL CONDITIONS OF THE NEWBORN

(Check all that apply)

- ☐ 01 Anemia (Hct. < 39/Hgb. < 13)
- ☐ 02 Birth Injury
- ☐ 03 Fetal alcohol syndrome
- ☐ 04 Neonatal meningitis
- ☐ 05 Congenital infection
- ☐ 06 Hyaline membrane disease/RDS
- ☐ 07 Meconium aspiration syndrome
- ☐ 08 Assisted ventilation < 30 min.
- ☐ 09 Assisted ventilation \geq 30 min.
- ☐ 10 Seizures
- ☐ 00 None
- ☐ 11 Other _____
- ☐ 12 Unknown (Specify)

51. CONGENITAL ANOMALIES OF CHILD

(Check all that apply)

- ☐ 01 Anencephalus
☐ 02 Spina bifida / Meningocele
☐ 03 Hydrocephalus
☐ 04 Microcephalus
☐ 05 Other central nervous system anomalies
 (Specify) _____
☐ 06 Heart Malformations
 (Specify) _____
☐ 07 Other circulatory anomalies
 (Specify) _____
☐ 08 Respiratory anomalies
 (Specify) _____
☐ 09 Rectal atresia / stenosis
☐ 10 Tracheo-esophageal fistula / esophageal atresia
☐ 11 Omphalocele / Gastroschisis
☐ 12 Other gastrointestinal anomalies
 (Specify) _____
☐ 13 Malformed genitalia
☐ 14 Renal agenesis
☐ 15 Other urogenital anomalies
 (Specify) _____
☐ 16 Cleft lip / palate
☐ 17 Polydactyly / Syndactyly / Adactyly
☐ 18 Club foot
☐ 19 Diaphragmatic hernia
☐ 20 Other musculoskeletal / Integumental anomalies
 (Specify) _____
☐ 21 Down's syndrome
☐ 22 Other chromosomal anomalies
 (Specify) _____
☐ 23 Multiple anomalies
☐ 00 None
☐ 24 Other _____
☐ 25 Unknown (Specify) _____

UTAH BIRTH CERTIFICATE WORKSHEET FOR PARENTS

1. CHILD'S NAME (FIRST, MIDDLE, LAST) _____

16a. MOTHER'S NAME (FIRST, MIDDLE, LAST) _____

16b. MOTHER'S MAIDEN LAST NAME _____

17. MOTHER'S DATE OF BIRTH (MONTH, DAY, YEAR) _____

18. MOTHER'S BIRTH PLACE (STATE OR FOREIGN COUNTRY) _____

19. MOTHER'S USUAL RESIDENCE (STREET AND NUMBER) _____

CITY, TOWN, OR COMMUNITY _____ INSIDE CITY LIMITS YES ☐ NO ☐

COUNTY _____ STATE _____

20. MOTHER'S MAILING ADDRESS (IF SAME AS RESIDENCE, ENTER ZIP CODE ONLY) _____

21. FATHER'S NAME (FIRST, MIDDLE, LAST) _____

22. FATHER'S DATE OF BIRTH (MONTH, DAY, YEAR) _____

23. FATHER'S BIRTHPLACE (STATE OR FOREIGN COUNTRY) _____

UTAH BIRTH CERTIFICATE WORKSHEET FOR PARENTS

26. OF HISPANIC ORIGIN?		27. RACE—American Indian (Tribe may be entered), Black, White Japanese, etc. (Specify below)
26a. Mother: Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, Indicate <input type="checkbox"/> Mexican <input type="checkbox"/> Cuban <input type="checkbox"/> Puerto Rican <input type="checkbox"/> Other Hispanic (Specify)	26b. Father: Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, Indicate <input type="checkbox"/> Mexican <input type="checkbox"/> Cuban <input type="checkbox"/> Puerto Rican <input type="checkbox"/> Other Hispanic (Specify)	27a. MOTHER
		27b. FATHER

UTAH BIRTH CERTIFICATE WORKSHEET FOR PARENTS

MOTHER	OCCUPATION WORKED LAST YEAR	FATHER
28a.		28b.
KIND OF INDUSTRY OR BUSINESS		
28c.		28d.
EDUCATION (Specify only highest grade completed) Elementary or secondary (0 through 12). College (13 through 18 or 17+)		
MOTHER		FATHER
29a.		29b.
30. MOTHER MARRIED? (At birth conception, or any time between)		
YES <input type="checkbox"/> NO <input type="checkbox"/>		
31. Has a relative of the baby had a hearing loss that existed since childhood? (Permanent, Hereditary loss)		
YES <input type="checkbox"/> NO <input type="checkbox"/>		
32. MOTHER'S HEIGHT AND WEIGHT		
Mother's height _____ feet _____ Inches		
Mother's prepregnancy weight _____ lbs.		
Mother's weight gain during pregnancy _____ lbs.		
25. Parental permission is given to provide the child's name and date of birth to the Social Security Administration for purposes of issuing a social security number to the newborn.		
YES <input type="checkbox"/> NO <input type="checkbox"/>		

UTAH BIRTH CERTIFICATE WORKSHEET FOR PARENTS

<p>33. OTHER RISK FACTORS FOR THIS PREGNANCY</p>	
<p>Tobacco use during pregnancy</p>	<p>YES <input type="checkbox"/> NO <input type="checkbox"/></p>
<p>Average number of cigarettes per day _____</p>	
<p>Alcohol use during pregnancy</p>	
	<p>YES <input type="checkbox"/> NO <input type="checkbox"/></p>
<p>Average number of drinks per week _____</p>	

I certify that the personal information provided on this certificate is correct to the best of my knowledge and belief.
 Signature of Parent or Other Informant _____

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