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Maternal Age: Influence on Length of Gestation and Birth Weight

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MATERNAL AGE:
INFLUENCE ON LENGTH OF GESTATION AND BIRTH WEIGHT

A Thesis
Presented to
the Faculty of the Department of Nursing
Western Kentucky University
Bowling Green, Kentucky

In Partial Fulfillment
of the Requirements for the Degree
Masters of Science in Nursing

by
Charlotte A. Bratcher
December, 1997
MATERNAL AGE:
INFLUENCE ON LENGTH OF GESTATION AND BIRTH WEIGHT

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9/5/97
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The findings indicated no significant differences among the age groups in relation to infant birth weight nor in relation to the risk factors of smoking, maternal weight gain, trimester of first entry into prenatal care, or marital status. They did indicate a significant difference [F(2,85) = 4.1364, p < .05] between the oldest and the youngest group (CD = 3.37, α = .05) in relation to gestational length. These findings are significant for healthcare providers in rural areas, since much of the previous research had been done in highly urbanized or inner city settings.
CHAPTER I

INTRODUCTION

In a highly popular booklet, *Eleven Million Teenagers*, the Alan Guttmacher Institute (1976) warned the United States that it had an "epidemic" of teenage pregnancy. Since then teenage childbearing has been regarded as an important social problem, and a great deal of attention has been focused on this problem from almost every segment of society.

In 1980, the Alan Guttmacher Institute reported that despite efforts to reduce adolescent pregnancy, the United States had one of the highest pregnancy rates for this age group in developed countries. The United States adolescent pregnancy rate was six times that of the Netherlands and twice that of England. Most of the pregnancies were premaritally conceived and unintentional. Adolescent pregnancy remains a key issue for politicians, social scientists, healthcare providers, and educators (Forrest, 1994).

Spitz and colleagues (1996) conducted a study to analyze pregnancy, abortion and birth rates among adolescents in the United States. Although pregnancy rates among girls aged 15 to 19 remained fairly stable from 1980 to 1985, they increased by 9% during the last half of the decade, totaling 95.9 pregnancies per 1000 teenaged girls by 1990. Pregnancies in girls younger than 15 increased by 15% from 1980 to 1990, making up 3% of all adolescent pregnancies. Spitz et. al reported that the United States continues to rank among the highest in developed countries for adolescent pregnancy as reported in the earlier study by the Alan Guttmacher Institute (1980).

Reducing the incidence of low birth weight and preterm deliveries are national goals established to improve the overall health of the nation (Hobson, 1993). Locally, the Green River Regional Health Council (1996) conducted a study that compared the Green River District community to state and national norms. Preterm deliveries and low birth
weight were identified as areas of concern, and goals were established to reduce the number of teen pregnancies and low birth weight infants in the Green River District. These goals were consistent with recommendations of Healthy People 2000, a national publication which identifies health problems in the United States and establishes goals for health improvement.

Over the past 20 years, many studies have examined the relationship between maternal age and outcomes of pregnancy. Ventura, Martin, Toffel, and Mathews, (1994) claimed that teen mothers generally had a lower educational attainment and were more likely to face lifetime poverty. Teen mothers were also less likely to receive timely prenatal care. They had higher rates of certain risk factors for poor pregnancy outcome that included inadequate weight gain, smoking, and drug abuse during pregnancy. Their babies were at increased risk for low birth weight and preterm birth, which in turn placed them at risk for illness, developmental delays, and even death. All of these outcomes have resulted in a significantly high cost to society.

Berkowitz and Papiernik (1993) reported that in the United States, preterm infants weighing less than 750 grams were found to account for 41% of early neonatal deaths and 25% of all infant deaths. They noted that preterm birth was a major determinant of neonatal and infant morbidity, including neurodevelopmental handicaps, chronic respiratory problems, intraventricular hemorrhage, infection, retrolental fibroplasia, and necrotizing enterocolitis. The neonatal and long term healthcare costs associated with these conditions have imposed an economic burden on individual families as well as the nation as a whole. Presently, healthcare cost is a major national focus; the identification and control of risk factors that are resulting in these high costs would be of considerable significance.

Early studies have been criticized for failing to take into consideration the influence of the pregnant teen's sociodemographic environment. These adolescents are more likely than older mothers to be nonwhite, poor, under educated, and unmarried. They are also
less likely to have received early prenatal care. All of these factors have been associated with low birth weight in babies (Ventura et al., 1994). Therefore, researchers have concluded that reports of young maternal age alone as a risk factor for preterm delivery or low birth weight are exaggerated. (Brown, Fan, & Gonsoulin, 1991; Lee, Ferguson, Corpus, & Gartner, 1988; McAnarney, 1987)

Purpose

The purpose of this study was to determine if there is a difference in the pregnancy outcomes of gestational length and birth weight of infants born to mothers in three different age groups of 15 to 17, 18 to 19 and 20 to 22. In addition, the study was conducted to determine if there was a difference among these age groups in the selected risk factors of smoking status, poverty level, marital status, number of prenatal visits, trimester of first prenatal visit, and maternal weight gain.

Research Questions

The research questions under consideration in this study were as follows:

1. Is there a difference in infant birth weights based on maternal age of primiparous (first pregnancy) mothers in the age groups of 15 to 17, 18 to 19 and 20 to 22?

2. Is there a difference in the gestational length of infants based on maternal age of primiparous mothers in the age groups of 15 to 17, 18 to 19 and 20 to 22?

3. Is there a difference in the selected demographic and socioeconomic factors of race, smoking status, poverty level, marital status, number of prenatal visits, trimester of first prenatal visit, or maternal weight gain during pregnancy among the maternal age groups of 15 to 17, 18 to 19 and 20 to 22?

Definition of Terms

Independent Variable

Maternal Age. Maternal age is the independent variable under consideration in this study and was defined as the chronological age of the mother at the time of delivery as recorded in the medical record.
Dependent Variables

1. Birth weight. Infant birth weight is one of the dependent variables in this study and was defined as the measurement in grams of the infant at the time of birth as reported by the agency where the infant was delivered.

2. Gestational Length. Gestational length is the other dependent variable in this study and was defined as the number of weeks between conception and delivery. Calculations were based on the mothers' report of last menstrual period or ultrasound measurement. When both figures were available in the medical record, the most reliable source, ultrasound measurement was used. Ultrasound measurement was available for 45 (51%) of the subjects.

Socioeconomic Factors

Smoking status of the mother, number of prenatal visits, trimester of first visit, mother's weight gain during pregnancy, race, poverty level, and marital status were selected socioeconomic variables to be considered in this study. These factors were considered in order to determine their possible influence on any differences that might exist between the groups.

1. Smoking Status. Smoking status was classified as smoking or nonsmoking according to the history provided by the mother in the prenatal record.

2. Number of Prenatal Visits. A tabulation of all visits to the health department during the prenatal period for the purpose of prenatal care was recorded as the number of prenatal visits.

3. Trimester of First Visit. The trimester of first visit to the health department for the purpose of diagnosis and care related to the pregnancy was recorded as the trimester of first visit. Weeks one through twelve are recorded as first trimester, weeks thirteen through twenty-six as the second trimester and above twenty six weeks as the third trimester. This information was found in the prenatal record.
4. **Weight Gain.** Maternal weight gain was defined as the amount of weight gained between the mother's report of prepregnancy weight and the weight on the day of delivery as recorded by the delivering institution.

