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Spontaneous Abortion: Risk Factors Among WIC Participants in Cherokee, North Carolina

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I am submitting herewith a thesis written by Deann Lee Stivers entitled "Spontaneous Abortion: Risk Factors Among WIC Participants in Cherokee, North Carolina." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Anthropology.

<div align="right">Richard L. Jantz, Major Professor</div>

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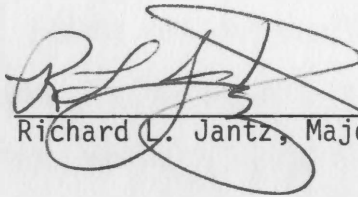<div align="right">Accepted for the Council:
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C.W. Minkel

The Graduate School

SPONTANEOUS ABORTION: RISK FACTORS

AMONG WIC PARTICIPANTS IN

CHEROKEE, NORTH CAROLINA

A Thesis

Presented for the

Master of Arts

Degree

The University of Tennessee, Knoxville

Deann Lee Stivers

June 1984

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ABSTRACT

The purpose of this study was to determine the rate and contributing factors of spontaneous abortion among participants in the Cherokee WIC Program. The data were collected from two sources: WIC Certification Records and personal interviews. The sample (N=500) consisted of both Indian (N=433) and Caucasian (N=67) women who participated in the Cherokee WIC Program from July 1976 to March 1982.

The spontaneous abortion rate for the total population studied is 24.89%, while the national rate of spontaneous abortion reported in the literature ranges from 10% to 20%. The Caucasian participants (N=67) in this study experience a higher rate (40.0%) than the Indian participants (N=433) (22.37%).

A series of common factors among women who had experienced spontaneous abortion were identified by use of Stepwise Logistic Regression and Phi Coefficients. These were substance use/abuse, maternal diet (including caffeine intake, prepregnancy weight, practice of pica), physiological well-being, blood type, menarcheal age, and the occurrence of vaginal infections.

Information obtained from the personal interviews suggest that a coping mechanism for the women who experience spontaneous abortion occurs. This mechanism can be defined as habituation.

The information gained in this study will be incorporated into the education program for WIC participants and used as a basis for establishing the effectiveness of the education program.

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CHAPTER I

INTRODUCTION

Spontaneous abortion is a form of fetal death with causes that remain largely unknown. This research has attempted to identify the rate and risk factors associated with spontaneous abortion for women participating in the Eastern Band of Cherokee WIC Program.

The term miscarriage often is used for spontaneous abortion in non-medical situations. Spontaneous abortion is a form of fetal death of which the medical community has not reached a universally satisfactory definition. In 1950 the Third World Health Assembly defined fetal death as "death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy" (Reid et al. 1972:254). In the same assembly fetal death was divided into three categories (Reid et al. 1972):

1. Early Fetal Death: death occurring at less than 20 weeks.

2. Intermediate Fetal Death: death occurring between 20 and 28 weeks gestation.

3. Late Fetal Death: (stillbirth) death occurring after 28 weeks until 40 weeks.

Williams Obstetrics (Pritchard and MacDonald 1976), an obstetric textbook, defines abortion as the termination of a pregnancy by any means before the fetus is developed to a point it can survive outside the womb. Delts et al. (1977) considers an abortion as the passage of

any fetus whose weight is less than 500 grams. The height associated with this weight is 25 cm (16.5 cm crown-rump length) and occurs anywhere from 20 to 22 weeks gestation. A stillbirth is a fetal death which exceeds these criteria. The actual spontaneous abortion transpires after fetal death, commonly occurring after two weeks.

Medical terminology referring to spontaneous abortion is often confusing. Threatened abortion is characterized by vaginal bleeding or bloody discharge which may or may not be associated with cramps. This occurs during the first half of a pregnancy. One out of five conceptions experience a threatened abortion, and of these approximately one-half will abort the fetus. The rupturing of the membranes and cervical dilation is termed inevitable abortion. An incomplete abortion defines the retention of the placenta, fully or partially, in the uterus. A missed abortion is the prolonged retention (longer than four weeks) of the products of conception after death. A habitual aborter refers to a woman who has had three or more consecutive spontaneous abortion (Hughes 1972; Pritchard and MacDonald 1976; Delts et al. 1977).

The actual incidence of spontaneous abortion is difficult to measure. The literature estimates the incidence of abortion in the United States anywhere from 10% to 20% of conceptions (Reid et al. 1972; Prichard and MacDonald 1976; Kavoussi 1977; Golden et al. 1981; Simpson 1981). Pritchard and MacDonald (1976) explain the range as the failure

to include early, prior to four weeks and therefore unrecognizable abortions. The improvement in methods to detect pregnancy prior to the first missed menstrual period has increased the estimates of known spontaneous abortion in some populations (Brabson 1983).

Several governmental programs have been developed to promote maternal and child health. One of these is the Special Supplemental Food Program for Women, Infants, and Children (WIC).

The WIC program was established as part of the Child Nutrition Act revision of 1972 (Kaufman and Vermeersch 1981) and began in Cherokee, North Carolina, in July 1976. The main office is located in the town of Cherokee where all records and information are kept. Once a month satellite clinics are held at the townships of Snowbird and Tomotla.

The goal of the WIC office in Cherokee is to "promote optimum health among Cherokee women, infants, and children" (Occumma 1983). This goal is met by providing nutritional counseling and supplemental foods. These foods are fortified in extra vitamins, iron, protein, and calcium and include milk, cheese, eggs, iron fortified cereals, peanut butter, fruit juice, infant cereal, infant formula, and infant rice. There are certain health problems among the Cherokee WIC women participants. The problem dealt with in this research is spontaneous abortion and information compiled from the WIC Certification Record will provide a basis for program planning and evaluation.

In the present study several hypotheses were examined:

1. Cherokee WIC participants would have a higher rate of spontaneous abortion than the range reported for the nation.

2. Indian participants in the Cherokee WIC Program would have a higher rate of spontaneous abortion than the national range.

3. Indian participants in the Cherokee WIC Program would have a higher rate of spontaneous abortion than non-Indian particpants.

4. Cherokee WIC participants who had experienced a spontaneous abortion will have certain attitudinal characteristics in common.

5. Cherokee WIC participants who experienced a spontaneous abortion will exhibit common physiological and behavioral traits.

CHAPTER II

REVIEW OF THE LITERATURE

The literature was explored to find the factors that other researchers had identified as being associated with spontaneous abortion. These factors can be categorized in terms of biological influences including age at pregnancy and genetical influences, disease states, sociocultural factors such as substance abuse and environmental influences.

Age of Women

Arakaki and Waxman (1970) stated that the number of congenitally malformed infants rises as maternal age increases. When chromosome abnormalities occur, the age of the mother is usually high. Three autosomal trisomies have a higher incidence in mothers older than 35 years: Trisomy-21 (Down's Syndrome), Trisomy-D_1, and Trisomy-18. Two exceptions are Turner's syndrome and Trisomy-E. Trisomy-E occurs when the mean maternal age is 30.1 years old. Two-thirds of aborted fetuses with Turner's Syndrome (XO sex chromosome formation) occur in women over the age of 25. Conceptions which are afflicted with a chromosome abnormality are often aborted in the first trimester of pregnancy.

Another study (Shami and Sultana 1980) reported that the highest incidence of spontaneous abortion in women occurred within two age ranges, below 18 years of age and in the 31-34 year old age.

Resseque (1974) examined spontaneous abortion and maternal age among Amish women. He found the greatest number of spontaneous abortions occurred after age 35.

