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RELATIONSHIP OF PRENATAL CARE TO INFANT BIRTH WEIGHT

By

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ABSTRACT

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Adequate prenatal care is necessary to reduce the financial and social burden associated with Low Birth Weight (LBW) infants. Many studies show that race and age influence birth weight. In Wayne County (1990) the percent of LBW infants born to black teens is 1.75 times greater than those born to white. This study does a secondary data analyses of 1990 birth certificate vital statistics records to examine the relationship between adequacy of prenatal care, as defined by the Kessner Index, and infant birth weight of infants born to black adolescents, age 19 and under in Wayne County, Michigan. Chi Square analyses supports the relationship between prenatal care and infant birth weight ($p.<.00$). Implications of this relationship would suggest if black teens received adequate prenatal care the number of LBW infants in Wayne County would decrease, however individual variation in the cells of the contingency table would suggest birth weight may be influenced by factors other than adequacy of care.

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I would like to dedicate this thesis to my husband Dean and daughters Dana and Cara for their love, support, and encouragement. They gave me the energy to move forward with this work.

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Introduction

Low birth weight (LBW) infants, those born weighing 2500 gms or less, have a greater risk of mortality and morbidity than normal birth weight infants (Institute of Medicine, 1985). Previous research has indicated a relationship between adequacy of prenatal care, teen pregnancy, race, and infant birth weight (Center for Disease Control, 1991; Howell & Brown, 1989; Kessner, 1973, Ketterlinus, Henderson, & Lamb, 1990; Moore, Origel, Key, & Resnik, 1986; Poland, Ager, & Olson, 1987; Ryan, Sweeney, & Solola, 1980; and the "Task Force on Infant Mortality," 1987). Inadequate prenatal care, age under 20, and black race, have been found to be contributing factors to poor pregnancy outcome, measured as birth weight 2500 gms or less.

The purpose of this study is to examine the relationship between the adequacy of prenatal care and infant birth weight of infants born to black teens in Wayne County, Michigan. In the literature review which follows, several variables are examined which impact infant birth weight. The literature review will be limited to discussion of data associated with birth weight, prenatal care, and demographic characteristics of age and race.

This study is directed at answering the question: Is there a relationship between adequacy of prenatal care as measured by number and timing of visits, using a modified Kessner Index, and low birth weight of infants born to black adolescents age 19 years and under in Wayne County, Michigan?

In this study teens of African American descent will be referred to as black, in keeping with Michigan Department of Public Health (MDPH) coding schemes.

Review of the Literature

Race

Although the etiology appears unclear in the research, blacks consistently have increased numbers of low birth weight and premature infants (Ketterlinus et al., 1990; Levine, 1991; and Miller & Jekel, 1987). Levine (1991) analyzed ethnic differences in pregnancy outcome in a Galveston Low Birth Weight Survey (GLOWBS). Blacks had a higher incidence of low birth weight and prematurity. Black teens consistently had greater low birth weight and prematurity than white or hispanic teens. Ketterlinus et al., (1990) found black mothers are 35 percent more likely than white mothers to have a premature infant, and 8-10 percent more likely to have a low birth weight infant.

The rationale for the influence of race on infant birth weight remains speculative. Some researchers believe race to be an indicator of social economic status (SES) (Ketterlinus et al., 1990), while other findings suggest black infants have a genetic predisposition for lower birth weight. Full term black infants on average have lower birth weight and head and chest circumferences than white infants (Miller and Jekel, 1987; Wilcox and Russell, 1990). The reason for concern about low birth weight is that low birth weight is closely associated with infant mortality and morbidity (Institute of Medicine, 1985). Wilcox and Russell (1990) describe that for the same birth weight, white teens have a greater likelihood of infant mortality, however, when mean birth weights are compared and LBW is considered as two standard deviations below the mean, birth weight is more predictive of infant mortality and black infant mortality continues to exceed white.

Birth weight

Chiles (1990), in a report by the national commission to prevent infant mortality, says that the United States ranks 20th in infant mortality among industrialized nations. "Cities such as Washington D.C., Detroit, and Philadelphia, have infant mortality rates which are twice the national average and higher than Jamaica or Costa Rica" (p. 2). According to Chiles, infants born at low birth weight are 40 times more likely to die during their first year of life and are 2-3 times more likely to suffer from such conditions as blindness, seizures, and mental retardation.

The cost of LBW for those infants who live encompasses hospitalization and long term supportive care. A recent cost analyses done at a major hospital in the Wayne County area determined the cost of NICU to be $1110.00 per day including ancillary services. The average length of stay in NICU for the sample analyzed by the hospital was 13.8 days. It is not uncommon for a LBW infant to spend a month or more in a neonatal intensive care unit. Morrison, Pittman, Martin, and McLaughlin (1990) surveyed several hospitals from different regions of the United States and found $1500 to be a conservative average daily fee with duration of stay ranging from 8-82 days.

Howell and Brown (1989) studied Medicaid expenditures for 1983 in Michigan, California, and Georgia. According to Brown's study more than 33 percent of all medicaid deliveries were "high cost," approximately twice the cost of an average delivery at that time. Only 12 percent of the total amount Medicaid paid for obstetrical care was spent on prenatal care. Prevention of LBW infants would save costs related to

care in neonatal intensive care units, and costs associated with care for chronic health problems.

Adolescent Age

Many researchers describe adolescents to be at increased risk for low birth weight infants (Behrman, Hediger, Scholl, & Arkangel, 1990; Buescher, Meiss, Ernest, Moore, Michielutte, & Sharp, 1988; Ketterlinus et al., 1990; Slap & Schwartz, 1989; and Sweeney, 1989). Adolescents are 2-3 times more likely to have a low birth weight infant than women age 25-29, and their infants are twice as likely to die before age one (Chiles, 1990). Other research suggests age alone has minimal effect on birth weight (Hardy, King, & Repke, 1987; Ketterlinus et al., 1990; and Slap & Schwartz, 1989). Delay in seeking prenatal care increases risks of complications related to sexually transmitted diseases, inadequate nutrition, and substance abuse. Teens often have a second infant within 1-2 years after their first. Higher birth order appears to increase the teens likelihood of delivering a low birth weight infant (Korenbrot, Showstack, Loomis, & Brindis, 1988). Sweeney's (1989) study did not support this finding.

Age less than 15 years

Adolescents less than 15 years of age appear to be at greater risk for low birth weight infants than teens age 15-19 (Ketterlinus et al., 1990; McAnarney & Greydanus, 1989; Pomeranz, Matson, & Nelson, 1991; and Sweeney 1989). The etiology of increased risk for low birth weight and very low birth weight infants is complex and appears to be related to biologic factors and social economic disadvantage (Sweeney, 1989).

Biologically the young adolescent is in the midst of a growth spurt which requires increased nutrition. The fetus is in competition with

the developing female for nutrition. The uterus is not fully developed until 17-18 years of age which compromises the fetus for room to grow.