5. **Maternal Race.** Race of the mother was classified as Caucasian, Black, Hispanic, Oriental, or other as identified on the prenatal record.

6. **Marital Status.** Marital status was defined as single, married, widowed, divorced or separated for the purposes of data retrieval.

7. **Poverty Status.** The patient was classified as above or below the poverty level using the district health department's definition of poverty. Their definition is based on federal guidelines that adjust for regional differences. Family income and the number of family members in the household were recorded on each medical record. Table 1 describes the scale used by the health department to determine poverty level for households of one to twelve members.

<table>
<thead>
<tr>
<th>Number in Family</th>
<th>Poverty Level Income in Dollars</th>
<th>Number in Family</th>
<th>Poverty Level Income in Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7,740</td>
<td>7</td>
<td>23,460</td>
</tr>
<tr>
<td>2</td>
<td>10,360</td>
<td>8</td>
<td>26,080</td>
</tr>
<tr>
<td>3</td>
<td>12,980</td>
<td>9</td>
<td>28,700</td>
</tr>
<tr>
<td>4</td>
<td>15,600</td>
<td>10</td>
<td>31,320</td>
</tr>
<tr>
<td>5</td>
<td>18,220</td>
<td>11</td>
<td>33,940</td>
</tr>
<tr>
<td>6</td>
<td>20,840</td>
<td>12</td>
<td>36,560</td>
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</tbody>
</table>
Conceptual Framework

Betty Neuman's Systems Model was used as the frame of reference for this study. The Neuman Systems Model describes a dynamic, open, systems approach to client care and was developed to provide an unifying focus for nursing problem definition and for better understanding of the client in interaction with the environment. Dunn and Trepanier (1989) described the Neuman Systems Model as an effective conceptual framework when applied to perinatal nursing because of the model's wholistic perspective, or total person approach that provides a means for thorough assessment which is important for the identification of risk factors.

Two of the concepts of interest to this study which are inherent in the Neuman model include the person or client and the environment. A Model of the client, as an open system is portrayed in the following figure.

![Figure 1. The conception of the person (client) in Betty Neuman's Systems Model, 2nd Ed (Neuman, 1989) Used with permission from Betty Neuman and Appleton and Lang Publishing (See Appendix A).](image-url)
Client

Neuman views the client as an open system, a dynamic composite of the interrelationship of five variables: physiological, psychological, sociocultural, spiritual, and developmental. To meet personal needs, the client interacts with the environment, affects it and is affected by it (Neuman, 1982).

The very center of the model indicates a core of basic structure and energy resources surrounded by hypothetical concentric circles which represent boundaries. The core structure includes survival factors that are universal and characterize all species as well as factors that are unique to the individual. Genetic structure, organ function, self-image, age and sex make up the core of the individual. The closest boundary to the core is portrayed by three broken line circles representing the lines of resistance which protect the core and consist of internal defensive processes such as the immune response, neuroendocrine responses, and economic resources. The next boundary portrayed by a solid line circle represents the normal line of defense, or the individual's usual state of equilibrium, and depicts what the person has become over time. It includes such aspects as intelligence, attitudes, and problem solving, or coping abilities. The final boundary represented by the outermost solid line circle is the flexible line of defense, a protective buffer for the normal line of defense. It has an accordion-like action which changes in a relatively short time. Rest and activity patterns, level of energy, and fatigue are components of the flexible line of defense (Neuman, 1989).

Neuman (1989) described the client as being constantly subjected to stresses from within her system as well as from the external environment. These stresses can cause disequilibrium, situational or maturational crises, disease, or death. The purpose of the boundaries described above are to prevent the core structure from reacting negatively to the stresses. Reaction to stresses is determined in part by natural and learned resistance which is manifested by the strength of the core and the various boundaries. Factors which influence the reaction to stresses are intrapersonal (conditioned responses), interpersonal
(between one or more individuals), or extra-personal (occurring outside the individual) in nature. The quality and quantity of an individual's reaction to stresses is determined by the interrelationship of the five variables (physiological, psychological, sociocultural, spiritual, and developmental). The relationship of the variables can affect the degree to which an individual is able to use their flexible line of defense against possible reaction to stresses. The number, timing and intensity of the stresses also affect the client's resistance to stresses.

**Environment**

Neuman described environment as all factors affecting or affected by a person. She contends that there is an external, internal and created environment. The internal environment is contained within the boundaries of the client system. The external environment contains forces outside a client system. The created environment denotes a client's unconscious mobilization of such structural components as energy factors, values, beliefs, and self esteem. Stresses are a part of the environment. Neuman defined them as stimuli which might penetrate both the client's flexible and normal lines of defense. The potential outcome of an interaction with a stressor may be positive or negative (Meleis, 1991).

Pregnancy, as applied to this model was considered to be an intrapersonal stressor. The theoretical proposition was that the physiological variable of young age had a negative impact on the client's lines of defense and resistance which could have resulted in instability of the client system. This instability may have influenced the length of gestation or birth weight of the infant. It was recognized that other stressors (risk factors) may have had a simultaneous effect on the client system; therefore, selected socioeconomic and environmental factors were considered which included smoking status, poverty level, race marital status, amount of prenatal care, and maternal weight gain during pregnancy. Since it was impossible to consider all possible variables in this study, only those factors
identified through previous studies as major contributing factors to low birth weight and preterm delivery were considered.

Assumptions

The following assumptions were applied to the study:

1) Nursing clients are dynamic; they have both unique and universal characteristics and are in constant energy exchange with environments (Neuman, 1989).


3) Clients present a normal range of responses to the environment that represent wellness and stability (Neuman, 1989).

4) Stresses attack flexible lines of defense, then normal lines of defense (Neuman, 1989).

5) The different agencies involved in the study used the same or similar methods to measure weights for both the mother and the infant.

6) The agencies had systems in place to assure the accurate calibration of measurement instruments being used (scales, ultrasound, etc.).

7) The mother's report of last menstrual period, smoking status, and prepregnancy maternal weight were accurate.

Significance of Study

It is important for the primary care provider to recognize that adolescent patients are at risk for pregnancy and poor pregnancy outcomes and to provide their adolescent clients with accurate information regarding these critical issues. In order to do this, the primary care providers must first come to a better understanding of these risks. For instance, is maternal age an independent predictor of gestational duration and birth weight, or are these outcomes more heavily influenced by socioeconomic factors?
In order to provide appropriate care to the adolescent age group, it is important for the primary care provider to understand how the client's age affects health outcomes. While many studies have been conducted for the purpose of identifying risk factors for preterm births and low infant birth weight, questions continue regarding the influence of maternal age as an independent risk factor.
CHAPTER II
LITERATURE REVIEW

A review of literature was conducted to determine existing knowledge regarding maternal age as a risk factor for preterm delivery and low birth weight, resulting in unclear findings. While several studies controlling for confounding factors found elevated rates of preterm delivery and low birth weight for adolescents, others concluded that adolescents did not have a significantly increased risk. Still others reported only certain subgroups of adolescents had higher rates of preterm birth and low birth weight than their adult counterparts.

Relevant Research

Maternal Age

A study by Moermal (1982) suggested that the pelvis does not reach its adult size until one to three years after menarche. Moermal used a longitudinal study of x-ray data from a sample of healthy, middle class girls and found that three of the four pelvic dimensions under study did not reach adult size until the third year following menarche. Her work, however, did not show the effects of immature pelvic size on pregnancy outcomes. In fact, McAnarney (1987) reported that available data indicated most pregnant adolescents were biologically mature when they conceived, except for those who mature very young and who conceived very early and still had some growth to complete. Even in these women, it was believed that the outcome of low birth weight had more to do with the size of the mother than her competition with the fetus for nutrients.