Menarcheal Age

Menarcheal age is defined as the age at which women begin regular menstrual cycles (Tanner 1978). Liestol (1980) found a significant relationship between spontaneous abortion and menarcheal age. The general trend of spontaneous abortion rates fell as menarcheal age increased. Women whose menarcheal age was 12 years and younger experienced a spontaneous abortion rate 1.5 to 2 times greater than women whose menarcheal age was 14 years and older.

Birth Control

A number of studies have explored the effects of various birth control methods on spontaneous abortion, although at present the results are inconclusive.

Rothman (1977) examined oral contraceptives in comparison to a variety of other methods and found a spontaneous abortion rate of 0.08 among oral contraceptive users as compared to 0.13 among non-oral contraceptive users. Women using oral contraceptives had fewer stillbirths than those who had used other contraceptive methods.

Janerich (1975) reports that 20.98% of pregnancies among former oral contraceptive users resulted in spontaneous abortion while the

percentage of spontaneous abortion among non-oral contraceptive users was 12.28%.

Kim-Farley et al. (1978) studied the influence of using an intrauterine device (IUD) on spontaneous abortion. No association was found between the duration of the IUD in situ and risk of spontaneous abortion. However, when pregnancy occurs with an IUD in situ, the women's chance of spontaneous abortion increased five fold. IUD wearers are at a greater risk of experiencing a febrile spontaneous abortion. Muller et al. (1981) reported a 43% pregnancy loss rate within 20 weeks after an IUD removal.

Guerrero and Rojas (1975) reported that failures with the rhythm method of birth control are more likely to end in spontaneous abortion of male fetuses due to the increased age of the gamete. It is becoming increasingly clear that additional research concerning the effects of various birth control methods on the outcome of subsequent pregnancies is warranted.

Induced Abortion

An induced abortion is the forced removal of a fetus. The World Health Organization Task Force (WHO) (1979) stated that induced abortion may increase the risk of subsequent spontaneous abortions. Two studies which support the WHO statement are Daling and Emanuel (1975) and the WHO task force's own research (1979). Daling and Emanuel (1975) reported a tenfold increase in second trimester spontaneous abortion of a pregnancy which follows an induced abortion using the dilation and curettage method. According to Levin et al. (1980) and Tupper and Weil

(1962), the risk of spontaneous abortion increased with each induced abortion. The relative risk of fetal death after experiencing two induced abortions was 2.2 times greater than normal. The risk with three or more induced abortions was 8.1 times greater than normal. Tupper and Weil (1962) reported a pregnancy survival rate of 27% after three induced abortions.

Levin et al. (1980) cited two reasons for the observed increased risk of spontaneous abortion following an induced abortion:

1. Cervical incompetence. The cervix will automatically dialate at a certain stage in pregnancy.

2. Alterations in the viability of the developing pregnancy possibly by impairing implanation or placentation.

Obel (1980) reported Danish women did not experience an increased risk of spontaneously aborting a pregnancy following a legal induced abortion. A recent study (Kline et al. 1978:297) conducted in Manhattan, New York found that "no increase of spontaneous abortion follows from a previous induced abortion." The medical community recommends a woman wait six months to one year before becoming pregnant again. This reduces the risk of spontaneous abortion (Levin et al. 1980). Clients receiving counseling prior to an induced abortion in a Knoxville, Tennessee health clinic are advised that after four induced abortions the chances of carrying a pregnancy to full term are almost zero (Knoxville Center for Reproductive Health 1982).

Paternal Influence

Resseque (1974) reported on biological aspects of paternal ageing in regard to accumulation of mutations associated with the outcome of a pregnancy. Three other investigations have verified and explained Resseque's findings. Stenchever et al. (1977) found that normal chromosome sperm may be selected over sperm with balanced translocation. However, chromosome morphology is not a factor in the fertilization rate of the egg. The egg has some chance to be fertilized regardless of the chromosome morphology.

Homonnae et al. (1980) stated that sperm quality was not responsible for any of the spontaneous abortions occurring in their study group. Weathersbee (1980) found the most common causative element in malformed sperm was chemical injury. This chemical injury can occur from exposure to mutagenic substances in the workplace, community, or home.

Substance Use

Alcohol. Strong evidence supports the statement "alcohol may harm (the fetus) even when taken in moderation" (Harlap and Shino 1980:175). Fetal development appears to be extremely sensitive to alcohol throughout the first and second trimester. The most frequent manifestation of this sensitivity is spontaneous abortion (Kline et al. 1980). Kline et al. (1980) stated that to harm a fetus or cause an abortion, a large amount of alcohol is not required. A dosage of one ounce of absolute alcohol, twice a week, is enough to cause harm and

even death to the fetus. This association with spontaneous abortion increased with more frequent drinking.

During the first trimester the risk of spontaneous abortion increased with the amount of alcohol intake. Harlap and Shino (1980) found the risk of spontaneous abortion to be equal for non-drinkers and occasional drinkers. The risk factor for women who consumed one to two drinks daily was 1.15 and for those who consumed three or more drinks per day the risk factor increased slightly to 1.16.

Most spontaneous abortions among pregnant women who consume one or more alcoholic drinks a day occur during the second trimester. Consumption of three or more alcoholic drinks daily (Mean = 3.53) was associated with the greatest risk of spontaneous abortion. On the other hand, there was little difference between occasional drinkers and non-drinkers of alcohol.

Drinking alcohol can cause a spontaneous abortion by acting in one of three ways: as a teratogen, an abortifacient, or a fetotoxin. If alcohol acts as teratogen, then one would see abortions early in gestation when malformations occur. An abortifacient can induce labor. Therefore if alcohol acts as an abortifacient, abortions might occur shortly after alcohol intake. The most plausible of these mechanisms is that alcohol causes a spontaneous abortion as a fetotoxin (fetal poison). Consumption of alcohol increases the exposure of the fetus to alcohol, thereby increasing the risk of death.

Tobacco Use. Like alcohol consumption, tobacco use also increases the risk of spontaneous abortion of chromosomally and morphologically

normal conceptions (Kline et al. 1977). Although this discussion will deal specifically with cigarette smoking, tobacco is also used in the forms of chewing tobacco, skoal, snuff, cigar smoking, and pipe smoking by women in the Cherokee community.

For a smoker, the risk of spontaneous abortion is 1.01 times greater in the first trimester and 1.21 times greater in the second trimester than the non-smoker (Harlap and Shino 1980). The number of cigarettes smoked daily had an effect on the risk of a spontaneous abortion in the second trimester. For a woman smoking two packs a day the risk increases from 1.13 to 2.02. Himmelberger et al. (1978) found that there is an increase in the spontaneous abortion rate in every age group for the smoker as compared to the non-smoker.

Harlap and Shino (1980) examined the combined effect of cigarette smoking and alcohol intake in second trimester spontaneous abortion. Regular drinkers who smoke, regardless of the amount, have a higher incidence of spontaneous abortion than those who do not.

Parasites

Mahajan et al. (1976) and Chowdhry and Kamalan (1970) found a significantly higher incidence of spontaneous abortion in women with positive antitoxoplasma antibodies compared to those with negative results. The reason as to this is unknown, however, both authors reported that taxoplasmoses should be considered one of the etiological factors, especially in women with three or more spontaneous abortions.

Reproductive Tract Disorders

Endometriosis is a disease in which displaced uterine tissue builds up in the uterus, fallopian tubes, ovaries, and in the vagina. This condition can lead to sterility. Endometriosis patients suffer a 46% spontaneous abortion rate. Corrective surgery can reduce this rate to 8% (Naples et al. 1981).

The position and shape of the uterus play a role in the duration of the pregnancy. Pritchard and MacDonald (1976) reported that the incarceration of a retroverted uterus can cause a spontaneous abortion at approximately the fourth month of gestation. This situation was rare, occurring in approximately one in 5,000 pregnancies. If the problem is corrected, spontaneous abortion can be avoided. Reid et al. (1972) reported that spontaneous abortions occur in slightly greater frequencies in women whose uterus is retroverted as compared to women with anterverted uteruses.