Cognitively the young adolescent is in the concrete stage of development, unable to understand the consequences of her action. The inability to perceive cause and effect, combined with the egocentric focus on her changing body and magical thinking, may lead to denial of the pregnancy and delay in prenatal care seeking (Ketterlinus et al., 1990; and McAnarney & Greydanus, 1989).

Ages 15-19 years

Adolescents between the age of 15 and 19 appear to be at risk for low birth weight infants not only because of similar socioeconomic status as the younger adolescent, but because of risk taking behaviors associated with sexual promiscuity, substance abuse, poor nutrition, and delay in seeking prenatal care. Age alone does not appear to increase the risk of having a low birth weight infant.

Biologically irregular menses in this age group and spotting associated with such sexually transmitted diseases as chlamydia, confuse the adolescent since she confuses spotting with her anticipated menstrual cycle (Stevens-Simon, Roghmann, & McAnarney, 1991). Stevens-Simon et al., (1991) interviewed 136 adolescents and 53 adults to assess for history of early vaginal bleeding. Adolescents were more likely than adults to experience early vaginal bleeding in pregnancy, 16.9 percent compared to 5.7 percent, which influenced the timing of entry into care. Adolescents who experienced early vaginal bleeding in pregnancy entered prenatal care at an average of 16.2 weeks compared to 12.7 weeks for those adolescents who did not have early vaginal bleeding. Pomeranz et al., (1991) studied 42 adolescent patients seen

for pregnancy at a downtown primary care clinic in Milwaukee, Wisconsin. Fifty percent of the students seen at the clinic had sexually transmitted diseases.

Inadequate nutrition from poor food selection or inadequate weight at contraception compromise the amount of nutrients needed for the growing fetus. Substance abuse may affect the fetus through direct chemical transference across the placenta or may impact the fetus by way of altering the teens appetite (Comerci, Kilbourne, & Harrison, 1989). Chiles, (1990) reports crack cocaine exposes infants to problems ranging from miscarriage, to low birth weight, neuro behavioral problems, and congenital malformations. He also reports nutrition may account for 57-65 percent low birth weight. Behrman, Hediger, Scholl, & Arkangel, (1990) assessed the effects of nausea and vomiting of pregnancy on pregnant teens in Camden, New Jersey. Behrman's study shows vomiting which persists into the second and third trimester is associated with a significant decrease in birth weight.

Cigarette smoking has frequently been associated with increased risk of LBW, however research does not support this relationship in adolescents (Slap & Schwartz, 1989). This may be due to the low number of cigarettes smoked by pregnant adolescents or under reporting. Peacock, Bland, Anderson, Poland, & Brooke (1991) studied the effects of cigarette smoking on pregnant women of all ages and found effects were dose related.

Cognitively the older adolescent is better able to understand the consequence of unprotected sex, pregnancy and increased risk of sexually transmitted diseases than the younger adolescent, however many teens still have difficulty with this concept. They also have difficulty

understanding the long term ramifications of their actions such as pregnancy's impact on socioeconomic status.

A combination of factors based on fear of telling family, cognitive development, and lack of knowledge related to signs of pregnancy interfere with early entry into prenatal care.

Prenatal care

Adequate prenatal care is important because it allows for early assessment and continued monitoring of care. Prenatal care consists of a comprehensive history and physical to gather information about the last menstrual period, the current pregnancy and a review of past obstetrical history. It also assesses for physiologic well being, nutritional status, and risk taking behaviors which may impact the infant birth weight.

Adequacy of prenatal care varies for several reasons: Waiting time for first prenatal appointment, denial of pregnancy, and lack of knowledge. It often takes 4-8 weeks for a teen to get an appointment with a health care provider once the teen acknowledges the pregnancy. From 1980-1987 the percentage of women obtaining late or no prenatal care has increased to 26 percent for black women and 17 percent for white women (Chiles, 1990). Prenatal care has a positive effect on infant birth weight when birth weight and adequacy of care are measured by number and timing of prenatal visits (Center for Disease Control, 1991; Hardy et al., 1987, and Heinz, Miller, Sear, Goodyear, & Gardner, 1983).

Buescher et al., (1988) suggest that when number of prenatal visits are controlled for women who are in the special pregnancy risk assessment programs have less low birth weight infants than women

receiving traditional prenatal care. Buescher et al., (1988) assessed a Premature Prevention Project (PPP) in North Carolina. Assessments were done on 18,282 live births. Results indicated that women out of the projects were 1.32 times more likely than PPP women to have infants ≤2500 gms. The probability of having an infant less than 38 weeks of gestation was 1.45 times greater for out of project women. For very low birth weight infants, those under 1500 gms, out of project women were 1.87 times more likely to have infants under 1500 gms than non project women. Heinz et al., (1983) however, found when demographics and number of prenatal visits were matched, special prenatal risk programs had no impact on infant birth weight, suggesting prenatal care may be an artifact of socioeconomic status (SES). The negative impact of SES on infant birth weight is also suggested in a study by the Institute of Medicine, 1985.

Moore et al., (1986) assessed the perinatal economic impact of prenatal care at University of California, San Diego. Prenatal care was divided into two groups, no care (0-3 visits) and more than three visits. There were 21 percent low birth weight infants in the no care group compared to the care group which had 2 percent. Slap and Schwartz (1989) also compared the number of prenatal visits to infant birth weight. They found there were more than twice as many low birth weight deliveries to women who did not receive prenatal care compared to those who received prenatal care. The maximum difference in birth weight outcomes appeared at five visits. Of those mothers who received care, 64.6 percent of the low birth weight group and 31.5 percent of the normal birth weight group had five or less visits. Five or fewer visits

were closely correlated with inadequate care as defined by the Kessner Index (Slap & Schwartz, 1989).

This thesis is not intended to measure prenatal care interventions. Prenatal care will be measured by number of visits and time of initiation, not quality or content.

Definition of Concepts

The concepts to be examined in this research will include: Prenatal care, infant birth weight, and adolescent age.

Prenatal care

Conceptual definition--Conceptually prenatal care has two parts: 1) qualitative (content) and quantitative (timing and number of visits). For purposes of this study, the quantitative portion describing adequacy of care, as defined by the Kessner Index, is the part of prenatal care analyzed; and 2) Antepartum (prenatal) care is described by the American College of Obstetricians and Gynecologists (ACOG), and American Academy of Pediatrics (AAP) (1983) as a program that "...begins as early as possible in the first trimester of pregnancy. There are three main components of antepartum care: 1) serial surveillance, which begins with a comprehensive history and physical examination to identify risk factors or abnormalities and to establish the date of confinement; 2) patient education to foster optimal health, good dietary habits, and proper hygiene; and 3) appropriate psychosocial support"(p.48).

Prenatal care allows for interventions such as education, counseling, and anticipatory guidance, which give information about behaviors which would influence pregnancy and impact infant birth weight. Behaviors which have been shown to negatively impact pregnancy are smoking, the use of alcohol, using certain prescription or over the

counter medication, the use of illegal drugs such as cocaine, and inadequate nutrition. Prenatal visits offer the health care provider an opportunity to assess progression of the pregnancy from physiologic and behavioral perspectives and help the teen make healthy choices.