Sukanich, Rogers, and McDonald (1986) concluded that adolescents who become pregnant, even the very young, should be at no greater disadvantage than the young of other species, such as mice, rats, pigs, cattle, horses, and rhesus monkeys. All of these
conceive at first ovulation and before they have achieved mature size without notable risk to the offspring.

Zlatnik and Burmeister (1977) reviewed records of obstetrical patients 17 years of age and younger at delivery in order to ascertain whether a patient's gynecological age independently related to poor pregnancy outcomes including preterm birth. Gynecological age was determined by subtracting the mother's age at menarche from her chronological age. This study showed that both mothers of low chronological age and mothers of low gynecological age were at greater risk than mothers who were older than 17. In addition, the low gynecological age group had a slight increased risk over the low chronological age group. Therefore, low chronological age as a risk factor should be further refined by the consideration of the gynecological age. However, this study was refuted by Scholl, Decker and Karp (1984), who found that nulliparous adolescents, aged 12 to 15 years, had a modest but statistically nonsignificant increase in preterm births and that this increase was confined to those with a low gynecological age. They also found that older nulliparous teens (no previous deliveries) aged 16 to 19 were not at increased risk of preterm birth when compared with adult multiparas (previous deliveries).

In a similar study conducted by Satin and colleagues (1994), it was concluded that differences between pregnancy outcomes of adolescents and adults were limited to the very young teen group, aged 11 to 15. The study included a total of 16,512 consecutive records of nulliparous women and their babies born at Parkland Memorial Hospital in Dallas, Texas, between January 1988 and December 1991. The purpose of the study was to determine pregnancy outcomes of middle school age, versus high school age, versus women beyond the teen years. Middle school age was defined as aged 11 to 15, high school age as 16 to 19 and women beyond the teen years as 20 to 22. Statistical analysis using logistic regression to control for potentially confounding demographic variables was used. Results showed middle school-aged mothers were predominantly black and had higher rates of very low birth weight infants, defined as birth weight less than or equal to
1000 grams. In addition, the middle school age group was less likely to receive adequate prenatal care. First births to mothers of high school age were not found to be relatively compromised compared to nulliparous women aged 20 to 22.

A recent study supported younger maternal age as an independent risk factor of adverse outcomes of pregnancy (Fraser, Brockhert & Ward, 1995). A stratified analysis of 134,088 white girls and women, 13 to 24 years of age, living in Utah, who delivered singleton, first-born children between 1970 and 1990 was conducted. The relative risk for subgroups of this study population was examined to eliminate the confounding influence of marital status, educational level and the adequacy of prenatal care. The adjusted relative risk for the entire study group was calculated as the weighted average of the stratum-specific risk. The study showed an increased risk of adverse pregnancy outcomes that were independent of important confounding sociodemographic factors for mothers aged 13 to 17 when compared to mothers aged 18 to 24.

**Infant Birth Weight**

In 1972, United States vital statistics revealed that 10% of all infants born to mothers aged 15 to 19 were low birth weight. No older age group had such a high rate. Infants born to mothers younger than 15 had a 16.2% rate of low-birth weight; 1.7% weighed less than 1000 grams at birth. The National Center for Health Statistics (1972) reported that controlling for socioeconomic variables does tend to minimize risks associated with low maternal age; however, even when these socioeconomic variables are considered, low maternal age remained a risk factor.

Lee, Freemason, Corpus and Garner (1988) studied birth certificate data on a total of 184,567 singleton live births from 1980 to 1984 with gestational ages of 40 weeks to determine the independent effect of maternal age on the incidence of low birth weight at term. A series of multiple logistic regression analysis was used to adjust for the presence of other maternal factors. Maternal age was categorized into seven groups to assess more precisely the relationship of very young teenagers to low birth weight. Before adjusting
for other maternal factors, the incidence of term low birth weights was highest among mothers under 17 (3.2%) and gradually declined with advancing maternal age to reach 1.3% in women aged 25 to 34 years. It increased for those 35 and over to 1.7%. Teenagers, however, showed a clustering of known risk factors for term low birth weight indicating that their higher incidence may have resulted from the confounding effects of the other maternal factors. When controlling all other factors by multiple logistic regression, the adjusted odds ratio for risk of term low birth weight increased with advancing maternal age, from the baseline value of 1.00 for maternal age equal to or less than 15 years to the high ratio of 2.59 for mothers equal to or greater than 35 years.

In 1980, United States vital statistics data indicated that 13.8% of infants born to women younger than 15 weighed less than 2500 grams compared with 5.8% of the infants to women aged 25 to 29 years old. The Collaborative Perinatal Project, a federally funded project to study the prevention of low birth weight, revealed similar findings (Committee to Study Prevention of Low Birth weight, 1985).

**Length of Gestation**

Berkowitz and Papiemick (1993) conducted a comprehensive review of risk factors for preterm delivery based on literature after 1984. They concluded that factors of maternal age, infant sex, parity, maternal weight gain, dietary intake, a short interpregnancy interval, and sexual activity were only weakly related to preterm birth. Factors established as risk factors included black race, single marital status, low socioeconomic status, previous low birth weight or preterm delivery, multiple second trimester abortions, placental abnormalities, gestational bleeding, cervical, and uterine anomalies, multiple gestations, and smoking.

Wen and colleagues (1990) conducted a study to determine the relationship between smoking and maternal age, and preterm delivery. They found the effect of smoking on both fetal growth and gestational age significantly greater as maternal age advances. In a multiple logistic regression adjusting for race, parity, marital status,
maternal weight gain and alcohol use, smoking was associated with a five fold increased risk of growth retardation in women older than 35 and less than a two fold risk in women younger than 17. Smoking in older women also was associated with more instances of preterm delivery and a lower mean gestational age when compared to women younger than 25.

Brown, Fan, and Gonsoulin (1991) compared outcomes in 286 teenaged primigravidas less than 16 years old with 267 adult primigravidas, aged 21 to 25, who had similar prenatal care, socioeconomic status, and racial balance. There was a significantly higher rate of preterm labor in the teenagers. It was noted that black teenagers were more likely to have preterm low birth weight infants than their white counterparts, however, there were no major differences between infants of teenaged blacks compared to adult blacks. These findings were consistent with those of Kessel et al. (1984) who reported that between 1979 and 1980 the incidence of preterm low birth weight for all races in the United States declined 7.1%; however, the rate of preterm low birth weight declined three times more in the white race (20.9%) than the rate for the black race (5.9%).

Wilcox and Skuoerven (1992) reported gestational age as a powerful predictor of birth weight and perinatal survival in a study which included data from 400,000 singleton births in the Norwegian Medical Birth Registry.

Summary

Over the past 20 years, many studies, largely of inner-city, minority-group women, examined the relationship between maternal age and outcomes of pregnancy. Studies prior to the mid 1970's tended to support a positive correlation between young maternal age and low birth weights and preterm deliveries. In the 1980's studies became more sophisticated in terms of range of factors controlled for in the analysis. These findings tended to support the idea of less difference in outcomes between teenage mothers and mothers in their twenties. Socioeconomic factors associated with young age, such as low income, insufficient education, marital status, and inadequate prenatal care, appeared to
have been more powerful influences on outcomes than the age of the mother. However, in the 1990's, studies which took into consideration these confounding variables were again finding maternal age to be an independent factor, at least in mothers less than 15.