Diabetes Mellitus

There are three types of diabetes: insulin dependent (Type I) diabetes, non-insulin dependent (Type II) diabetes, and gestational diabetes. Pregnant women who have any of the three types of diabetes mellitus are at a higher risk for complications during pregnancy. Complications for the women include early spontaneous labor, greater chance of needing cesarean section delivery, and placement of infant in intensive care nursery, possibly causing problems with parent-infant bonding. The infant also experiences complications which included high

birth weight, increased risk of death, and an adverse effect on intelligence by age 5 as measured by the Intelligent Quota test (Mintz et al. 1978, Soler et al. 1979, Iyer 1980, Hollingsworth and Grundy 1982).

Herpes Simplex II

Naib et al. (1970) report a significantly higher spontaneous abortion rate in pregnant women with genital outbreaks of Herpes Simplex II, especially if the woman is under 18 years old. Percentages of spontaneous abortion and the detection of Herpes Simplex II are presented in Table 1.

TABLE 1. Percent of Spontaneous Abortion and Time of Detection of Herpes Simplex II (HSII) (After: Niab et al.:1970)

Pregnancy Occurring:	Percentage
Prior to HSII detection	10.8
During HSII detection	9.9
After HSII detection	33.3
Without HSII detection	9.4

Surgery

Brodsky and associates (1980) reported on the effects of anesthetics and the combination of surgery and anesthetics on spontaneous abortion. Although surgery during pregnancy was associated with spontaneous abortion, the researchers found that women who inhale

anesthetics due to their occupation, such as dentists and dental assistants, have an increased risk of spontaneous abortion. If a woman in one of the above occupations undergoes surgery during the first and second trimester the risk is three times greater than a control group of women with no occupational exposure.

The procedure of amniocentesis and its effects on spontaneous abortion has been studied by two researchers. Bennett (1978) concluded that amniocentesis increased the risk of spontaneous abortion, with the finding that 1 out of 10 pregnancies in which amniocentesis occurs will result in a fetal loss. Carter (1976) reported a lower risk of spontaneous abortion than Bennett. Carter stated that the occurrence of spontaneous abortion is probably not greater than 0.5%.

Gamete Age

The age of the egg and sperm may influence a spontaneous abortion. Conceptions which occur four days before the rise of basal body temperature and two to three days after the change are at an increased risk of spontaneous abortion. This can be offered as an explanation of the preponderance for male fetuses being aborted since the sex ratio is heavily weighted toward males being conceived during the above time periods (Guerrero and Rojas 1975; Pritchard and MacDonald 1976).

Chromosome Abnormalities

Of the spontaneous abortions which occur during the first trimester (1-12 weeks) approximately 60% are due to chromosome abnormality (Burrow and Ferrie 1975; Pritchard and MacDonald 1976; Golden et al. 1981). The chances of an abortion being due to chromosome abnormality decrease by

the fourth month (Pritchard and MacDonald 1976). Weathersbee (1980:316) reported the top four cytogenetic malformations occurring in spontaneous aborted fetus were:

1. 52% trisomy
2. 20% triploidy
3. 15% monosomy
4. 3.8% structural

McConnell and Carr (1975) pointed out that it is useful to the parents to know what genetic abnormalities occur in the aborted fetus so that corrective measures can be made.

Mental Health

There are few studies that deal with the role of mental health in spontaneous abortion. Tupper and Weil (1962:422) state that two personality types are prone to abort:

1. The basically immature women who can not accept the outstanding responsibility of mature feminity.
2. The independent frustrated woman who has been conditioned to and yearns for the rewards of the male world and feels that maternity, the greatest reward of the female world is much less satisfying--in fact, unsatisfying.

Michel-Wolfromn (1980) reported that there is no proof of a purely psychological cause for spontaneous abortion; however, Tupper and Weil (1962) stated that women who are subjected to undue emotional stress are candidates for a spontaneous abortion. They also identified three actions that can cause undue emotional stress:

1. An absent husband.

2. A lack of interest in the woman and her pregnancy by her husband.

3. A lack of interest by family members, friends, and doctor.

In the same report the authors interpreted their evidence to mean that emotional factors play an important role in spontaneous abortion (Tupper and Weil 1962).

Janerich et al. (1981) reported an excessive number of spontaneous abortions occurred in one city affected by a flood. The increased abortion rate occured the year after the flood. Substantial psychological stress is offered by the authors as a possible reason for this rate increase.

Environment

Environmental influences can play a role in spontaneous abortion. Kavoussi (1977) reported a higher incidence in the rate of spontaneous abortion in industrial workers in Iran as compared to non-industrial workers. The spontaneous abortion rate for industrial workers was 12%, as compared to a rate of 8% for non-industrial workers. Exposure to chemicals and/or stress in the work place may be contributing factors. In Love Canal, New York, site of underground disposal of toxic chemicals, a spontaneous abortion rate of 50% was reported during the period of 1958 to 1960. By 1970 the local rate had fallen to the expected rate (15%). The rate decrease suggests that the cause had disappeared.

The interrelationships of mental health and physicological health are complex and have not been thoroughly investigated. Further research

on the role of the woman's mental health and spontaneous abortion could provide a better understanding of spontaneous abortion and its prevention.

In summary, the causes of spontaneous abortion are numerous. The causes can be broadly categorized into physiologically, psychologically, and/or environmentally related factors, and these may be of single or multiple origin. These factors may act independently of each other or be synergistic in nature. For instance, a 35 year old woman who drinks, smokes, and who is having marital difficulties may be at a greater risk of a spontaneous abortion than a 20 year old woman who has all of the same problems mentioned above. A 35 year old woman in good health who does not drink or smoke but is having marital problems may carry a pregnancy to full term. Many of the studies took into account only one or two factors which influence a spontaneous abortion and did not recognize the possibility of a synergistic effect.

CHAPTER III

RESEARCH SITE, SAMPLE FORMATION, AND METHODOLOGY

The Research Site

At the time of White contact the largest tribe in the Southeast was the Cherokee, with an estimated population of 20,000 (French and Hornbuckle 1981). The Cherokee occupied thousands of acres in what is now eight states. Today, the Eastern Band of Cherokee Indians occupy 56,500 acres that are held in federal trust. This acreage is divided into four areas (Plate 1). The largest area is Qualla Boundary. Other areas are Snowbird, Tomotla, and the 3200 Acre Tract.

The Qualla Boundary is commonly referred to as Cherokee. All federal and tribal governmental offices are located on the Qualla Boundary, along with the tourist district. Snowbird is near Robbinsville, North Carolina in Graham County, approximately 60 miles from Qualla Boundary. This community is considered more traditional in their beliefs and language (French and Hornbuckle, 1981). Tomotla, (80 miles from Qualla Boundary) is located outside the town of Murphy, North Carolina in Cherokee County and is commonly referred to as Murphy. The 3200 Acre Tract is located on the boundary of the Nantahala National Forest. Deeded land separates the 3200 Acre Tract from the Qualla Boundary (French and Hornbuckle 1981).

Governmental Agencies

There are numerous federal and tribal agencies that serve the Eastern Band of Cherokee Indians. The Emergency Ambulance Service, the Otitis Media Program, and the Fish and Wildlife program are a few of the many programs the tribal government administrates. The Bureau of Indian Affairs supervises the school system. The hospital is under the control of the Indian Health Service which is a division of the Public Health Service. The United States Department of Agriculture operates the Commodity Food Program, the Food Stamp Program, and the Special Supplemental Food Program for Women, Infants, and Children (WIC).