Birth Weight

Conceptual definition--Weighing infants has been a practice for hundreds of years, however Yllpo, a Finnish pediatrician, in 1930, first advocated 2500 gms as the birth weight below which adverse conditions were most likely to occur. His recommendation was adopted by the World Health Organization (WHO) at the First World Health Assembly in 1948 (Institute of Medicine, 1985). Birth weight can be normal, greater than 2500 gms; low, 2500 gms or less; or very low, below 1500 gms. Low birth weight can be attributed to prematurity, intra uterine growth retardation, or a combination of both (Center for Disease Control, 1991; and Ketterlinus et al., 1990). This study does not differentiate between birth weight based on etiology. The interest in studying low birth weight infants is because of the close association between low birth weight and infant mortality and morbidity (Institute of Medicine, 1985).

Adolescent age

Age under 15 years

Adolescents under age 15 are at increased risk for LBW infants because the growing body is in direct competition with the fetus for nutrients, and the uterus has not finished growing, thus creating a physical deficit. Cognitive functioning at the concrete level leads to magical thinking, denial of the possibility of pregnancy, and delayed entry into prenatal care.

Age 15-19 years

Adolescents between ages 15-19 are at no greater risk physiologically than adults except the uterus does not attain full development until age 17 or 18. The greatest cause of LBW in this population has to do with adolescent risk taking behaviors related to sexual promiscuity, substance abuse, inadequate nutrition, and delay in entry into prenatal care.

Conceptual Framework

Martha Rogers theory of Unitary Man is the model utilized in this research on adequacy of prenatal care and infant birth weight. In this study the term unitary human being will be used instead of unitary man. Concepts which describe four dimensionality of unitary human beings and life process are basic to understanding pregnancy and fetal development as unidirectional and predictable. Unifying principles derived from the science of unitary human beings are related to the Principles of Homeodynamics. These principles are resonancy, helicy, and integrality (Malinski, 1986).

Concept of Unitary Human Beings

Woman is a four dimensional energy field continuous with her environment and greater than the sum of her parts. The unitary human field, refers to the openness and amount of interaction that occurs within the woman and her environment which are not differentiated. This continuous, mutual, simultaneous interaction of human and environmental fields is referred to by Rogers as the principal of integrality (Malinski, 1986). The human field is made up of energy patterns which are cyclicle, unidirectional, and predictable.

Life Processes

Rogers' "Philosophy of becoming" supports the idea that changes occur to the human field along a space time continuum which are unidirectional, non causal, innovative, and predictable. "The continuous, innovative, probabilistic increasing diversity of human and environmental field patterns characterized by non-repeating rhythmicities" is known as the Principle of Helicy (Malinski, 1986). Life process continues forward with continuity of motion which produces patterns which are similar and predictable, however different from patterns and events that have been experienced before. The change in frequency of wave patterns from lower to higher frequency is called the Principle of Resonancy.

Application of Rogers Concept of Life Process and Unitary Human Beings to Prenatal Care and Infant Birth Weight.

Application of Rogers' model of four dimensional unitary human beings to prenatal care and infant birth weight can be described using Rogers' concepts of resonancy, helicy, and integrality. The term helicy is used to describe woman as a function of self and environment which is capable of bringing about a change in the human field. Change in the human field is dependent on the simultaneous state of the environmental field at any relative point in time, is rhythmical and unidirectional.

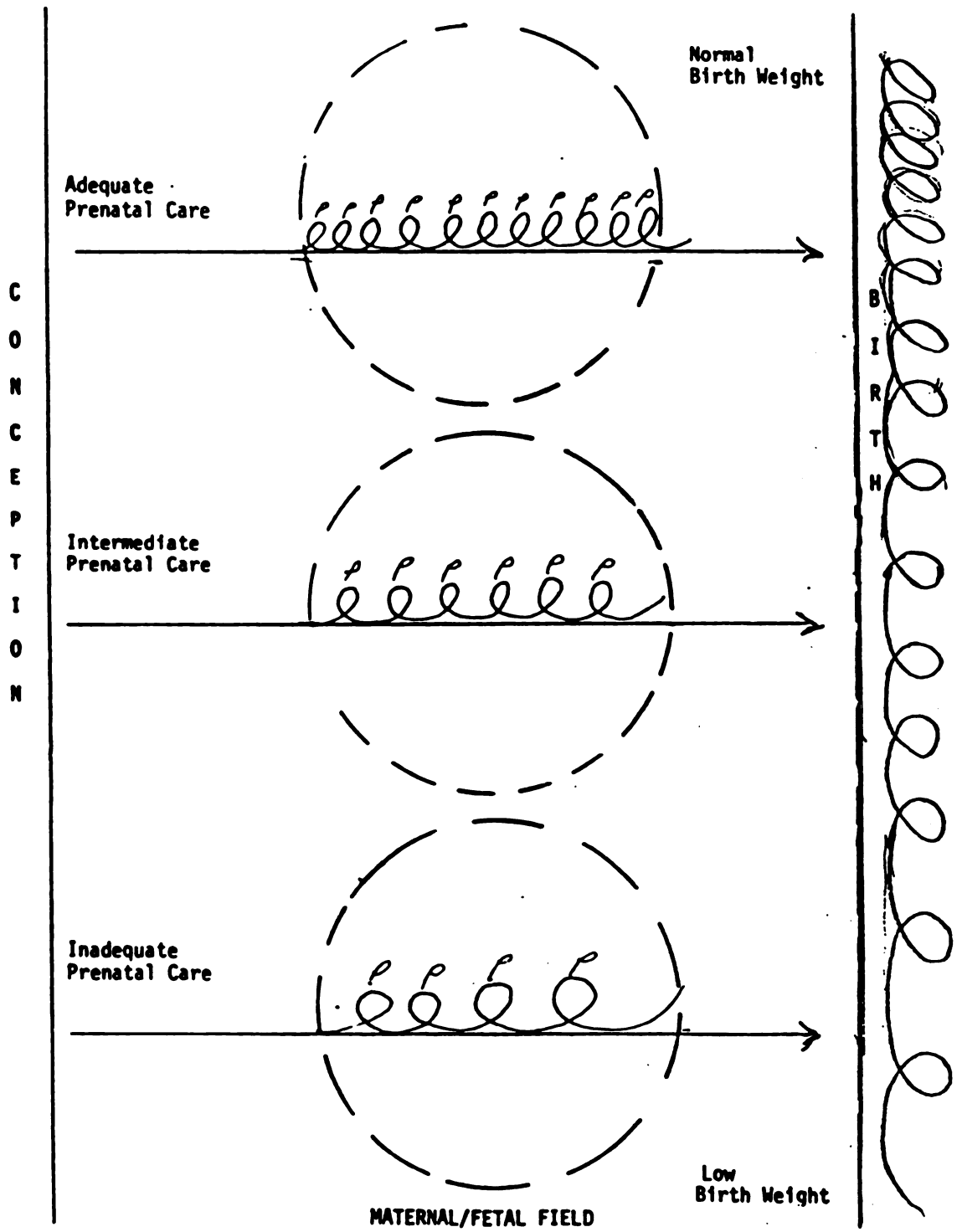
In the model of four dimensional unitary human beings (Figure 1), P stands for any relative point in time. Prenatal care is a regular pattern of visits a woman keeps with her health care provider to monitor her pregnancy. The adequacy of prenatal care is measured by the timing and frequency of prenatal visits. Prenatal care is a measure of resonancy. Adequate prenatal care would be a measure of high resonancy