These conflicting findings raised important questions. First, what was the reason for the discrepancy in results? Although there are many possible explanations, the chief reason may have been differences in the populations studied. There may have been a greater difference in risk between teens and older mothers in more rural areas when compared to younger and older inner-city mothers. In addition there were some major differences among the studies relating to the definition of teenager. For instance very young teenagers, those between the ages of 11 and 15, were often grouped with teenagers up to 19 years of age. Also, in some studies primarily nulliparous teenaged mothers were compared with older and more often multiparous women.
CHAPTER III

METHODS

The purpose of this retrospective comparative study was to describe the effects of maternal age on the pregnancy outcomes of gestational length and low birth weight. In this chapter the research design used for this study will be described under the following headings: 1) research design, 2) setting, 3) sample, 4) procedure, and 5) ethical considerations.

Research Design

This researcher used a comparative descriptive design to examine and describe differences in the pregnancy outcomes of gestational length and birth weight in women of three different age groups. In addition, consideration was given to selected socioeconomic and demographic data that may have influenced the study. The data retrieval were conducted through the retrospective review of medical records. Descriptive and inferential statistical analyses were used to examine differences between and among the groups.

Setting

The setting for this study was a district health department prenatal program. This district health department serves a seven county region in western Kentucky; however, only three of the seven counties provided full prenatal services. Therefore, data were obtained from these three counties only. During the calendar year 1996 there were a total of 529 deliveries, and it was believed that an adequate sample size could be obtained. The district health department's director of nursing expressed a willingness to cooperate in the conduct of this study. After approval was granted by the Thesis Committee and the Western Kentucky University Human Rights Review Board (See Appendix B), the administrative staff of the district health department was provided with information regarding the nature and purpose of the project. An Institutional Terms of Agreement for
Research was cosigned by the investigator and the director of nursing of the district health department (See Appendix C). The agreement outlined the responsibilities of the health department as well as the investigator and included a discussion on risk and benefits to the subjects.

The nursing director of the health department worked cooperatively with the investigator to establish dates for data retrieval at each of the counties involved. In addition the director provided instructions to county staff regarding the retrieval of medical records which met the criteria for study. A private office was provided at each site that was conducive to data retrieval. Assistance was offered to orient the investigator to the format of the medical record.

Sample

A convenience sample was obtained from the medical records of women who attended prenatal clinics through the district health department in western Kentucky and delivered a live infant during the time period of October 1995 through December 1996.

Sampling Criteria

Staff in the county health departments retrieved and provided to the investigator medical records which met all of the following criteria:

1. Women between the ages of 12 and 22,
2. Primiparous mothers (first deliveries),
3. Delivered only one infant (no multiple births), and
4. Delivered a live infant (defined as living at the time of discharge from the hospital).

Sample Size

The sample size was determined by use of power analysis. The level of power used for the study was .80 and the level of significance .05. According to the Master Table for Power Analysis developed by Kraemer and Thiemann (1987), to obtain at least a
medium effect size (0.5), a sample of no less than 22 participants in each of the three
groups was required.

The study as originally planned was to be for the age groups of 12 to 15, 16 to 19
and 20 to 22. The youngest group fell below the needed sample size level when all records
for 1996 had been considered, therefore records from the previous three months were
added to the study. Even after this effort, there were only six subjects who were aged 15
and none fell below that age. Therefore, after consultation with members of the thesis
committee and a statistician, it was determined that modification of the groups was
necessary. The revised age groups were 15 to 17, 18 to 19 and 20 to 22. The revision
provided for a more even distribution of number of subjects in each age group for the
purpose of statistical analysis.

Procedures

A data collection tool developed by the researcher was used to record data from
the medical record (See Appendix D). This instrument was reviewed by the thesis
committee for content appropriateness and completeness. The instrument was pilot tested
using 10 medical records to determine if all needed information was available in the
medical record and to identify any problems with use of the form. Originally, it was
planned to calculate weight gain as weight at the time of the last prenatal visit less weight
at the time of the first prenatal visit. After a trial application of the data collection tool
however, the definition was modified to maternal weight at time of birth less prenatal
weight as reported by the mother. The original definition was selected because of
uncertainty about whether the mother's report of prepregnancy weight would be on the
medical record. However, this information was available on the record and the change was
believed to be necessary because of a concern that weight gain data could be skewed by
mothers who were not seen until late in the second or third trimester. The original
definition would have resulted in a lower weight gain than actually occurred. In addition
the classification of "separated" was added to marital status to accommodate all of the categories represented in the study.

Consistency of data retrieval was maintained as data was collected solely by this investigator. The operational definitions previously described in Chapter I were derived to guide the investigator in the precise collection of data.

Ethical Considerations

Confidentiality and subject privacy were maintained. The subjects were identified on the data collection tool by a code number. The code number was matched to the medical record number of the subject on a separate form. During the study, this information was maintained in a locked file box separate from the other research data in the researcher's office. Upon completion of the study, the only copy of this form was submitted to the investigator's Western Kentucky University faculty advisor. The advisor is responsible for safekeeping and confidentiality of the form within the offices of the Western Kentucky University Owensboro Extension Campus for a period of three years. Retaining this information is important so that the data can be verified if necessary. No other identifying information was maintained by the investigator. In addition, information obtained from this study will be disseminated in aggregate form only, thereby avoiding identification of any individual based on the data.

Since the purpose of this study was to explore and describe phenomena in real life situations, no treatments were applied or withheld from the subjects being studied. The researcher was not in direct contact with any of the subjects, hence, there was no risk or, for that matter, direct benefit to the subjects being studied. There should be an indirect benefit to future clients of the prenatal clinics being studied. The aggregate results, conclusions, and recommendations will be shared with the clinics. This information should enhance their knowledge regarding maternal age as a risk factor for outcomes of pregnancy and, in turn, be used to improve the assessment, health education, and interventions for their clients.
Prior to beginning data collection for this research, the proposal was reviewed and approved by the Thesis Committee, the Western Kentucky University Human Subjects Review Board, and the district health department participating in the study.
CHAPTER IV

RESULTS

The purpose of this retrospective, comparative study was to describe the effects of maternal age on the pregnancy outcomes of gestational length and low birth weight and to determine if there were differences in the socioeconomic factors of smoking status, poverty level, marital status, number of prenatal visits, trimester of first prenatal visit and maternal weight gain during pregnancy among the three age groups. Data were retrieved from medical records of women who delivered between October 1, 1995 and December 31, 1996 and received prenatal care at the district health department. The data were analyzed to answer the research questions of the study. Additional findings and limitations are discussed along with the results of the data analysis.

Description of Sample

Socioeconomic Factors

At the district health department, there were 91 prenatal medical records health department that met criteria for review for deliveries occurring between October 1995 and December 1996. Of these, three did not contain all of the required information and were deleted from the review leaving a balance of 88 subjects.

**Poverty level.** Eighty two (93.2%) were classified as below poverty level.

**Race.** Eighty two (93.2%) were Caucasian. Five (5.7%) were black and one (1.1%) Hispanic. For the purposes of further analysis, race was classified as Caucasian and noncaucasian

**Marital Status.** Forty six of the subjects were married, 39 were single, one divorced, two separated, and none widowed. Since the divorced and separated were too small a group for meaningful analysis, they were grouped with the single subjects for purposes of further analysis.
Smoking Status. Thirty nine subjects (44.3%) smoked and 49 (55.7%) denied smoking.