Study Sample

The population for this study was comprised of women participants (from July 1976 through March 1982) in the Cherokee WIC Program (Human Subject Authorization No. CRP #1376). It is estimated that of all pregnant women in Cherokee, 95% participate in the Cherokee WIC Program (Oocumma 1983). The sample was comprised of Indian women (N=433) who are enrolled members of the Eastern Band of Cherokee Indians and Caucasian women (N=67) whose husbands are an enrolled member of the Eastern Band of Cherokee Indians. Ten percent of the study sample were (100%) full blood Cherokee inheritance. Twenty percent were over ½ Cherokee inheritance. An equal proportion of women have a blood degree between ¼ and ½. The age of the women at the beginning of their WIC participation ranges from 12 to 40 years (Driscoll 1982). The number of pregnancies ranges from 1 to 10.

Data Collection

Data for this analysis were obtained from the WIC Certification Records and personal interviews with WIC participants.

WIC Certification Record. The WIC Certification Record (Appendix A) provided information on height, prepregnancy weight, hematocrit, presence or absence of adequate diet, diabetes, and substance abuse. This information was available for all members of the study population. Complete information including blood types and obstetrical history was obtained for 163 women.

Personal Interviews. During August 1982, personal interviews were conducted with 100 women who were either current WIC participants or former WIC clients. To comply with Human Subjects regulations, each woman was assured of the confidentiality of her responses. The former WIC clients were interviewed in their homes or work place. A part time WIC employee accompanied the researcher on the interviews conducted outside the WIC office.

The interview format was scheduled with open ended questions (Appendix B). The actual interview required approximately 15 minutes to conduct. The interview schedule contained five sections:

1. Attitudes Regarding WIC.

2. Biographical/Behavioral Data.

3. Pregnancy Related Data.

4. Data on Miscarriage.

5. Reproductive Behavior.

Data Analysis

The quantitative data included such items as Indian inheritance and number of spontaneous abortions (if any). The qualitative data dealt with the personal view of spontaneous abortion and dietary intake information.

Two variables, number of pregnancies and number of spontaneous abortions, were utilized in the determination of the prevalence of spontaneous abortion. The Statistical Analysis System (SAS) was utilized to obtain the rate of spontaneous abortion. This rate was computed by dividing the number of pregnancies into the number of spontaneous abortions for each individual. The spontaneous abortion rate determinations were completed for the total sample and separately for the Indian and White WIC participants.

CHAPTER IV

RESULTS AND DISCUSSION

The researcher hypothesized that Cherokee WIC participants would have a higher rate of spontaneous abortion than the range reported for the nation. The rate of spontaneous abortion for the total sample was 24.89%. Assuming that 15%, or the midpoint of range reported in the literature (Reid et al. 1972; Pritchard and MacDonald 1976; Kavoussi 1977; Golden et al. 1981; Simpson 1981) was a valid comparative figure, the frequency of occurrence of spontaneous abortion in the Cherokee WIC Program was almost twice as high. Seventy-five percent of the women had no abortions and two percent had no successful pregnancies. (Bivariant contingency tables are located in Appendix C.)

The second hypothesis was that Indian participants in the WIC Program would have a higher rate of spontaneous abortion than the national range.

The occurrence of spontaneous abortion for the Indian participants was 22.37%, slightly higher than the upper range for the general population. Seventy-seven percent of the Indian women had no abortions.

The third hypothesis was that Indian participants in the Cherokee WIC Program would have a higher rate of spontaneous abortion than non-Indian WIC participants. This hypothesis proved invalid, however, in that a spontaneous abortion rate of 40% was experienced by the White participants in the WIC program. This is well above the rate for the Indian women, as well as being above the upper range for the general population.

The fourth hypothesis stated that Cherokee WIC participants who experienced a spontaneous abortion will have certain attitudinal characteristics in common. During the personal interviews with 100 women, a series of questions (Part IV of the questionnaire) were asked in order to assess the emic or popular view of spontaneous abortion. The question "What do you think causes a miscarriage?" offered insight into how these women perceived spontaneous abortion. The responses to this question were recorded verbatim and in the case of multiple answers, the order in which the responses were given was recorded. A total of 134 responses to the above mentioned question were given.

The sample was divided into two groups. Group 1 consisted of women who have never had a spontaneous abortion, while Group 2 contained women who had experienced a spontaneous abortion. The direct replies on Part IV question 13 of the survey instrument were grouped by the researcher according to the similarity of the participants' answer, such as emotional, body harm and nutrition (Table 2). A reply of "don't know" or one with similar meaning ("never thought about it") was given by 41% of the women. Only two of these informants gave a second response.

Women who have experienced spontaneous abortion are the only individuals who responded that the cause of the abortion was something that one has no control over. This cause was placed in the omnipotent category. These women never responded that the cause of the abortion was a result of body harm, which they did have control over.

TABLE 2. Responses of Women as to the Cause of a Spontaneous Abortion.

Category	Responses
1. Women's Knowledge	not taking care of yourself lack of knowledge unaware of pregnancy previous experience
2. Substance Abuse	drugs drink pill taking something
3. Emotional	strain stress depression pressure abuse not wanting it
4. Body Harm	accident fall boyfriend beat you
5. Physical Activity	working hard working too hard lifting physical activity exercise doing too much long trip running, jarring
6. Lack of Care of Self	not right care not doing what doctor told you agree with doctor
7. Women's Body	genetics of both parents chemistry of body can't carry it young age history of miscarriage anemic (something) wrong with female body
8. Surgery	teeth pulled

TABLE 2. (continued)

Category	Responses
9. Fetus	abnormal pregnancy genetics blighted pregnancy forming wrong
10. Nutrition	poor nutrition not eating right
11. Omnipotent	wasn't meant to be nature's way God's will
12. Catch All	anything different things
13. Don't Know	don't know never thought about it

The women who have not experienced spontaneous abortion tended to blame the woman for the abortion. For example, the non-aborters were the only individuals with an answer that fit into the woman's body category. Also, a greater percentage of non-aborters gave replies that fitted in the woman's knowledge and substance abuse categories than aborters (Table 3). A clear difference of opinion on causaulity of spontaneous abortion exists between non-aborters and those women who have experienced spontaneous abortion except for the response "don't know" (category 13).

The final hypothesis examined stated that Cherokee WIC participants who had experienced a spontaneous abortion will exhibit common physiological and behavioral traits.

A total of 54 study variables were derived from the data obtained from the information sources and confirmed in the literature and by local health professionals. The variables were recorded on three principal scales of measurement: nominal, interval, and ratio. To assess which factors might most significantly contribute to spontaneous abortion, two statistical methods were used: Stepwise Logistic Regression Analyses and Phi Coefficients.

Stepwise Logistical Regression. In order to fully utilize the information content of the variables, the Stepwise Logistic Regression Program PLR of the BMDP Statistical Software Package (Engleman 1979) was used to predict the probability of the occurrence of a spontaneous abortion given specific variable combinations. This program can use variables measured categorically, as well as variables treated on

TABLE 3. Frequencies of Responses.