Figure 1

Influence of Prenatal Care

on

Infant Birth Weight



and inadequate care would be a measure of low resonancy. Intermediate adequacy of prenatal care would be a resonancy which is neither high nor low. The content of prenatal care is not measured. The model describes that when regular prenatal care, at any point P becomes a function of the human field, the impact will have an effect on infant birth weight. Infant birth weight is a function of the human field of the mother over time from conception to birth of the infant. Infant birth weight is dependant on those predictable cyclicle changes which take place in the development of the fetus over time. The principle of integrality does not differentiate between the fetus, the mother, and the environment. The fetus, mother, and environment are one human field. Research suggests that increased resonancy (adequacy of prenatal care) has a positive impact on infant birth weight (Center for Disease Control, 1991; Hardy et al., 1987; and Heinz et al., 1983).

Methods

Overview of study

This study used ex post facto birth certificate data from 1990 to analyze the relationship between adequacy of prenatal care and infant birth weight of black teens in Wayne County, Michigan. Birth certificate data provided information related to demographic characteristics such as age, race, sex, infant birth weight, and adequacy of prenatal care, as measured by the modified Kessner Index. This study describes the population characteristics of the sample and explores differences in adequacy of prenatal care groups by age of adolescent (younger and older), the independent variable or the dependant variable, and infant birth weight. A correlational design was used to describe the relationship among variables. In this section the

design of the study is explained, variables are operationally defined, assumptions and limitations are explored, and the plan for statistical analyses is described.

Design

The design of this study is descriptive in nature and examines 1990 ex post facto birth certificate data related to age (<15 yrs and 15-19 yrs), adequacy of prenatal care, and infant birth weight.

Infants born to black teens age 19 and under who gave birth in Wayne County, Michigan, and their infants are grouped into categories by birth weight (dependant variable). Birth weight classifications will be normal birth weight (>2500 gms), low birth weight (≤2500 gms), and very low birth weight (<1500 gms). The independent variable is adequacy of prenatal care which is categorized using the Kessner Index as adequate, intermediate, or inadequate (Figure 2--for categories of care by initiation and timing of visits).

Research Question

This study is directed at answering the question: Is there a relationship between adequacy of prenatal care as measured by number and timing of prenatal visits using the Kessner scale for adequacy and birth weight of infants born to black adolescents from onset of puberty through age 19, in Wayne County, Michigan?

Sample

The study sample included vital statistics data on all black adolescents from onset of puberty through age 19 who gave birth to infants in Wayne County, Michigan, in the year 1990. The sample size was 5377 infants. Data related to prenatal care and infant birth weight

Figure 2

Kessner Index

Level of Care	Month in Which Prenatal Care Began	Weeks of Gestation	Number of Prenatal Visits
Adequate	Within 1 and 3 months	13 or less	1 or more
		14-17	2 or more
		18-21	3 or more
		22-25	4 or more
		26-29	5 or more
		30-31	6 or more
		32-33	7 or more
		34-35	8 or more
		36	9 or more
Intermediate:	All combinations other than specified for adequate or inadequate		
Inadequate:	Seventh month or later	14-21	0 or not stated
		22-29	1 or less
		30-31	2 or less
		32-33	3 or less
		34 or more	4 or less

Michigan Department of Public Health uses a slightly modified Kessner Index where cases with year or month of last menses is unknown or gestational age is implausible (less than 13 or greater than 48 weeks) are coded as unknown on index.

for this population was obtained from the Michigan Department of Public Health birth records, vital statistics.

Operationalization of variables

Dependant variable

Birth weight.

Birth weight is defined as the first recorded infant weight after birth which is recorded on the birth certificate. Birth certificate data obtained from Michigan Department of Public Health (MDPH) will be categorized by weight of infants born to black teens in Wayne County, Michigan, weighing less than 1500 gms, those weighing 1500-2500 gms, and those weighing more than 2500 gms. Birth weight can be described as normal birth weight, more than 2500 gms, low birth weight 2500 gms or less, or very low birth weight, less than 1500 gms (Buescher et al., 1988; Hobel, 1984; and Institute of Medicine, 1985). Each circumstance of low birth weight may have a different etiology. In this study the researcher does not classify birth weight based on etiology.

Independent variable

Adequacy of prenatal care.

The independent variable, adequacy of prenatal care is measured by number and timing of prenatal visits using a modified Kessner Index. The Kessner Index categorizes prenatal care as adequate, intermediate, or inadequate (Figure 2).

Adolescents who start prenatal care on or before 13 weeks of gestation and have nine or more visits by the time they are 36 weeks pregnant will be considered to have adequate prenatal care. Inadequate prenatal care is care which started at the seventh month

or later, no care, or less than four prenatal visits in 34 or more weeks of pregnancy. All other combinations of prenatal care which are neither adequate nor inadequate are placed in the intermediate category (Figure 2).

Adolescent Age

Age under 15 years

Adolescents in the younger category will be from puberty to age 15.

Age 15-19 years

Adolescents in the older category will be ages 15-19.

Limitations and assumptions of the study

Assumptions:

1. Prenatal care was available to black teens in Wayne County during the year 1990.

Limitations:

1. Data gathered may not be valid based on inconsistent mechanisms of data collection.
2. There are other factors besides prenatal care which affect infant birth weight; for example the general health of the adolescent prior to becoming pregnant, nutritional status of the teen during her pregnancy, presence of a sexually transmitted disease or streptococcus infection in the vagina, preeclampsia, incompetent cervix, behaviors such as smoking, or the use of drugs such as cocaine or heroin. These variables are not measured in this study.
3. The results are only generalizable to black adolescents age 19 and under in Wayne County, Michigan.
4. The quality of prenatal care may be an important factor in preventing LBW. This study makes no attempt to measure these.

5. Birth weight related to adequacy of prenatal care may be measuring something other than adequacy of prenatal care based on individual differences which of individuals who seek prenatal care.

Reliability and validity

There is currently no instrument to measure the reliability and validity of the Kessner Index (Figure 2). The validity of the study is dependant on the accuracy of birth certificate data reporting. When three different hospitals were asked what their procedure was for collecting birth certificate data related to number of prenatal visits, one birth records clerk said she asks the patient, another uses data from the physicians prenatal record and then asks the patient for any additional visits beyond a certain date, and the other birth records clerk says she asks the patient unless the information is already recorded for her in labor and delivery. Some women receive prenatal care from walk in clinics which may not be reported on birth certificates as a prenatal visit (Poland et al., 1987). This would suggest data may vary in reliability.