Prenatal Care. Most (N=58, 65.9%) were seen for prenatal care in their first trimester; 23 (26.1%) in the second trimester and only seven (8.0%) waited till the third trimester to be seen. The mean number of prenatal visits was 8.10 and a median of 7.5 visits. The range was 19 visits with the lowest number of visits being one and the highest being 20.

Maternal Weight Gain. There was significant variation in maternal weight gain during pregnancy. Three of the patients actually lost weight, with the most lost being 13 pounds and the most gained being 62 pounds for a range of 75 pounds. The mean weight gain was 25.67 pounds and a median of 26 pounds.

Dependent Variables

Gestational Length. The length of gestation varied from 28 weeks to 42 weeks creating a range of 14 weeks. The mean gestation length was 39.07, the median was 40 weeks which is the normal gestation length for full term deliveries.

Birth Weight. The birth weight of the infants ranged from 1,105 grams (2 pounds and 13.5 ounces) to the largest weighing 4,627 grams (10 pounds and 6 ounces), a difference of 3,522 grams (7 pounds and 2.5 ounces). It was interesting to note that both the smallest and largest infant were born to mothers in the youngest age group.

Independent Variable

The original intent was to compare the very young teens (ages 12-15) with the older teens and with adults, however, this comparison was not possible because a large enough sample size could not be obtained for the 12 to 15 aged group. Therefore the three groups were divided so that they would be near equal in size. This division still allowed for a comparison of younger teens, older teens and adults. The revised age groups were ages 15 to 17, 18 to 19 and 20 to 22. A frequency distribution by age group using the SPSS data analysis system is described in Table 2.
Table 2

Frequency Distribution by Age Group

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages 15-17</td>
<td>26</td>
<td>29.5%</td>
</tr>
<tr>
<td>Ages 18-19</td>
<td>36</td>
<td>40.9%</td>
</tr>
<tr>
<td>Ages 20-22</td>
<td>26</td>
<td>29.5%</td>
</tr>
<tr>
<td>Total</td>
<td>88</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Research Questions

Question One

Is there a difference in infant birth weights, based on maternal age of primiparous mothers in the age groups of 15 to 17, 18 to 19 and 20 to 22?

Measures of central tendency were used to calculate mean infant birth weights according to the specified age groups as described in Table 3.

Table 3

Mean Infant Birth Weight According to Maternal Age Groups

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Mean Birth weight in grams</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages 15-17</td>
<td>3032.81</td>
<td>812.98</td>
<td>159.44</td>
</tr>
<tr>
<td>Ages 18-19</td>
<td>3062.11</td>
<td>560.94</td>
<td>93.49</td>
</tr>
<tr>
<td>Ages 20-22</td>
<td>3299.12</td>
<td>487.39</td>
<td>95.59</td>
</tr>
</tbody>
</table>

The range of birth weight according to age group is described in Table 4. The largest and smallest infants were both found in the same age group of 15 to 17.
Table 4

Range of Birth Weight According to Age Group

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Minimum Weight in Grams</th>
<th>Maximum Weight in Grams</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages 15-17</td>
<td>1105</td>
<td>4627</td>
<td>3522</td>
</tr>
<tr>
<td>Ages 18-19</td>
<td>1493</td>
<td>4115</td>
<td>2622</td>
</tr>
<tr>
<td>Ages 20-22</td>
<td>2299</td>
<td>4173</td>
<td>1874</td>
</tr>
</tbody>
</table>

The SPSS data analysis program was used to apply the one-factor between-subjects analysis of variance (ANOVA) at a .05 significance level to determine differences in birth weight within and between the three age groups. The findings of this analysis are described in Table 5.

Table 5

Analysis of Variance of Birth Weight by Age Group

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>Significance of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Group</td>
<td>1151382</td>
<td>2</td>
<td>575690.85</td>
<td>1.462</td>
<td>.238</td>
</tr>
<tr>
<td>Error</td>
<td>33475036</td>
<td>85</td>
<td>393823.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>34626418</td>
<td>87</td>
<td>398004.80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These findings indicate that observed differences of birth weight among the means are nonsignificant and the sample means of 3032.81 grams, 3062.11 grams and 3299.12 may be treated as samples from the same population. In addition, there is no evidence that the independent variable age had an effect on infant birth weight. The observed
differences were nonsignificant \[ F (2,85) = 1.462, p > .05 \], therefore strength of association measures were not indicated. These results are not surprising considering the means and standard deviations displayed in Table 3.

**Question Two**

Is there a difference in the gestational length of infants based on maternal age of primiparous mothers in the age groups of 15 to 17, 18 to 19 and 20 to 22?

Measures of central tendency were used to calculate the mean gestational length for each age group as described in Table 6. Variability of gestational age decreased as age increased, with the youngest age group having the most variability and the oldest the least variability. This determination was made by comparing the standard deviations and confidence intervals of the three different age groups.

**Table 6**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Mean Gestation in weeks</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages 15-17</td>
<td>38.08</td>
<td>3.24</td>
<td>.64</td>
</tr>
<tr>
<td>Ages 18-19</td>
<td>39.31</td>
<td>2.14</td>
<td>.36</td>
</tr>
<tr>
<td>Ages 20-22</td>
<td>39.71</td>
<td>1.20</td>
<td>.24</td>
</tr>
</tbody>
</table>

The SPSS analysis program was used to measure the range of gestational length for each age group and is described in Table 7. It should be noted that one very low figure in the youngest age group (28 weeks) may have caused the data for that group to be skewed.
Table 7

Range of Gestational Length According to Age Group

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Shortest Gestation in weeks</th>
<th>Longest Gestation in weeks</th>
<th>Range in weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages 15-17</td>
<td>28</td>
<td>41</td>
<td>13</td>
</tr>
<tr>
<td>Ages 18-19</td>
<td>32</td>
<td>42</td>
<td>10</td>
</tr>
<tr>
<td>Ages 20-23</td>
<td>37</td>
<td>42</td>
<td>5</td>
</tr>
</tbody>
</table>

The SPSS data analysis program was used to apply the one-factor between-subjects analysis of variance (ANOVA) at a .05 significance level to determine differences in gestational length within and between the three age groups. The findings of this analysis are described in Table 8.

Table 8

Analysis of Variance of Gestational Length by Age Group

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>Significance of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Group</td>
<td>38.43</td>
<td>2</td>
<td>19.22</td>
<td>3.566</td>
<td>.033</td>
</tr>
<tr>
<td>Error</td>
<td>459.27</td>
<td>85</td>
<td>5.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>457.71</td>
<td>87</td>
<td>5.72</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These findings indicate that there is at least one significant difference in the means of gestational length among the three age groups [$F(2,85) = 3.566, p < .05$] and therefore provides evidence of an effect of maternal age on the length of gestation.

Post hoc comparisons using the Tukey HSD test were applied to determine the location of the difference. This test was chosen because it was considered more stringent than the Newman-Keuls, an alternative post hoc test which was considered. The Tukey
HSD requires approximately equal sample sizes. The Tukey HSD test indicated the youngest age group (ages 15 to 17) had a shorter gestational length than the aged 20 to 22 group. (CD = 3.37, α = .05). There was no significant differences between any other groups.

Question Three

Is there a difference in selected socioeconomic factors of smoking status, poverty level, marital status, number of prenatal visits, trimester of first prenatal visit, and maternal weight gain among the maternal age groups of 15 to 17, 18 to 19 and 20 to 22?