Category	Spontaneous Aborters		Non-Aborters	
	#	%	#	%
1. Women's Knowledge	3	9	8	10
2. Substance Abuse	2	6	6	7.5
3. Emotional	3	9	4	5
4. Body Harm	0	0	2	2.5
5. Physical Activity	4	12	6	7.5
6. Lack of Care of Self	3	9	8	10
7. Women's Body	0	0	7	8
8. Surgery	1	13	0	0
9. Fetus	2	6	3	3.7
10. Nutrition	2	6	1	1.2
11. Omnipotent	3	9	0	0
12. Catch All	0	0	1	1.2
13. Don't Know	7	22	33	41

interval or ratio scales as independent variables. Stated simply, the logistic regression program generates a model consisting of a log-linear combination of independent variables that will predict the probability of a spontaneous abortion occurring. Another valuable feature of the logistical regression procedure, like discriminant analysis, unknown cases can be classified utilizing the beta coefficients of the models

generated. For more detailed discussion of logistic regression see Cox (1974), Bishop et al. (1976), and Press and Wilson (1978). The linear logistic model is:

$$P_i = \frac{e^{\alpha + \underline{\beta} \underline{x}}}{1 + e^{\alpha + \underline{\beta} \underline{x}}}$$

Logistic regression has been successfully used in studies similar to that conducted here (Press and Wilson 1978). Truett, Cornfield, and Kannell (1967) have utilized logistic regression in predicting the risk of coronary heart disease.

Phi Coefficients. In order to assess the bivariate interactions of all the study variables Phi coefficients (Nie et al. 1975) were generated by converting interval and ratio scale variables into binary categories; for example the hematocrit (HCT) value was converted into binary scale by splitting the values at the point where anemia is defined (i.e. less than 34%).

Approximately 15 models were generated using the Stepwise Logistic Regression. The three indices presented below represent the highest predictive power. Each one differs in respect to variables used or data source utilized.

Model I (Table 4) was identified by submitting all 54 variables obtained on the subsample of 100 for which personal interviews were conducted and contained 10 variables in decreasing order of predictive power: number of pregnancies, cigarette use, alcohol use, age at menarche, number of induced abortions, caffeine intake within 24 hours,

TABLE 4. Preliminary Models for Predicting Spontaneous Abortion.

Model I	Coefficient (β)
Number of Pregnancies	5.02
Cigarette Use	-5.04
Alcohol Use	5.33
Age at Onset of Menses	0.598
Number of Induced Abortions	-6.46
Caffeine Intake Within 24 Hours	0.166
Treatment for Mental Illness	2.13
Hematocrit	0.531
Prepregnancy Weight	-0.623
Pica	-2.09
Constant (α)	33.7

Correct Classification Rate
No Spontaneous Abortion   95%
Spontaneous Abortion   87.5%
Total Correct   93%

Model II	Coefficient (β)
Number of Pregnancies	4.07
Blood Type O	-2.71
Age at Onset of Menses	1.88
Dysmenorrhea	3.37
Cigarette Use	-3.03
Treatment for Mental Illness	2.15
Morning Sickness with Prior Pregnancies	1.21
Constant (α)	-35.1

Correct Classification Rate
No Spontaneous Abortion   90%
Spontaneous Abortion   87.5%
Total Correct   89%

Model III	Coefficient (β)
Dysmenorrhea	3.19
Incidence of Mumps	3.17
Blood Type A	2.14
Degree of Indian Inheritance	7.52
Trichomoniasis	2.21
Alcohol Use	2.97
Constant (α)	-0.152

Correct Classification Rate
No Spontaneous Abortion   87%
Spontaneous Abortion   86%
Total Correct   87%

treatment for mental illness, hematocrit, prepregnancy weight, and practice of pica. This model had a 93% correct classification rate.

Model II (Table 4) uses 7 variables with a correct classification rate of 89%. This was also derived on the subsample of 100 using the data from two sources. The variables and their order of significance are number of pregnancies, blood type O, age at menarche, dysmenorrhea, cigarette use, treatment for mental illness, and morning sickness during pregnancy.

Model III (Table 4) differs from the others in that number of pregnancies was withheld from consideration. It was derived from the WIC records on the sample of 163 women with the most complete records. Six variables were selected: dysmenorrhea, mumps, blood type A, degree of Indian Inheritance, trichomoniasis, and alcohol use. This model has a correct classification rate of 87%.

The variables used represent a wide range of behavior and medical data. All three models contain some type of substance use. Model I contains the best reflection upon the maternal diet in the variables hematocrit, prepregnancy weight, and practice of pica. The presence of treatment for mental illness in two models demonstrates that psychological well-being appears to affect pregnancy outcome.

All blood types were entered into the models, however only blood type A and O were selected out by the computer. As discussed by Lampl and Blumberg (1979) blood type O occurs in high frequencies within American Indian groups. Pollitzer et al. (1962) reported a high frequency of blood type O (0.9458) among the full blooded Eastern Cherokee and among the Indians of mixed blood (0.6810). They found that

the A gene present in the Eastern Cherokee was A_2 as oppsed to A_1 and occurred at a frequency of 0.0182. The occurrence of blood type B and AB was not present until the individual's blood degree was 3/4 or less.

Phi coefficients allowed for trends among all 54 variables to be inspected. A summary of the correlations of variables significant at the 0.05 alpha level is presented in Table 5. Correlations which are significant at the 0.01 level are starred. The matrix of Phi coefficients can be found in Appendix C.

Discussion and Implications

The Cherokee WIC participants experience a higher occurrence of spontaneous abortion (24.8%) than the general population of the United States (10% to 20%). Explanations for this may be as varied as the causes of spontaneous abortion. Alcoholism and substance abuse are recognized problems in the Cherokee community (French and Hornbuckle 1981). Diabetes Type II is prevalent among Cherokees over the age of 45. Further research is obviously needed to elucidate the impact of the genetic tendency toward adult on-set diabetes, and in turn its effect on spontaneous abortions.

The occurrence of an extremely high rate of spontaneous abortion among the White women WIC participants represents a serious problem for health personnel. Two out of every five recognized pregnancies will end in a spontaneous abortion. It is important to note that this finding is only the spontaneous abortion rate for the recognizable pregnancies. Therefore, the rate may possibly be higher due to the number of spontaneous abortions which occur prior to a noticed missed menstrual

TABLE 5.   Summary Phi Coefficient Matrix Relating to
Spontaneous Abortion.

Variable Number	Variable Name	Correlated With
1	Drug Use	33
2	Alcohol Use	3, 24, 42*, 43*
3	Cigarette Use	2, 5, 45*, 46
4	Caesarean Section	---
5	Pica	27, 50
6	Caffeine Intake in 24 Hours	14, 46, 54
7	Induced Abortion	49*
8	Spontaneous Abortion	9, 17, 46
9	Morning Sickness	8, 14, 28*, 42*, 43, 52, 53
10	Family History of Spontaneous Abortion	---
11	Age at Onset of Mesas	47*
12	Birth Control Use	31, 41, 42*, 54
13	Age at Onset of Sexual Relations	24*, 49
14	Inadequate Diet	6, 9, 51*
15	Hematricate 0-33 34	17, 24, 30*, 54
16	Degree of Indian Inheritance	20*, 21*, 34, 48*
17	Blood Group A	8, 20*, 21*, 44, 45, 46, 52*, 54
18	Blood Group B	23, 32*, 41*, 48
19	Blood Group AB	---
20	Blood Group O	16, 21*, 31*, 32*, 33*, 34, 35, 47, 49
21	Rh Factor	16, 17, 26, 31*, 32*, 33*, 34*, 35, 43, 44*, 46, 47*
22	Incidence of Heart Disease	32*, 33* 34, 39*, 40*, 51*
23	Incidence of Diabetes	28*, 41
24	Incidence of Toxemia	2, 13, 15, 26*, 30, 42, 43*
25	Incidence of Phlebitis	---
26	Incidence of Anemia	24*, 27, 28*, 33, 39
27	Incidence of Bladder	5, 26, 31, 32, 33, 45, 48*
28	Incidence of Circulatory	9*, 41, 42
29	Incidence of Flu	---
30	Incidence of Rubella	15, 24, 47, 49*

TABLE 5. (continued)