Human Subjects

There is anonymity of individual subjects due to the use of secondary data which is supplied from the Michigan Department of Public Health, birth certificate, vital statistics, and includes no personal identifying data. There is no way of linking this data to any individuals. Human subjects approval was given (Appendix B).

Data Analyses Procedures

Data was obtained from MDPH (Tables 1 and 2). For the purpose of analyses prenatal care was categorized as adequate, intermediate, and inadequate using a modified Kessner Index. The Kessner Index was

Table 1

Adequacy of Prenatal Care by Age of Mother Compared to Birth Weight of Infant for all Black Teens in Wayne County, Michigan, 1990 (% /raw numbers)

Adequacy	Adequate		Intermediate		Inadequate		Totals
Age	15	-19	15	-19	15	-19	
Birth Weight	%/n	%/n	%/n	%/n	%/n	%/n	%/n
<1500 G	.05	1.38	.02	.80	.11	.87	3.14
	(03)	(69)	(01)	(43)	(06)	(47)	(169)
1500-2500 G	.07	5.10	.24	2.90	.13	1.94	10.38
	(04)	(274)	(13)	(156)	(07)	(104)	(558)
>2500 G	.95	42.38	1.12	28.90	.71	12.42	86.50
	(51)	(2279)	(60)	(1554)	(38)	(668)	(4650)
Totals	1.10	48.75	1.38	14.00	.95	15.23	100.00
	(58)	(2622)	(74)	(1753)	(51)	(819)	(5377)

X=53.25 P<.0005 df10 Cramers 0=.06 Contingency Coefficient=.09 n=5377

Table 2

Adequacy of Prenatal Care Compared to Infant Birth Weight for all Black Teens Under Age 20 in Wayne County, Michigan, 1990. (% /raw numbers)

Adequacy	Adequate	Intermediate	Inadequate	Totals
Birth Weight	%/n	%/n	%/n	%/n
<1500 G	1.3	.82	.99	3.14
	(72)	(44)	(53)	(169)
1500-2500 G	5.2	3.14	2.06	10.38
	(278)	(169)	(111)	(558)
>2500 G	47.05	30.39	13.13	86.48
	(2530)	(1614)	(706)	(4650)
Totals	49.84	33.98	16.18	100.00
	(2680)	(1827)	(870)	(5377)

X =39.63 P<.0005 df4 Cramers 0=.06 Contingency coefficient=.09 n=5377

modified such that any missing or implausible data was not counted. Ages were grouped into <15years of age and 15-19 years of age for each category of prenatal care. Age and level of prenatal care was compared to infant birth weights of >2500 gms, 1500-2500 gms, and less than 1500 gms. A 3X6 contingency table was used to calculate the Chi Square Statistic. A probability table was used to assess the statistical significance based on Chi Square and degrees of freedom. The level of significance was set at p=.05.

Results/Findings

Description of sample and other background material.

Expost facto birth certificate data from calendar year 1990 was used to analyze a relationship between adequacy of prenatal care and infant birth weight of infants born to black teens in Wayne County, Michigan. The sample consisted of 5377 infants born to black teens age 19 and under in Wayne County, Michigan. Birth weights of these infants were compared to level of prenatal care using criteria from a modified Kessner Index (Figure 2). Level of prenatal care was further divided into age under 15 and ages 15-19. The study was directed at interpreting if there was a relationship between adequacy of prenatal care, as defined by the Kessner Index and birth weight of infants born to black teens from onset of puberty through age 19, in Wayne County, Michigan (Table 2).

Description of findings

There were three findings in this study which were based on statistical analyses of prenatal care and birth weight of infants born to black teens in Wayne County, Michigan. Findings indicated: 1) There was a positive relationship between adequacy of prenatal care and infant

birth weight; 2) Younger teens, less than age 15, had an 18 percent LBW rate and the relationship between prenatal care and infant birth weight for this population was not significant at the .05 level; and 3) Teens age 15-19 with adequate prenatal care have a higher percentage of LBW infants than those teens ages 15-19 who have inadequate care, though it would appear that teens with adequate care are more likely to have better birth weight outcomes. The relationship between prenatal care and infant birth weight in the 15-19 year old age group is significant.

There was a positive relationship between adequacy of prenatal care and infant birth weight for all black teens who gave birth in Wayne County, Michigan in 1990. A Chi Square analyses was done by MDPH Bureau of Health Statistics using a 3X6 contingency table (Table 1). The table showed significant differences in the amount of infants born to teens under age 15 and those age 15-19, resulting in very small numbers of births in the under 15 year old age group. Therefore, age categories were collapsed to form a 3X3 contingency table (Table 2), Chi-Square analyses continued to be significant ($p<.00$). Almost half (49.8%) of the teens sampled received adequate care, whereas 16 percent received inadequate care. Normal birth weight infants (NBW) >2500 gms accounted for 86.5 percent of all live births. LBW infants $\leq$2500 gms accounted for 13.5 percent of the live births for this population. It would appear that regardless of birth weight, most teens have adequate care (Table 2). Of the normal birth weight infants, 47 percent had adequate care and only 13 percent had inadequate care. Six and a half percent of all low birth weight infants received adequate prenatal care compared to 3 percent who received inadequate care.

Age specific differences in birth weight of black teens in Wayne County were difficult to ascertain from the 3X6 table (Table 1) because of the small number of births to teens under age 15, and was not controlled for in the 3X3 contingency table (Table 2). Therefore two other tables were designed to examine prenatal care and infant birth weight for each subgroup by age, collapsing birth weight to reflect <2500 gms and >2500 gms (Tables 3 and 4).

Table 3 analyses the relationship of birth weight and adequacy of prenatal care for all black teens under age 15. Of all black teens who gave birth (n=138), 18.6 percent delivered infants ≤2500 gms and 81.4 percent delivered infants >2500 gms. In that group there were twice as many infants ≤2500 gms born to teens with inadequate or intermediate prenatal care than adequate prenatal care. The categories of adequacy of prenatal care were similar, ranging from 27.9 percent for inadequate care to 31.7 percent for adequate care with most of the teens 40.4 percent receiving intermediate care.