Significant differences were identified between the oldest and youngest age groups in relation to gestation, therefore ANOVA was applied to each socioeconomic factor at a .05 significance level to determine if differences in gestation length existed between and among the age groups based on differences in socioeconomic factors. The findings are described in Table 9.

Table 9

Length of Gestation by Socioeconomic Factors

<table>
<thead>
<tr>
<th>Socioeconomic Factors</th>
<th>F Ratio</th>
<th>F Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marital Status</td>
<td>2.82</td>
<td>.10</td>
</tr>
<tr>
<td>Smoking Status</td>
<td>1.06</td>
<td>.31</td>
</tr>
<tr>
<td>Trimester of First Visit</td>
<td>.09</td>
<td>.92</td>
</tr>
<tr>
<td>Maternal Weight Gain</td>
<td>2.85</td>
<td>.06</td>
</tr>
<tr>
<td>Number of Prenatal Visits</td>
<td>22.07</td>
<td>.02*</td>
</tr>
</tbody>
</table>

* Indicates at least one significant difference in the number of prenatal visits among the three groups in relation to gestational length [F (2,85) = 4.1364, p < .05].
As indicated by data in the table there were no significant differences in length of gestation as it related to marital status, smoking status, trimester of first visit, or maternal weight gain.

There was however, a significant difference related to number of prenatal visits. Post hoc comparisons using the Tukey HSD test (CD = 3.37, α = .05) indicated the youngest group, who also had the shortest gestation, made significantly less prenatal visits than the oldest group. There were no differences identified between any other groups. This finding is not a surprising finding considering the frequency of prenatal visits are usually increased to weekly beginning at thirty-five to thirty-six weeks gestation. It makes sense that the group with a shorter gestation length would also make less prenatal visits.
CHAPTER V
DISCUSSION

In this chapter, the results of the study and possible explanations for the findings are examined in relation to the research questions, previous research and nursing theory. The interpretations of major findings, conclusions derived from the study, limitations of the study, implications for nursing, and recommendations for further research are discussed. Teenage pregnancies have been and continue to be a problem of local and national concern. The purpose of this study was to increase knowledge regarding negative outcomes related to teen pregnancy and to determine if age alone was a predictor of these negative outcomes. In this study, the researcher addressed the pregnancy outcomes of infant birth weight and length of gestation.

The data collected and analyzed in this study provide comparative, descriptive information on length of gestation and infant birth weights for three different age groups. The age groups are 15 to 17, 18 to 19 and 20 to 22. In addition consideration is given to sociodemographic factors which may influence pregnancy outcomes. These include poverty level, smoking status, number of prenatal visits, trimester of first visit, and maternal weight gain. Demographic variables of race and marital status are also considered.

The setting was prenatal clinics within a district health department in western Kentucky. The sample consisted of medical records of 88 primiparas who were primarily low income rural western Kentuckians who delivered live singleton infants between October 1, 1995 and December 31, 1996. The data were collected at the participating county health departments solely by the investigator using a data collection tool developed and pilot tested by the investigator. Data were analyzed using the SPSS data analysis program to determine and report frequency counts and percentages. In addition, a one-factor multilevel design (ANOVA) was used to measure the between and within group
variations, and a post hoc comparison test (Tukey HSD) was applied when significant differences were identified.

Description of the Sample

This study was unique in that the sample was from a rural area in western Kentucky. There have been several studies on the relationship of maternal age to length of gestation and low birth weight, however many samples were largely of inner-city minority-group women. No studies were found whose sample was obtained from Caucasian rural Kentuckians.

In this study, the effort was made to divide the groups so that the younger, less mature teens were considered separately from the more mature teens whose physical characteristics were more closely related to those of the adult. This division was not done to the extent intended because of an inability to obtain an adequate sample size in the 12 to 15 age group. The literature review showed great variation in the definition of teen in studies have been conducted. The very young teens were very often grouped with teens up to 19 years of age. This study format does allow for a subdivision of younger and older teens.

While the sample was a convenience sample, it was comprised of relatively homogenous characteristics among and between groups in regard to race, poverty level, smoking status, amount of prenatal care, and maternal weight gain. In addition, the parity of each group was the same. Because of the homogeneous characteristics of this sample, it is logical to conclude that this study could probably be generalized to other rural populations. In contrast, it probably may not be generalized to inner-city minority groups.

Research Questions

Three research questions guided the study. The first question was, is there a difference in infant birth weights, based on maternal age of primiparas in the age groups of 15 to 17, 18 to 19 and 20 to 22? ANOVA indicated that there was no significant
differences in or between any of the age groups in relation to infant birth weight \[F(2,85) = 1.462, p > .05\].

**Conclusions.** These findings imply that when all other factors are essentially equal, maternal age, at least within the range of 15 to 22 years, is not a determining factor in the negative pregnancy outcome of low birth weight. This result supports conclusions by other researchers that claims of age alone as a risk factor for low birth weight are exaggerated (Brown, Fan, & Consoulin, 1991; Lee, Ferguson, Corpus, & Gartner, 1988, and McAnarney, 1987).

**Implications for Nursing.** The distinction between association and causality is critical for health educators who must have accurate facts about age related reproductive risk in order to correctly inform their clients and effectively assist them in their decisions concerning timing of their pregnancies. The distinction is also critical for social policy makers whose interventions to alleviate complications of pregnancy and childbirth depend on the accurate identification of their sources. When applied to Neuman's model these findings indicate that for rural primiparas ages 15 to 22, maternal age would not be considered a stressor which would result in low birth weight for the infant. The question becomes, if age alone is not a predictor of low birth weight, what are the most significant influencing factors? More research is indicated to determine the correlation of known risk factors for poor pregnancy outcomes in rural America.

This study supports literature which indicates that socioeconomic factors other than age are more important indicators of poor pregnancy outcomes. For instance several studies have shown the black race at particular risk (Brown, Fan, and Consoulin, 1991; Ketterlinus, Henderson, & Lamb, 1990; Kessel et al, 1984; Zuckerman et al., 1984; Hollingworth and Kotchen, 1981).

The second question was, is there a difference in the gestational length of infants based on primiparous age groups of 15 to 17, 18 to 19 and 20 to 22? Analysis using ANOVA indicated that there was a significant difference among the age groups in relation
to length of gestation \([F(2,85) = 4.1364, p < .05]\). The Tukey HSD post hoc comparison test \((CD = 3.37, \alpha = .05)\) indicated that the differences were located between the youngest and the oldest group only. Therefore length of gestation was significantly shorter for the youngest group than for the oldest. This finding would support research which promotes the idea that maternal age is an independent predictor of preterm delivery or shorter lengths of gestation. (Fraser, Brockhert, & Ward, 1995; National Center for Health Statistics, 1972)

**Conclusions.** These findings are inconclusive and should be applied with caution because of limitations described previously in the study. It is quite possible that the data for the youngest group were skewed because of one very short gestational length (28 weeks). Removal of this one datum point from the study increases the mean of the youngest age group to almost equal that of the whole group (38.4800), in which case no significant differences among the groups would have been identified. In addition, almost half of the data collected regarding length of gestation were based on the mothers recollection of last menstrual period. Kramer and colleagues (1988) reported a predictive value of only 0.775 for predicting gestational age based on the mothers recollection of last menstrual period. Therefore the data could have been skewed based on errors in reporting by the younger group, especially in those who were recently married. Western Kentucky is a part of the region known as the bible belt, and Christian type values may put pressure on the teens to deny that pregnancy occurred prior to the marriage. Though a possible explanation for differences identified in length of gestation but not in birth weight among the age groups, it is speculation only, not verified by statistical analysis.