Variable Number	Variable Name	Correlated With
31	Incidence of Chicken Pox	12, 27, 32, 33*, 34, 41, 46, 47*
32	Incidence of Measles	22*, 27, 31, 33*, 34*, 41, 47
33	Incidence of Mumps	1, 22*, 26, 27, 31*, 32*, 34*, 35
34	Use of Pill	16, 22, 31, 32, 33*, 47, 48*, 49
35	Use of IUD	28*, 33, 39
36	Use of Diaphragm	---
37	Use of Foams/Jellies	---
38	Use of Rhythm	---
39	Use of Prophylactic	22*, 26, 35
40	Use of Other Birth Control Methods	22*, 47, 49*
41	Use of Tubal Ligation	12, 23, 28, 31, 32
42	Alcohol Treatment	2, 9*, 12, 24, 28, 43*, 44*, 45, 49*, 52*
43	Drug Treatment	2, 9, 24, 42*, 45*, 47*
44	Mental Illness Treatment	42, 46*, 52*
45	Cigarette Treatment	3, 27, 42, 43, 46*, 47*
46	Yeast Infection	3, 6, 8, 21, 44, 45, 48, 52*, 54*
47	Trichomoniasis Infection	11*, 21*, 30, 31*, 32, 34, 40, 43*, 45*, 51*
48	Other Infection	16, 20* 27*, 46, 50*
49	Gonorrhea	7*, 13, 30*, 34, 40, 42*
50	Syphillis	5, 48*
51	Herpes Simplex Virus-2	14, 22, 47*
52	Other Sexually Transmitted Disease	9, 42*, 44*, 46*
53	Dysmenorrhea	9, 15, 54*
54	Premenstrual Syndrome	6, 12, 46*, 53*

period. At present, a concrete explanation to account for this difference in rates of spontaneous abortion between White and Indian participants is unavailable. However, future research is planned to investigate this difference. Some possible explanations include the use or non-use of traditional medicine, the former environment of the Caucasian women, or the presence or absence of a support network.

Attitudal data on the cause of spontaneous abortion obtained from the interviews suggest that an adaptive response was occurring among women who have experienced spontaneous abortion. In order to understand the implications of the data discussed above, a brief explanation of adaptation is presented.

Although the actual concept of adaptation is difficult to define, one can recognize ways (domains) in which adaptation occurs. Frisancho (1981:3) recognizes three domains of adaptation: functional, cultural, and genetic. The functional domain is subdivided into three avenues, acclimitization, acclimation, and habituation.

Habituation is defined as the process of making something accustomized. Frisancho (1981:5) considers habituation as the non-physiological response(s) to maintaining homeostasis. This implies a gradual reduction of responses to, and/or perception of repeated stimulation. This stimulation can include normal neural response such as mental or physical pain. Habituation can occur when learning and conditioning are present. This allows the individual to transfer the pain to an entity out of the individual's control. Such entities can be very diverse, ranging from monetary concerns and absent family members to nature, chance, or God.

The form of psychological adaptation occurring among the Cherokee WIC participants who have had a spontaneous abortion appears to be habituation in order to deal with mental pain. Most women who have had a spontaneous abortion are displacing the mental pain on to an entity they have no influence or control over.

The conclusion that this coping mechanism is present can be substantiated by Carole Browner's 1975 study on women who had an induced abortion. In this study, women were grouped into two categories, those who saw the induced abortion as a non-crisis situation and those who saw the abortion as a crisis. Women who were experiencing a crisis reported that the abortion would not occur if other conditions could be met. Two of these conditions included monetary concerns and a supportive father. The women in a crisis situation are coping with the induced abortion by placing the responsibility on something or someone they have no control over. This is similar to women who have experienced a spontaneous abortion in Cherokee, North Carolina.

By combining the information obtained from the Stepwise Logistic Regression Analysis and the Phi Coefficients, contributing factors to spontaneous abortion can be identified.

These factors are both behavioral and biological in origin (Table 4) and include:

1. Substance Use/Abuse: This study confirmed the findings of other researchers pertaining to the effects of tobacco and alcohol use on a fetus (Harlap and Shino 1980; Kline et al. 1977, 1980).

2. Maternal Diet: Three variables associated with the nutritional practices can play a role in spontaneous abortion--caffeine intake, prepregnancy weight, and the practice of pica.

3. Psychological Well-Being: Although Tupper and Weil's (1962) research on personality types of women who had abortions is twenty years old, the present research supports their findings on the importance of psychological well-being among pregnant women.

4. Blood Type: An unexpected factor contributing to spontaneous abortion was the woman's blood type. Both blood types A and O appeared to play a role in a spontaneous abortion. Further research regarding the rate of spontaneous abortion among Indian women with higher degree of blood quantum could aid in explaining this phenomenon since American Indians have a high rate of blood types O and A (Lampl and Blumberg 1979).

5. Menarcheal Age: This research corroborates the study of Liestol (1980) who found that spontaneous abortion rates fell as menarcheal age increased.

6. Occurrence of Vaginal Infections: A recent study (Naib et al. 1970) reported an increase risk of spontaneous abortion among women with Herpes Simplex II. This research shows a correlation between spontaneous abortion and yeast infections ($p = 0.05$). The occurrence of trichomoniasis is a contributing factor in the Predictive Model III.

Summary of Findings

The women who are participating in the Cherokee WIC Program appear to experience a higher rate of spontaneous abortion (24.89) than the

women of the United States as a whole (10% and 20%). Within the population of WIC participants, a difference in rates occurred between White women (40.0%) and Indian women (22.37%). Research to address this difference needs to be conducted.

Future research should also attempt to examine the effect of psychosocial stress on spontaneous abortion. The presence of a coping mechanism and the occurrence of variables which may be related to stress (substance abuse and treatment of mental illness) indicates the importance of considering psychosocial stress as an etiologic factor. Identification of specific stressful situations for pregnant women, and education in the management of such stress, may contribute to healthier mothers and babies.

The analysis presented here suggests that it may be possible to assess the risk of a pregnancy terminating in a spontaneous abortion in a deductive manner. The models presented in Chapter 4 are the preliminary results of a population specific study. Ongoing research is currently planned involving the refinement of the models and testing them upon a different sample of Cherokee WIC participants. Plans are also underway to conduct a similar study on other Indian and non-Indian populations, in rural settings as well as urban.

Despite the preliminary nature of this research, certain conclusions can be drawn:

1. A judicious mixture of data types is needed to predict the probability of spontaneous abortion. The occurrence of spontaneous abortion appears not to be related to just one factor, such as maternal

age or the occurrence of smoking, but instead a syngeristic effect appears to be present. For these women the probability of a pregnancy terminating through a spontaneous abortion increases with the number of variables. Further research could determine the relative importance of the individual variables in relationship to the whole.

2. Certain uncontrollable factors, such as menarche age and previously induced abortions, appear to be related to spontaneous abortion. There are certain factors, however, which can be controlled, such as caffeine intake, substance abuse, and weight. For these factors education programs should be designed to emphasize the importance of diet, good physical and mental health, the restrictive use or abstinence of alcohol, tobacco, and drug products prior to and during pregnancy.

3. The Cherokee WIC participants did have a higher rate of spontaneous abortion (22.37%) than the range reported for the nation (10% to 20%). However, the rate for White participants (40.0%) was higher than that of Indian participants (24.89%). The causes for this difference should be addressed in future research. Since blood type O is more prevalant among American Indians, and was selected out in two of the three models further research is warranted in this area. Other factors that deserve further examination are stress and demographic trends.

Pregnancy is a normal physiological state in which environmental and mental factors can influence the result. Knowledge of these factors in program planning and education will enhance the likelihood of an optimal outcome.

