

The Influence Of Work On The Outcome Of Low-Risk Pregnancies

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Abstract: In this study, the relation of white-collar work on the outcomes of low-risk pregnancies was investigated. The medical records of 300 primiparous women whose pregnancy outcomes were known were selected sequentially from prenatal care log books over a 6-month period in three private, group obstetric practices in a university community. The majority of these women worked outside the home and included 220 white-collar workers (73 percent) and 28 blue-collar workers (9 percent). Thirty-four women (11 percent) were homemakers. Within this sample, 197 women (66 percent) met the selection criteria for low-risk pregnancies based on known so-

ciodemographic, medical, and health risk factors. Although the sample numbers were small, comparison of low-risk white-collar workers ($n = 141$) with low-risk homemakers ($n = 24$) showed significant differences for rates of Cesarean section for failure to progress (16 percent versus 0 percent, $P < 0.05$) and a summary index of poor delivery and/or infant outcome (21 percent versus 4 percent, $P < 0.05$). No other adverse outcomes were significantly associated with occupation. This study suggests that increased pregnancy risks may be associated with white-collar work in otherwise low-risk women. (*J Am Bd Fam Pract* 1988; 1:167-74.)

Women's participation in the work force has increased dramatically over the last 2 decades. In 1960, 38 percent of women aged 15 years and greater were gainfully employed.¹ By 1980, 52 percent or more than 40 million American women were working.² Increasing numbers of women are working into as well as throughout their pregnancies. The 1980 National Natality Survey found that 63 percent of married mothers surveyed were working at some time during the 12 months before delivery.¹ For women with no previous children, the figure was 82 percent. Despite these large numbers, few studies have examined the relations between work and pregnancy outcome while controlling adequately for socio-demographic and concurrent medical risks of the mothers.

Occupational Classification

To investigate such relations, it is helpful to define occupational classes. The standard occupational classification system issued by the Office of Fed-

eral Statistics, Policy, and Standards has defined 6 summary classes and 13 major groupings.³ The 6 classes can be further categorized into white-collar and blue-collar occupations. White-collar occupations include: (1) Managerial and Professional Specialty Occupations; and (2) Technical, Sales, and Administrative Supportive Occupations. Blue-collar occupations include the remaining 4 classes: (1) Service Occupations; (2) Farming, Forestry, and Fishing; (3) Precision, Production, Craft, and Repair Occupations; and (4) Operators, Fabricators, and Laborers. These definitions are in keeping with those of Makuc and Lalich.¹ While the effect of a few blue-collar job categories and chemically hazardous occupations on pregnancy has received some attention in the literature, the majority of women in the United States are white-collar workers. The potential health risks and stress factors characteristic of this occupational class of women have not been previously identified in regard to pregnancy outcome.¹

Previous Research

Early studies of employment during pregnancy showed a higher frequency of premature delivery⁴ and low birth weight⁵ among working women. McDonald,⁶ however, identified adverse

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outcomes only within a small sample of women engaged in occupations requiring heavy work. While these studies examined many potential risk factors, they did not control adequately for the health risk factors generally considered to confer "low risk."

Because conflicting results continue to persist among more recent studies, it may be useful to look at the effect of work in those women thought to be low risk. Four of seven large retrospective studies published since 1980, including groups of both white- and blue-collar workers, found adverse effects that included fetal death,⁷ prematurity,⁸ and low birth weight^{9,10} for employed mothers. The remaining three found either no effect of employment;¹¹ a positive effect of fewer premature deliveries for workers;¹² or an overall positive effect for employed women, with the exception of premature deliveries clustered among workers with physically demanding jobs (work hours > 42 hours per week, primarily standing, travel time > 30 minutes).¹³ While these studies controlled for some health risk factors thought to have an independent effect on pregnancy outcomes, no study used a comprehensive definition of low risk. For example, none of the studies described use of alcohol, trimester of first presentation for prenatal care, or history of previous spontaneous abortion. Inadequate control for low medical risk and occupational status were confounding factors that may underlie this series of conflicting results.

Another potential form of confounding in these studies involved the use of homemakers as the comparison group to examine adverse outcomes. Homemakers, as a group, are more frequently at the extremes of age, are likely to have poor obstetric and medical histories, seek prenatal care less often, and are more likely to be recipients of public aid.^{11,12} The present study has eliminated these confounding factors by limiting analysis to white-collar workers and full-time homemakers who met a comprehensive set of criteria for low risk.

Methods

A retrospective chart review was used to identify and describe the occupational and medical characteristics of a presumed low-risk obstetric population. The study tested the hypothesis that white-collar work was associated with poorer pregnancy outcomes for otherwise low-risk women.

The medical records of 300 primiparous women who delivered between January 1, 1984, and Au-

gust 1, 1984, and whose pregnancy outcomes were known were selected sequentially from prenatal care log books in three small, private, group obstetric practices in Ann Arbor, Michigan, a university community with a population of 110,000. The physicians in these practices were board certified, and infants were delivered at a large, private, secondary care center. These practices were selected because of their high proportion of low-risk pregnancies. In addition, care was provided at a single hospital with consequent uniformity in labor and delivery records. The medical records were reviewed for the following information: (1) maternal characteristics, which included sociodemographic information, medical histories, and health habits; and (2) occupational information, which covered job title and description, duration of work during pregnancy, and suspected teratogenic exposure.