**Implications for Nursing.** If the findings are valid, they would indicate that according to Neuman's model maternal age is a developmental, intrapersonal source of stress which affects the lines of defense and resistance resulting in a shorter gestation (premature delivery).
Question three was, what is the difference of selected demographic and socioeconomic variables among the three primaparous age groups of 15 to 17, 18 to 19 and 20 to 22? Analysis using ANOVA indicated no differences in marital status, smoking status, trimester of first visit, or maternal weight gain among the three age groups at a .05 significance level. There was a significant difference \([F (2,85) = 4.1364, p = < .05]\) in one variable, number of prenatal visits, as it related to length of gestation. The Tukey-HSD test \(\text{CD} = 3.37, \alpha = .050\) indicated the difference was located between the oldest and youngest groups with no other differences identified.

**Conclusions.** It was determined that there were no significant differences among all of the age groups in this study; therefore, it may be postulated that rural Kentucky teens are at no greater risk of being affected by the selected demographic variables than either of the other two groups.

**Implications for Nursing.** These findings are not suggesting that these risk factors do not exist in western Kentucky, but that they exist approximately equally in all of the groups. Therefore, practitioners should assess their pregnant clients of all ages for factors shown in other research to have a negative influence on the outcomes of pregnancy. Some of the factors identified in other studies include smoking, drinking and drug abuse status, race, maternal education, and maternal weight gain. (Ketterlinus, Henderson, & Lamb, 1990)

According to Neuman (1989) it is critical to recognize the important environmental stressors such as influences of social, economic and medical factors which may result in a negative reaction by the pregnant client. Neuman's model calls for a total-person approach to examine the physiological, psychological, sociocultural, developmental and spiritual variables of the maternal-fetal unit in order to identify these stressors. Recognizing the stressors, the healthcare practitioners would emphasize to clients the importance of adequate prenatal care, good nutrition, and lifestyle changes needed to improve general good health. Findings from this study would allow the practitioner to
provide emotional support to the pregnant teenaged client, ages 15 and above, who may be experiencing fear that she is placing herself and or her baby at risk by being pregnant at an early age. They could then focus on environmental factors which may be more within the control of the teenager to change.

**Limitations**

**Small Sample**

One of the most significant methodological limitations of this study was the utilization of a small convenience sample from a relatively restricted geographic area. The small sample size may have contributed to the effect of an outlier in the youngest age group. As previously noted, if the one 28 week gestation in the age group of 15 to 17 was removed from the study, the mean gestational length would have been nearly equal to that of the other two groups, and there would have been no significant differences found among the three age groups related to length of gestation.

Despite the small sample size, because of the homogeneous nature of the sample, it is believed that the findings of this study may be generalized to other rural populations. Conversely, the findings probably may not be generalized to a highly urbanized population.

Another serious limitation of the study was the inability to obtain an adequate sample size in the desired younger age group of 12 to 15. Most of the recent studies that found an independent influence of maternal age on length of gestation, found it in this younger age group. (Fraser, Brockhert, & Ward, 1995; Satin et al., 1994; Brown, Fan & Gonsoulin, 1991)

**Variation in Measurement of Weight**

The study was a retrospective review of medical records thus there was no investigator control on measurement methods utilized by the different institutions involved in the study in relation to measurement of weight. This lack of investigator control may have resulted in some variation among the sites in relation to the mother's weight as well
as the infant's birth weight. In addition, the maternal weight gain for the mother was calculated based on the mother's recollection of pre pregnancy weight gain and therefore dependent on the mother's memory and honesty. These variances should have occurred equally across all of the age groups however, and should not result in a reporting error in this study.

**Variation in Measurement of Gestational Length**

Measurement of gestational length may also have varied to some degree at the different sites. In a study conducted by Kramer, McLean, Boyd, and Usher (1988), it was noted that estimation of gestational age based on maternal recollection of the last normal menstrual period is fraught with error. While the predictive value for full term infants is quite high (.949), the predictive value in preterm infants is only .775. For this reason, when other, more reliable, predictive data such as ultrasound was available, it was used to estimate gestational age. Ultrasound verification was provided in 45 (51%) cases. The remaining 49% relied upon the mother's recollection of last menstrual period and may have varied depending on correct memory or honesty on the part of the mother. Inaccurate reporting of the time of last menstrual period may have negatively impacted the reliability of the data; however, the researcher was limited to information found in the medical records.

**Confounding Effects of Other Variables**

Other variables that were identified in the literature review as having a confounding effect on the pregnancy outcomes of gestational length and birth weight included drug and alcohol use, poor nutrition, and the incidence of genital infections. (McAnarney, 1987) These variables were not considered in this study, but should be considered for future studies.

**Communication of Findings**

The findings of this study will be shared in aggregate form with the participating district health department and the local school system who has established a priority goal
to reduce teen pregnancy in school age children. The researcher will present findings in the classroom environment as requested. In addition, a written summary of findings will be provided to the teaching staff of the health careers program at the local high school, if desired. Information will also be shared with professional organizations such as the Kentucky Nurses Association and Sigma Theta Tau.

Recommendations for Further Study

It would be beneficial to use a larger sample which includes an adequate sample size of teens in the 12 to 15 age groups categorized to break out this group. The sample should be pulled from a wider variety of healthcare settings which may provide a broader representation of the whole population, not just those at low income levels. In addition, as mentioned previously it would be wise to use only ultrasound verified length of gestation data.

There needs to be more research on the specific socioeconomic factors which may place rural women at risk for poor pregnancy outcomes. Many studies have been conducted on risk factors for pregnancy, but few have focused on rural women. This study implied that the risk factors studied were spread pretty evenly among the three groups; however, it did not explain the correlation of risk factors to specific pregnancy outcomes. This information would be very helpful in applying Betty Neuman's model to the care of rural women. In order to properly assess for stressors that might have a negative impact on the pregnancy, the practitioner needs an understanding of what the significant stressors are. Correlation studies of poor pregnancy outcomes to such risk factors as smoking, drug and alcohol abuse, maternal weight gain, and amount of prenatal care would be helpful.

Summary

In this study a retrospective medical record review was utilized to provide a comparative, descriptive analysis of the influence of maternal age on the pregnancy outcomes of gestational length and infant birth weight among three different age groups.
The findings indicated no significant differences among the age groups in relation to infant birth weight nor in relation to the socioeconomic risk factors under study.

The findings did, however, indicate a difference among the age groups in relation to length of gestation. These findings were considered to be inconclusive because of limitations identified with the data.
References


Appendix A

Approval for Use of Conceptual Model
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Encl.
Tuesday, March 25, 1997

Betty Neuman, RN
Box 488
Beverly, OH 45715

Dear Ms. Neuman,

This letter is written to request permission to reproduce the illustrations depicted in Figure 24-1 and Figure 24-3 in *The Neuman System's Model, 2nd Ed.* (1989). I am a graduate student in the nursing program at Western Kentucky University. I am using your conceptual model as the framework for my thesis which is related to the influence of maternal age on gestation length and birth weight of the infant. I have already obtained permission from Appleton & Lang subject to your approval. Your positive consideration would be greatly appreciated. If you have any questions, please let me know.