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APPENDICES

Appendix A:

WIC Certification Record

CHEROKEE WIC PROGRAM
CERTIFICATION RECORD

Name _____

Address _____

_____

Phone Number _____

Parent's Name _____

County of Residence _____

Information Recorded by (Name) _____

I.D. Number _____

Date of Birth _____

SEX: ☐ Male   ☐ Female

Ethnic Group: W.B. Am. Ind. O.
(circle)

No. in Household _____

No. Now on WIC _____

CATEGORY: Pregnant ☐

Trimester of Pregnancy ____1____2____3

Expected/Actual Delivery Date _____

Last Delivery Date _____

Prepregnancy Weight _____ lbs.

Postpartum ☐   Breast-Feeding ☐

Infant ☐   Child ☐

Date _____

		Initial	PP	6 mo.	6 mo.	6 mo.	6 mo.	6 mo.	6 mo.	6 mo.	6 mo.
Date of Initial Visit:											
Date Information received:											
	Professional										
	Position										
Height											
Weight											
Hematocrit Anemia	34% or less										
Hemoglobin	11 G or less										
Inadequate diet											
Chronic cond. - Diabetes, GI, Renal, Heart, etc.											
Infant of a breast-feeding mother at nutritional risk or Breast-feeding mother of an infant at risk											
Inborn error of metabolism											
Low Birth Weight	◄ 2500 G or ◄ 5 lbs.										
Unacceptable weight gain or (Excessive weight gain)	◄ 10th percentile or ► 90th percentile										
Unacceptable growth for length or height	◄10th percentile ►90th										
Mental Retardation or infant of alcoholic, mentally retarded, drug addicted mother											
Infant of WIC mother											
Regression in nutritional status											
Abnormal Wt. Pattern	◄ 10% ideal wt. or ► 20% ideal wt.										
Unacceptable gain	◄ 3 lb. month 1st trimester ► 7 lb. month										
High Risk	◄ 18 yr. old ► 35 yr. old										
Previous low birth weight infant											
Miscarriage											
Prematurity											
Still Birth											
Abrupto Placenta											
Multiple Fetus											
Toxemia											
Alcohol, Tobacco Abuse											
Other											
PRIORITY											
CERTIFIED											

INELIGIBLE BECAUSE: WRITTEN NOTICE GIVEN BY:

DATE TERMINATED   WHY:

SIGNATURE   TITLE:

Appendix B:

Interview Schedule

NAME_____ CODE_____

PART I. ATTITUDES REGARDING WIC

HAVE YOU USED WIC FOR ALL YOUR PREGNANCIES   yes   no
WHICH ONES_____

HOW DID YOU FIND OUT ABOUT WIC_____

HAS WIC BEEN OF HELP TO YOU   yes   no
HOW HAS IT HELPED_____
DO YOU HAVE ANY COMPLAINTS REGARDING WIC_____

IF WIC WAS NOT HERE WOULD YOU HAVE GREATER CONCERN WITH YOUR
PREGNANCIES   yes   no

PART II. BIOGRAPHICAL/BEHAVIORAL DATA

MARITAL STATUS   married____ divorced_____ widow____
    single

BIRTHDATE_____

DO YOU WORK OUTSIDE THE HOME   yes   no
WHERE_____
WHAT DO YOU DO_____

DO YOU WORK IN THE GARDEN OR IN THE YARD
HOW OFTEN_____

WHAT ELSE DO YOU DO TO EXCERISE

ARE YOU AROUND ANY HARSH CHEMICALS SUCH AS PESTICIDES
    yes   no
WHAT_____

DO YOU TRY TO EAT A WELL BALANCED DIET   yes   no
WHAT DID YOU EAT YESTERDAY

HAVE YOU EVER DONE DRUGS   yes   no
WHAT KIND_____
HOW OFTEN_____
DID YOU USE ANY OF THESE WHILE PREGNANT_____
HOW OFTEN_____
DURING WHICH PREGNANCY_____

DO YOU DRINK ALCHOL   yes   no
WHAT TYPE DO YOU DRINK   beer   wine   liquor
HOW MUCH DO YOU DRINK DURING A WEEK_____
DID YOU DRINK DURING A PREGNANCY   yes   no
WHAT DID YOU DRINK   beer   wine   liquor
HOW MUCH DID YOU DRINK IN A WEEK_____
WHICH PREGNANCY DID YOU DRINK_____

DO YOU SMOKE CIGARETTES   yes   no
HOW MANY CIGARETTES DO YOU SMOKE A DAY_____
HOW LONG HAVE YOU BEEN SMOKING_____
DID YOU SMOKE AT ONE TIME   yes   no
HOW LONG DID YOU SMOKE BEFORE QUITTING_____
DID YOU SMOKE DURING A PREGNANCY   yes   no
WHICH PREGNANCY_____
HOW MANY CIGARETTES DID YOU SMOKE A DAY_____

PART III. PREGNANCY RELATED DATA

HOW MANY TIMES HAVE YOU BEEN PREGNANT_____
WHAT ARE THE AGE(S) AND SEX OF YOUR CHILD(REN)
male-_____
female-_____

WHAT INSTRUCTIONS DID THE DOCTOR GIVE YOU WHEN YOU WERE
TOLD THAT YOU WERE PREGNANT

HOW WERE EACH OF YOUR CHILDREN DELIVERED

DID YOU EVER HAVE MORNING SICKNESS   yes   no
ON WHICH PREGNANCY_____
HOW LONG DID IT LAST_____

DID YOU CRAVE NON FOOD THINGS SUCH AS STARCH OR CLAY yes   no

HOW MANY CUPS OF COFFEE AND COKES DID YOU DRINK A DAY WHEN
PREGNANT_____

DID YOU TAKE ANY ASPIRIN OR DRUGS FROM THE DRUGSTORE WHEN PREG.
          yes   no
WHAT_____

HAVE YOU EVER HAD AN ABORTION   yes   no
HOW MANY_____
WHEN_____
DO YOU REMEMBER HOW FAR ALONG INTO THE PREGNANCY YOU WERE_____

PART IV. DATA ON MISCARRIAGE

HAVE YOU EVER HAD A MISCARRIAGE   yes   no
HOW MANY_____
WHEN_____
DO YOU REMEMBER HOW FAR ALONG INTO THE PREGNANCY YOUWWERE_____
HOW OLD WERE YOU_____
DID YOU HAVE MORNING SICKNESS WITH THE PREGNANCY THAT WAS
MISCARRIED   yes   no

*DID YOU SENSE ANYTHING WAS WRONG WITH THE PREGNANCY YOU
MISCARRIED   yes   no
WHAT DID YOU SENSE_____

*HOW DID YOU FEEL ABOUT LIFE IN GENERAL AFTER THE MISCARRIAGE

*WERE FAMILY AND FRIENDS SUPPORTIVE   yes   no

*WHAT DID THE DOCTOR TELL YOU ABOUT YOUR MISCARRIAGE AND WHY
IT HAPPENED

WHAT DO YOU THINK CAUSES A MISCARRIAGE

HAS ANYONE IN YOUR FAMILY EVER HAD A MISCARRIAGE
            yes   no   don't know
WHO_____
HOW ARE THEY RELATED TO YOU_____
HOW OLD ARE THEY NOW_____
HOW MANY TIMES HAVE THEY BEEN PREGNANT_____
HOW MANY MISCARRIAGES HAVE THEY HAD_____
WHEN DID THESE HAPPEN_____
WHAT DID THE DOCTOR TELL HER ABOUT THE MISCARRIAGE

HAS ANY OF YOUR FRIENDS EVER HAD A MISCARRIAGE
            yes   no   don't know
WHO_____
HOW OLD ARE THEY NOW_____
HOW MANY TIMES HAVE THEY BEEN PREGNANT_____
HOW MANY MISCARRIAGES HAVE THEY HAD_____
WHEN DID THESE HAPPEN_____
WHAT DID THE DOCTOR TELL HER ABOUT THE MISCARRIAGE AND WHY
IT HAPPENED