Table 4 represents black teens age 15-19 who gave birth in Wayne County, Michigan. Of this population (n=5194), 13.3 percent of the infants were born <2500 gms compared to 86.7 percent born >2500 gms. Fifty percent of all black teens age 15-19 received adequate prenatal care, 33.8 percent received intermediate prenatal care and 15.8 percent received inadequate prenatal care. For infants born >2500 gms 43.9 percent of the mothers received adequate prenatal care and 12.9 percent received inadequate prenatal care. Comparing Tables 3 and 4 for percentages in similar categories revealed teens <15 years were 1.7 times more likely to receive inadequate care as teens age 15-19, 27.87 percent (Table 3) verses 15.77 percent (Table 4). When infants ≤2500

Table 3

Adequacy of Prenatal Care Compared to Infant Birth Weight for all Black Teens Under Age 15 in Wayne County, Michigan, 1990 (% /raw numbers)

Adequacy Birth Weight	Adequate %/n	Intermediate %/n	Inadequate %/n	Totals %/n
<2500 G	3.83 (07)	7.65 (14)	7.10 (13)	18.58 (34)
>2500 G	27.87 (51)	32.79 (60)	20.77 (38)	81.42 (149)
Totals	31.69 (58)	40.44 (74)	27.87 (51)	100.00 (183)

n=183 X=3.24 p< .10 df=2 *p.05 = X=3.84

Table 4

Adequacy of Prenatal Care Compared to Infant Birth Weight for all Black Teens 15-19 in Wayne County, Michigan, 1990 (% /raw numbers)

Adequacy Birth Weight	Adequate %/n	Intermediate %/n	Inadequate %/n	Totals %/n
<2500 G	6.60 (343)	3.83 (199)	2.91 (151)	13.34 (693)
>2500 G	43.88 (2279)	29.92 (1554)	12.86 (668)	86.66 (4501)
Totals	50.48 (2622)	33.75 (1753)	15.77 (819)	100.00 (5194)

n=5194 X=24.54 p< .0005 df=2

gms were compared by age of mother and adequacy of care, black teens under age 15 receiving inadequate care were 2.4 times more likely than black teens between ages 15 and 19 to receive inadequate care and to have an infant ≤2500 gms.

Unexpected were the findings that the largest percent of infants ≤2500 gms were born to adolescents between ages 15 and 19 were those who received adequate prenatal care. As prenatal care increased for this age group from inadequate to adequate, percentages of infants ≤2500 gms increased from 2.9 percent to 6.6 percent (Table 4 and Figure 3). Though Table 4 may give the appearance that teens age 15-19 have poor outcomes when they receive prenatal care, percentages of low birth weight infants are less for those teens who receive prenatal care than those teens who do not, 13 percent compared to 18 percent (Table 2).

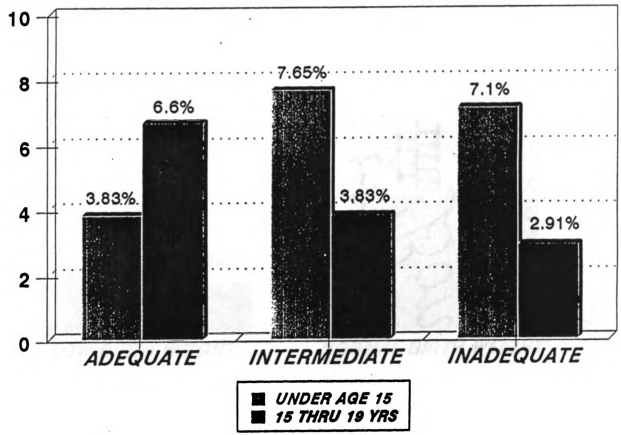
Relationship to Conceptual Model and Literature

Conceptual model

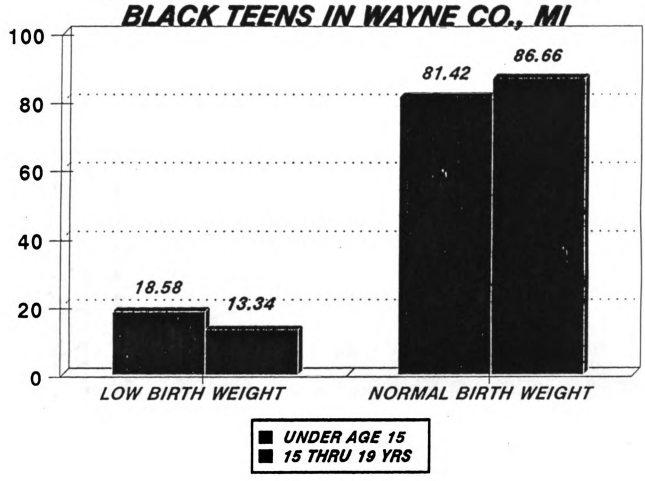
Chi Square analyses supports the relationship between prenatal care and infant birth weight for teens under age 19. For teens >15 years this relationship did not hold. A contingency coefficient of .1 shows the relationship between infant birth weight and prenatal care for teens less than age 20 is in a positive direction. This follows Rogers model to suggest that as increases in number of prenatal visits occur, there is an increased likelihood of improved birth weight. The model does not propose a cause and effect relationship among variables, but a relationship influenced by environmental differences over time which are to a degree predictable. The unexpected rate of LBW infants born to 15-19 year olds with adequate care does not follow the conceptual model. In explanation of the discrepancy, consider those infants born to

ADEQUACY OF PRENATAL CARE COMPARED TO INFANT BIRTH WEIGHT FOR ALL BLACK TEENS

% OF RAW NUMBER IN WAYNE CO., MI.



INFANT BIRTH WEIGHT COMPARISON BY AGE
LOW WEIGHT VS. NORMAL WEIGHT



mothers who received adequate care may have had factors other than prenatal care which influenced the low birth weight. In those instances, the teen who had more prenatal care was at greater risk for LBW than those teens who did not receive adequate prenatal care.

Literature

Literature says one factor which puts women at risk for a LBW infants is age. Statistically teens have a greater number of LBW infants, however age alone does not appear to influence the infant birth weight. This study would support the view that age has an impact on infant birth weight as teens under age 15 are more likely to have LBW infants than teens age 15-19. Adolescents were not compared with adult women in this study, therefore it is not possible to say that this study supports other known statistics. The significant relationship between prenatal care and infant birth weight found in this study is similar to findings by Moore et al., (1986) and Slap & Schwartz (1989).

Discussion

Assumptions and Limitations

Assumptions basic to this study were that data were reported accurately to MDPH. This later also became a limitation as it became apparent there were some basic inconsistencies in data gathering from individual hospitals. Another assumption was that prenatal care was available to black teens in Wayne County, Michigan during the year 1990. There was no reason to believe that care was not available.

Limitations of this study involve the lack of generalizability. A specific population of black adolescents in Wayne County, Michigan was analyzed and results can only be generalized to black adolescents in Wayne County, Michigan. The quality of prenatal care is an important

factor in preventing LBW. There are many factors besides prenatal care which affect infant birth weight; for example the general health of the adolescent before becoming pregnant, nutritional status of the adolescent during her pregnancy, presence of a sexually transmitted disease or streptococcus infection in the vagina, preeclampsia, incompetent cervix, behaviors such as smoking, or the use of drugs such as cocaine or heroin. These variables were not measured in this study. The unexpected findings related to prenatal care and infant birth weight in the 15-19 year olds may suggest that in some cases prenatal care, as currently delivered, has little impact on individual characteristics and behaviors which impact birth weight. Another factor which may play a part in the significance of the data is the accuracy by which data is collected for birth records regarding number of prenatal visits and the impact of pregnant teens using walk in clinics for prenatal care. Poland et al., (1987) identified a trend in the City of Detroit which showed 36 percent of all obstetrical patients studied had between 1-16 visits at emergency walk in clinics, where there was virtually no health education and follow up visits were not made. These visits were not counted, and would have an impact on adequacy of care. The impact of these walk in clinic visits is unknown.