Sincerely,

Charlotte A. Bratcher, RN, BSN

Above permission request is granted 7/31/97
Betty Neuman, Ph.D., Prof.
Appendix B

Western Kentucky University

Human Subjects Review Board Approval
March 10, 1997

Charlotte A. Bratcher
C/o Dr. Pat Bailey
Department of Nursing
Western Kentucky University

Dear Ms. Bratcher:

Your research topic “Maternal Age: Influence on Length of Gestation and Birth Weight,” has undergone review by the Western Kentucky University IRB for human subjects of research and it has been determined that risks to subjects are: (1) minimized and reasonable; and that (2) research procedures are consistent with a sound research design and do not expose the subjects to unnecessary risk. Reviewers determined that: (1) benefits to subjects are considered along with the importance of the topic and that outcomes are reasonable; (2) selection of subjects is equitable; and (3) the purposes of the research and the research setting is amenable to subjects’ welfare and producing desired outcomes; that indications of coercion or prejudice are absent, and that participation is clearly voluntary.

In addition, the IRB found that: (1) informed consent will unnecessary because of the tertiary nature of your research; (2) provision is made for collecting, using and storing data in a manner that protects the safety and privacy of the subjects and the confidentiality of the data; and (3) that appropriate safeguards are included to protect the rights and welfare of the subjects. Please store all data securely at an on campus location for a minimum of three years.

Screeners of the HSRB believe that you should not use the term “questionnaire.” A more appropriate term is “data collection tool” since you will not be questioning subjects directly.

Your research therefore meets the criteria of Expedited review under the institutional human subjects protocol and is approved. Copies of your request for human subjects review, your application, and this approval, are maintained in the Office Sponsored Programs at the above address. Best of luck with the project.

Kindest regards.

Sincerely,

Phillip E. Myers, Ph.D.
Director, Office of Sponsored Programs and
Human Subjects Coordinator

c: Human Subjects File

HSApprovalBratcher
Appendix C

Institutional Terms of Agreement for Research
INSTITUTIONAL TERMS OF AGREEMENT FOR RESEARCH

Project Title: Maternal Age Influence On Length of Gestation and Birth Weight
Investigator: Charlotte A. Bratcher
36 Keown Lane
Hartford, Ky. 42347
Phone: Home (502)298-3083 Work (502)298-5437

Affiliation: Nursing Department
Master of Science in Nursing
Advisor: Dr. Patricia Bailey (502)686-4510

District Health Department is being asked to participate in the above project through Western Kentucky University. The University requires signed agreement by agency representative to participate in this project.

Charlotte Bratcher will explain to you in detail the purpose of the project, the procedures to be used and any potential benefits or risks of participation. The authorized representative of your facility may ask her any questions you have to help your agency understand the project and your role in it. A basic explanation of the project is written below. Please read and discuss with Ms. Bratcher any questions you may have. If you then decide to participate in the project, please sign on the last page of this form in the presence of Ms. Bratcher. You will be provided a copy of this agreement.

Nature and Purpose of Project:

The purpose of this study is to describe the effects of maternal age on the pregnancy outcomes of birthweight and length of gestation. A comparative descriptive design will be used to examine and describe differences in these outcomes between three different age groups; ages 12-15, ages 16-19 and ages 20-23. The study will be conducted through a retrospective review of the medical records.

The study is designed to answer the following questions:

1) Is there a difference in birth weight of infants based on maternal age, for the primiparous mother in the age groups of 12-15, 16-19, and 20-23 years old?

2) Is there a difference in length of gestation of infants based on maternal age groups of 12-15, 16-19 and 20-23?

3) What is the relationship of selected demographic factors (smoking status, poverty level, marital status, amount of prenatal care and weight gain during pregnancy) among the maternal age groups of 12-15, 16-19, and 20-23?
Responsibility of Agency:

__________ District Health Department agrees to provide records needed by the investigator for review. These records will be identified and retrieved by staff of the health departments in the four counties where full services are provided. (names of counties). Criteria for identification and retrieval of records include:
   1) Primiparous clients seen in the prenatal clinics during the 1996 calendar year,
   2) Ages are between 12 and 23 and
   3) Had singleton births

In order to obtain at least a medium effect size, the sample size for each age group may not be fewer than 22, so if an appropriate sample is not obtained through review of records for the calendar year 1996, the health department would be asked to retrieve records from the previous three months until an adequate sample size is reached.

In addition, __________ Health Department will be asked to provide a small space in which the investigator may gather data from the medical records, so that the security of the records will be maintained.

Data retrieval is expected to begin in late March.

Responsibility of the Investigator:

Data will be gathered by Charlotte Bratcher. Ms Bratcher will not disseminate any information obtained from the review of the medical records except in aggregate data form. Confidentiality and privacy of subjects will be protected in the following manner; Ms Bratcher will assign a code to each subject which will be matched to the medical record number on a separate form. During this study the key for the medical record codes will be kept by the investigator in a locked file box. After the completion of the study, the only copy of this medical record codes will be kept by Ms. Bratcher’s faculty advisor at Western Kentucky University on the Owensboro Extended Campus premises. The purpose for maintaining this record is so that the study can be verified if necessary. Names of subjects will not be recorded nor will any effort be made by the investigator to contact subjects personally.

Ms Bratcher will conduct her research in such a manner as to minimize any interruption to the work flow within the institution and will schedule her days for data retrieval around the needs of the agency. The name of the __________ District Health Department will not be used in any published material relative to this study.

If desired, Ms Bratcher will participate in any educational offering to staff at the health department relative to the findings of the study.
Benefits and Risk

Since there are no treatments withheld or administered in this study the risk to subjects is minimal to none. The only possible risk would be a breach in confidentiality and privacy which is being safeguarded as described above. District Health Department will receive the benefit of information shared in aggregate form related to the risk factor of maternal age specific to the population treated there. This increase in knowledge should also indirectly benefit the patients of the health department through improved assessments and interventions based on known risk factors.

The District Health Department has a right to refuse participation in this study and such refusal will have no effect on the future services or relationships to either Western Kentucky University or the investigator.

By signing this agreement the agency is acknowledging that it is not possible to identify all potential risks in a research study, and that reasonable safeguards have been taken to minimize both the known and potential but unknown risks.

Approved Representative of Agency

Date

Investigator

Date
Appendix D

Data Collection Tool
DATA COLLECTION TOOL
MATERNAL AGE RESEARCH PROJECT

Assigned Code Number

1. Age at time of Delivery:

2. Marital Status: _____ Married _____ Single _____ Widowed
   _____ Divorced _____ Separated

3. When did subject begin prenatal visits? Check correct answer.
   _____ First Trimester _____ Second Trimester _____ Third Trimester

4. How many prenatal visits did the subject make? _____

5. Weight Gain: ________ lbs. \((b - a = \text{weight gain})\)
   a. Prenatal weight in pounds as reported by subject at time of first prenatal visit. ________ lbs.
   b. Weight in pounds of subject at time of delivery. ________ lbs

6. Smoking Status: **Check correct answer.** _____ Smoking _____ Nonsmoking

7. Race of Subject: **Check correct answer.**
   _____ Caucasian _____ Black _____ Oriental _____ Hispanic _____
   Other

8. Poverty Status based on determination of Health Department: **Check correct answer.**
   _____ At or below poverty level _____ Above poverty level

9. Birth Weight of Infant ________ gms. **Check source of information.**
   _____ record provided by delivering hospital _____ Mother's report

10. Length of Gestation: ________ weeks **Check source of calculation.**
    _____ Mother's report of last menstrual period _____ Ultrasound