PART V. REPRODUCTIVE BEHAVIOR
HOW OLD WERE YOU WHEN YOU BEGAN YOUR PERIOD_____

WOULD YOU DESCRIBE YOUR PERIOD AS REGULAR   yes   no
IF NOT, HOW WOULD YOU DESCRIBE IT_____

DO YOU OR HAVE YOU EVER SUFFERED FROM MENSTRUAL CRAMPS
         yes   no   _____

DO YOU OR HAVE YOU EVER SUFFERED FROM PREMENSTRUAL SYNDROME
         yes   no   _____

WHAT TYPE OF BIRTH CONTROL DO YOU OR HAVE YOU USED
pill _____ iud_____ diaphragm_____
foams/jellies_____ rythm_____
none_____ other_____

WHEN DID YOU BEGIN SEXUAL RELATIONS_____

Appendix C:

Bivariant Contingency Tables

TABLE 6. Bivariant Contingency Table for Total WIC Participants

Number* of Women	Number of Pregnancies	Number of Spontaneous Abortions											Percentage of Spontaneous Abortion
		0	1	2	3	4	5	6	7	8	9	10	
1	10	0	0	0	0	0	0	0	1	0	0	0	100%
1	9	0	0	0	0	1	0	0	0	0	0		100%
2	8	0	0	1	0	1	0	0	0	0			100%
2	7	0	0	1	1	0	0	0	0				100%
5	6	1	2	2	0	0	0	0					80%
14	5	5	2	6	1	0	0						64%
35	4	21	12	1	1	0							40%
96	3	56	33	3	1								40%
165	2	137	28	0									17%
125	1	116	9										7%

* excludes 57 women with incomplete data

TABLE 7. Bivariant Contingency Table for Indian WIC Participants

Number* of Women	Number of Pregnancies	Number of Spontaneous Abortions											Percentage of Spontaneous Abortion
		0	1	2	3	4	5	6	7	8	9	10	
1	10	0	0	0	0	0	0	0	1	0	0	0	100%
1	9	0	0	0	0	1	0	0	0	0	0		100%
1	8	0	0	1	0	0	0	0	0	0			100%
2	7	0	0	1	1	0	0	0	0				100%
4	6	1	2	1	0	0	0	0					75%
12	5	5	2	4	1	0	0						58%
31	4	20	10	1	0	0							35%
75	3	49	24	1	1								35%
148	2	124	24	0									16%
109	1	103	6										6%

* excludes 49 women with incomplete data

TABLE 8. Bivariant Contingency Table for White WIC Participants

Number* of Women	Number of Pregnancies	Number of Spontaneous Abortions									Percentage of Spontaneous Abortions
		0	1	2	3	4	5	6	7	8	
1	8	0	0	0	0	1	0	0	0	0	100%
0	7	0	0	0	0	0	0	0	0		–
1	6	0	0	1	0	0	0	0			100%
2	5	0	0	2	0	0	0				100%
4	4	1	2	0	1	0					75%
18	3	7	9	2	0						61%
17	2	13	4	0							24%
16	1	13	3								19%

* excludes 8 women with incomplete data

Appendix D:

Matrix of Phi Coefficients

TABLE 9. Matrix of Phi Coefficients.

Variable names are listed in Table 3.

MAP 1

REGION MAP

ALL LANDS OWNED BY THE EASTERN
BAND OF THE CHEROKEE INDIANS

Plate 1
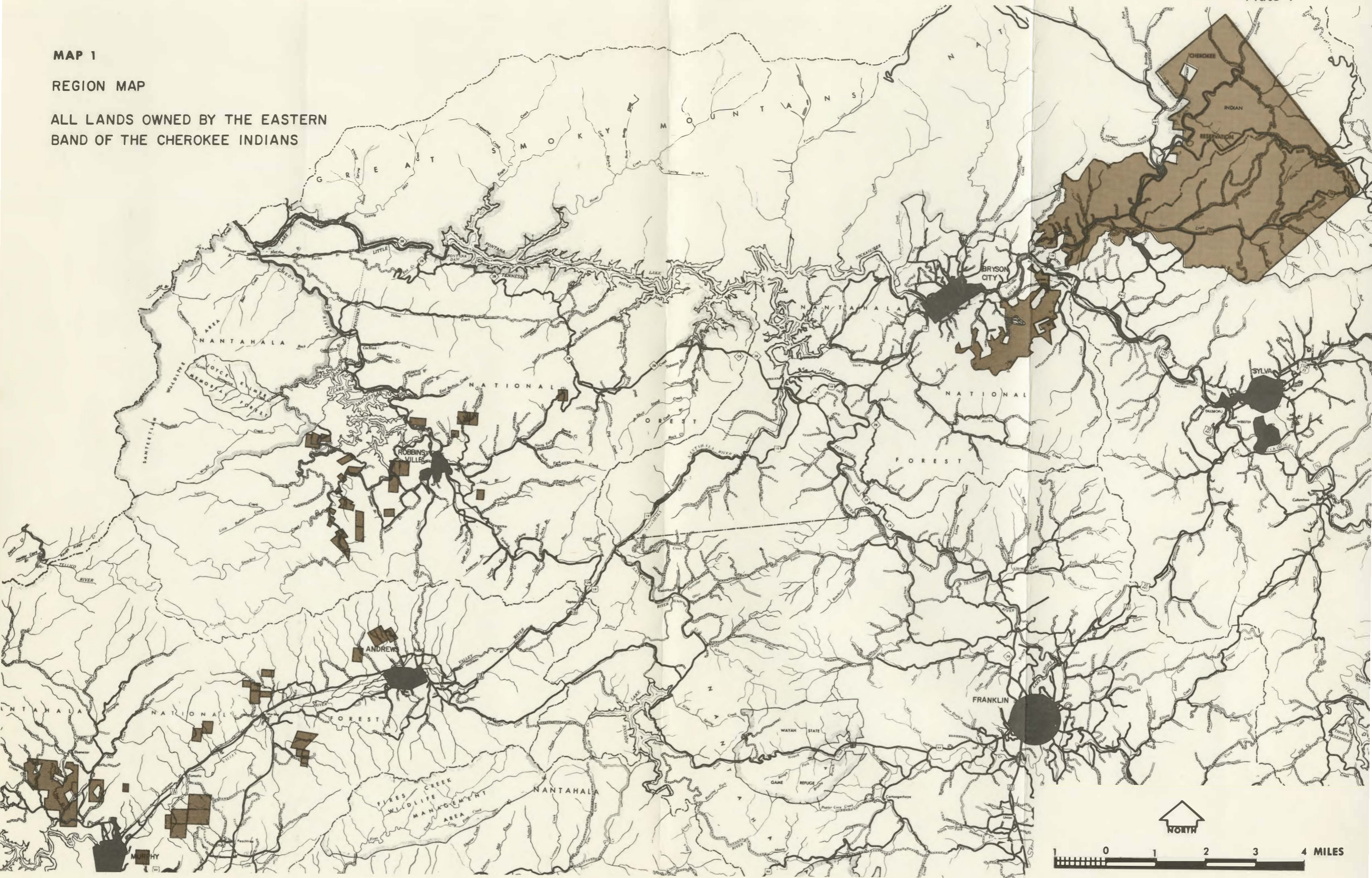
VITA

Deann Lee Stivers was born on July 6, 1960 in Knoxville, Tennessee. She graduated from Halls High School in June 1978. Later in June 1978, she entered The University of Tennessee, Knoxville and in June 1981 received a Bachelor of Arts, majoring in Anthropology.

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