Implications for nursing practice

National statistics (1991) indicate black teens age 19 and under have a LBW rate of 14.6 percent; teens age 15-19, 13.4 percent; and teens under age 15, 15.8 percent (U.S. Department of Health and Human Services, 1991). 1992 statistics will not be available until January 1993. These percentages are not dramatically different from the percentage for LBW infants found in this study which are 13.5 percent,

13.3 percent, and 18.5 percent respectively. These numbers are important when considering strategies to decrease the percentage of LBW infants to meet the year 2000 goals. The goal for the year 2000 is to decrease LBW infants to no more than 5 percent of all live births, and VLBW to no more than 1 percent. The goal for black infants is no more than 9 percent LBW and no more than 2 percent VLBW (U.S. Department of Health and Human Services, 1991).

As a clinician, the advanced practice nurse functions autonomously to provide holistic care. The non-authoritarian manner in which advanced practice nurses interact with their clients to offer education, counseling, support, and patient satisfaction, is of primary importance in preventing LBW infants (Institute of Medicine, 1985). Other researchers have found advanced practice nurses as clinicians provide quality of care equal to or greater than the quality of care provided by physicians (Koch, Pazaki, and Campbell, 1992).

Finding 1

This study indicates there is a positive relationship between prenatal care and infant birth weight of infants born to black teens age 19 and under in Wayne County, Michigan. Research supports the importance of providing prenatal care to teens to decrease LBW infants. Social programs such as Maternal Support Services Program (MSSP) help make prenatal care available to teens, however the health care providers are not always accessible. Teens experience barriers related to finances, accessing the medicaid programs, transportation, timing of visits, and the psychological feeling of intimidation when they go for prenatal visits. Nursing needs to focus on increasing access to care for teens. One way in which increased early access to care might be

facilitated is through better use of school based clinics for initiation of prenatal care, education, and referral.

There are 11 publicly funded school based adolescent centers and nine publicly funded community based adolescent centers in the State of Michigan (Waszak & Neidell, 1991). Nine of the school based centers are staffed by Certified Nurse Practitioners who provide continuous, comprehensive, coordinated care in collaboration with a health care team. In a survey of public funded adolescent centers in Michigan (n=15) 20 percent of the adolescent centers provided prenatal care on site and 93 percent offered referrals for prenatal care (Waszak & Neidell, 1991).

School based clinics reduce barriers associated with money, transportation, time constraints, and trust. Teens are easily accessible for follow up when they are in school. Fees for service at adolescent health centers are based on a sliding scale of the teens ability to pay. Teens develop a sense of trust in the care providers at school based clinics because the clinic becomes part of the normal school environment. Care providers at school based clinics are accustomed to meeting the needs of teens and the pregnant teens do not feel intimidated there. Psychological access to care is important because many times in traditional settings, through verbal or nonverbal communication, the pregnant teen is made to feel inferior, unclean, or rejected. To increase environmental comfort, the waiting room could be decorated with pictures of teens interacting with other teens, and teens with babies. Videos made by teens should be used to educate teens on child care and pregnancy prevention. Professionals need to talk with teens about what is on the teens agenda first: body changes,

discomforts of pregnancy, peers, school, work, home, and immediate living arrangements, before moving to the health care professionals agenda of healthy behaviors related to nutrition, sexuality, and substance abuse. The advance practice nurse (APN) assesses the teen for health behaviors which put the teen at risk for a low birth weight infant within the context of her environment, which includes culture and values. After assessing the teen, the APN brings about planned change through mutual goal setting and education. To determine if positive health behavior changes have occurred the APN evaluates changes. This can be accomplished by use of a survey, observation at regular appointments, or keeping track of appointment keeping behavior.

To provide accessible prenatal care to teens the APN must often collaborate with other agencies. It is through collaboration and community support that resources are made available for adolescent health care, of which prenatal care is a part. The community must be educated of the need for special prenatal care for teens, and show acceptance of the centers program for pregnant teens, or the program will not be successful. The APN as an advocate for teens must collaborate with community members and agencies in a culturally sensitive manner. One way the APN gains trust in the community is by interacting with community churches and agencies such as the Urban League. Let the community members share their concerns and then ask how the health care providers can help meet the needs of that community. It is important to find out the community's perception about the issue of adolescent pregnancy. If the APN desires the support of the community, the community must be a part of the problem solving process.

Finding 2

Younger black teens, less than age 15, had an 18 percent LBW rate. The relationship between prenatal care and infant birth weight for this population was not significant at the .05 level. This finding would challenge the APN to identify why the younger age group had low birth weight infants which apparently were not significantly related to the amount of prenatal care received. One reason for increased LBW is probably related to the growing teens need for increased nutrients which competes with nutritional needs for the fetus. Another reason may be related to the under developed uterus. The uterus does not finish growing until age 17-18.

In the younger age group the APN needs to focus on education related to the changing body, nutrition, and pregnancy prevention. The APN could facilitate a peer education group or act as a consultant for classroom instruction related to normal growth and development, peer relationships, and sexuality. One reason peer education is a valuable strategy at this age is because younger teens act in ways which emulate older teens.

Though amount of prenatal care does not significantly impact infant birth weight in this age group, it is still important because it is through prenatal care that the pregnant teens health status can be monitored. Many teens this age delay entry into care because they do not know they are pregnant. They are unable to understand cause and effect in terms of the possibility of being pregnant. This inability to understand cause and effect and the fact that young teens often have irregular menstrual cycles leads to denial of the pregnancy.

Finding 3

Unexpected were the findings that teens age 15-19 with adequate prenatal care have a higher percentage of LBW infants than those teens ages 15-19 who have inadequate care, though it would appear that teens with adequate care are more likely to have better birth weight outcomes. The increase in LBW among teens receiving adequate prenatal care may be related to increased risk taking associated with substance abuse, sexually transmitted diseases, poor nutrition, increased parity, or some other factor which encourages the highest risk teens to seek care earlier and have more visits. Teens at this age understand cause and effect more than the younger teen, but are unable to understand the long term consequences of their actions in terms of impact on their health or the health of the fetus.

History of substance abuse and poor nutrition affects the health of the teen before she is pregnant which impacts her ability to provide nutrition to the developing fetus. The desire to look thin often interferes with the teens motivation to eat. Substance abuse can cause birth defects and premature labor. Sexually transmitted diseases such as Chlamydia can cause midcycle bleeding delaying the teens entry into care because she does not realize she is pregnant. Other sexually transmitted diseases and bacterial infections such as streptococcus can cause premature rupture of membranes or uterine irritability. All of these factors have implications for changing the content of prenatal care as it is currently delivered.

Once again the APN assesses the pregnant teen in the context of her environment, offers education and anticipatory guidance and collaborates with outside agencies to improve social support. Social programs shown

to impact pregnancy outcome in a positive way are Women, Infants, and Children (WIC) and MSSP.

Pregnancy prevention

Ultimately if teens did not get pregnant, they would not be delivering LBW infants. The APN acts as a consultant to other agencies to provide education and expertise related to sexual risk taking practices of teens. She collaborates with other health care providers, teachers, and community members to identify teens who are at increased risk of pregnancy. The APN counsels teens to determine the level of risk, offers age appropriate information related to developing healthy relationships, decision making, and family planning.

The APN nurse educates other professionals and families about factors which may increase the teens risk of becoming pregnant. Teens often become pregnant as part of the normal desire for autonomy. The more controlling the environment, the greater the risk of the teen becoming pregnant because consciously or unconsciously, pregnancy is something she has control of. The use of contraceptives makes many teens feel sex was planned. Culturally unplanned intercourse is more acceptable than planned intercourse.

Implications for research

Further research could examine geographic pockets which appear to have the most LBW infants by zip code, then determine if there are certain zip codes which are prone to be age specific for LBW. Areas identified with large number of teen births and LBW infants could be targeted for pregnancy prevention or special prenatal care programs to increase access to care.

Further research could compare adolescents in Wayne County, Michigan who attended private physicians, or health department physicians for care and those who attended an office who specialized in adolescent care, or those students whose care was started and monitored by a school based clinic, even though they were referred to an obstetrician for ongoing prenatal care.

If nursing is going to impact infant birth weight, the content of the visit for physical and psychosocial assessment needs to be examined. The APN researcher might analyze the content of the prenatal visit and evaluate the impact of how the content of the visit is delivered on infant birth weight for teens. Further research might measure length of time the adolescent spends communicating with the physician or nurse, or the amount of perceived risk the adolescent acknowledges at the time of the first prenatal visit.

Summary

Rogers concept of life process and unitary human beings describes woman as a function of self and environment and is capable of bringing about a change at any point in time which is unidirectional. Prenatal care which may occur at any point in time has an impact on the Maternal/Fetal Field which influences birth weight.

Literature supports a positive relationship between prenatal care and infant outcome. Risk factors which tend to increase the likelihood of a low birth weight infant are adolescent age and black race. Age alone is not a factor in increasing risk of LBW, however, birth weight is affected by adolescent risk taking behaviors and delayed prenatal care seeking. Some researchers believe infants of black race have a genetic predisposition to be smaller while other researchers believe

race is an indicator of low socioeconomic status and the environment influences birth weight outcomes.

This study supports the premise that increased prenatal care will improve birth weight outcome. It makes no attempt to measure the quality of care received by adolescents in the study. The researcher acknowledges prenatal care is but a vehicle by which nursing process can take place. It is the quality of care provided by the APN using nursing process and expert knowledge that impacts the infant birth weight. Of special concern were the unexpected findings that of all the LBW infants born to teens between the age of 15-19, the teens who received adequate prenatal care had twice as many LBW deliveries as the teens who received inadequate prenatal care. This could be related to increased risk taking in this age group, increased parity, or prenatal which was ineffective in addressing issues which impact LBW.

Advanced practice nurses have the ability to provide quality prenatal care to a population who is at risk for LBW. Through research, education, counseling, evaluating consulting, collaborating, advocating, and managing nurses are able to bring about change which will impact many teens at risk. As a clinician the advanced practice nurse assesses the individual biologically, psychologically, socially and spiritually in her environment and provides anticipatory guidance, education, and counseling.

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List of References

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APPENDIX A

Letter to Michigan Department of Public Health
Bureau of Health Statistics

07/16/92

Office of the State Registrar and Center for Health Statistics
Michigan Department of Public Health
3423 N. Logan/Martin Luther King Jr. Blvd
P.O. Box 30195
Lansing, Michigan 48909

Dear Ms Humphrey

In response to our conversation of earlier today, I am a graduate student at Michigan State University working on my thesis. The purpose of my study is to examine the relationship between adequacy of prenatal care and infant birth weight of infants born to black adolescents in Wayne Co., Mi., for the calendar year 1990. I am using the Kessner Index to define levels of prenatal care as adequate, intermediate, or inadequate. Chi square analyses will be used to describe the significance of the relationship.

Enclosed are three contingencie tables. I need the Chi square calculated for each combination of variables, and also a CR if you have the ability to do son on your soft wear. If there are any questions related to my request or any costs involved for this analyses please let me know.

Thank you for helping me obtain and calculate the data I need to complete my thesis.

Sincerely,

Sandra L. Elliott

Sandra L. Elliott, RNC/BSN
Coordinator/Nurse Practitioner

Home
3719 Hi Dale
Lake Orion, Mi 48360

(313) 391-0114
Fax (313) 678-3133

Work
Pontiac Teen Health Center
300 W. Huron
Pontiac, Mi. 48341

(313) 857-8411
Fax (313) 340-0494

Age and level of prenatal care

birth weight	Adequate <15	Adequate 15-19	Intermediate <15	Intermediate 15-19	Inadequate <15	Inadequate 15-19
>2500 gm						
2500-1500gm						
<1500 gm						

Age and level of prenatal care

birth weight	Adequate 19 and under	Intermediate 19 and under	Inadequate 19 and under
>2500 gm			
2500-1500 gm			
<1500 gm			

Age and level of prenatal care

birth weight	Adequate 19 and under	Intermediate 19 and under	Inadequate 19 and under
>2500 gm			
<2500 gm			

APPENDIX B

Letter of approval for study from UCRIHS

MICHIGAN STATE UNIVERSITY

OFFICE OF VICE PRESIDENT FOR RESEARCH
AND DEAN OF THE GRADUATE SCHOOL

EAST LANSING • MICHIGAN • 48824-1046

July 9, 1992

Sandra L. Elliott
3719 Hi Dale
Lake Orion, MI 48360

RE: RELATIONSHIP OF PRENATAL CARE TO INFANT BIRTH WEIGHT, IRB #92-316

Dear Ms. Elliott:

The above project is exempt from full UCRIHS review. The proposed research protocol has been reviewed by a member of the UCRIHS committee. The rights and welfare of human subjects appear to be protected and you have approval to conduct the research.

You are reminded that UCRIHS approval is valid for one calendar year. If you plan to continue this project beyond one year, please make provisions for obtaining appropriate UCRIHS approval one month prior to July 6, 1993.

Any changes in procedures involving human subjects must be reviewed by UCRIHS prior to initiation of the change. UCRIHS must also be notifed promptly of any problems (unexpected side effects, complaints, etc.) involving human subjects during the course of the work.

Thank you for bringing this project to my attention. If I can be of any future help, please do not hesitate to let me know.

Sincerely,

David E. Wright, Ph.D., Chair
University Committee on Research Involving
Human Subjects (UCRIHS)

DEW/pjm

cc: Dr. Linda Tiedje