Low-Risk Criteria

To investigate the potential effect of occupation on pregnancy outcome, low-risk cases only were selected from the study population for subsequent outcome data analysis. A comprehensive, conservative definition of low risk was used. Women were considered low-risk primiparas if they met the following criteria: (1) aged 21 to 35 years; (2) Caucasian; (3) a maximum of two spontaneous or therapeutic abortions in the past; (4) presentation for prenatal care in the first or early second trimester; (5) no serious medical illnesses (i.e., diabetes, hypertension, cancer, thyroid disease, heart disease); (6) nonsmokers or smoking < 1/2 pack per day; (7) no alcohol or alcohol consumption listed as rare or occasional; (8) no recreational drug use; (9) married; and (10) health insurance other than Medicaid.

Outcome information collected consisted of the following data: (1) pregnancy information: pregnancy complications, type of delivery, and delivery complications (Cesarean sections were recorded as either done for maternal reasons [failure to progress, cephalopelvic disproportion] or for fetal reasons [fetal distress or malpresentation]); and (2) infant outcome: Apgar scores, infant condition, birth weight, and disposition.

Summary Index

To explore any differential effects of work status between low-risk, white-collar workers and

homemakers on infant outcome, an a priori summary index of poor delivery and infant outcome was used. This outcome variable was created because of the expected small numbers in any single outcome category, and it would afford greater sensitivity in detecting negative pregnancy and infant outcomes than any individual outcome measure for this population. The index was scored positive when any one of the following delivery or infant outcomes occurred: spontaneous abortion, gestational age < 35 weeks, stillbirth, neonatal death, birth injury, Apgar 1 minute < 5, birth weight < 2,500 g.

Data Analysis

Maternal subgroups were compared on categorical outcome measures using standard nonparametric chi-square analysis. Continuous outcome measures were analyzed through Student's t-tests.

Results

Maternal Characteristics

The demographic characteristics of the total study population are presented in Table 1. Significant differences emerged between homemakers and workers on several sociodemographic and health history variables before selection for low-risk pregnancy. There were significantly greater numbers of homemakers who were nonwhite and on Medicaid insurance (maximum likelihood chi-square, $P < 0.05$). More white-collar workers than homemakers reported some alcohol use during pregnancy (defined as rare or occasional use and < 7 drinks per week, $P < 0.02$). White-collar workers also had a higher incidence of previous spontaneous abortion (maximum likelihood chi-square, $P < 0.05$).

Among the 300 women in our sample, 197 (66 percent) met all our selection criteria for low-risk pregnancies. The demographic characteristics of low-risk, white-collar workers and full-time homemakers are presented in Table 2. Among low-risk women, health habits and obstetrical history differences between white-collar workers (WCW) and homemakers (H) were significant only for smoking < 1/2 pack per day, which was greater among WCW (maximum likelihood chi-square, $P = 0.05$). A similar trend for ingestion of alcohol during pregnancy was noted among WCW, where a larger percentage of rare or occasional alcohol usage was found (< 7 drinks per

Table 1. Maternal Characteristics of the Total Sample.

| Maternal Characteristics | Homemakers (n = 34) | | White-Collar Workers (n = 220) | |
|----------------------------|------------------------|---------|--------------------------------------|---------|
| | Number | Percent | Number | Percent |
| Age | | | | |
| < 21 | 4 | 12 | 10 | 4.5 |
| 21-35 | 30 | 88 | 208 | 94.5 |
| > 35 | 0 | | 2 | 1 |
| Race | | | | |
| White | 31 | 91 | 217 | 99 |
| Nonwhite | 3 | 9* | 3 | 1 |
| Married | | | | |
| Yes | 33 | 97 | 217 | 99 |
| No | 1 | 3 | 3 | 1 |
| Medicaid | | | | |
| Yes | 1 | 3* | 0 | |
| Other private insurance | 33 | 97 | 220 | 100 |
| Medical illness | | | | |
| Diabetes | 0 | | 1 | 0.5 |
| Hypertension | 0 | | 3 | 1.4 |
| Heart disease | 0 | | 4 | 2 |
| Cancer | 0 | | 1 | 0.5 |
| Renal disease | 0 | | 2 | 1 |
| Thyroid | 1 | 3 | 10 | 4.5 |
| Seizures | 0 | | 5 | 2 |
| Other significant illness | 8 | 24 | 54 | 25 |
| > 30 percent overweight | 3 | 9 | 17 | 8 |
| Health habits | | | | |
| Smoker | 4 | 14 | 25 | 13 |
| Smoker \geq 1/2 pack/day | 0 | | 9 | 5 |
| Unknown smoking history | 5 | | 22 | |
| Alcohol | 10 | 34.5† | 113 | 58.5 |
| Alcohol > 7 drinks/week | 0 | | 6 | 3 |
| Unknown alcohol history | 5 | | 27 | |
| Exercise 3x/week | | | | |
| Yes | 1 | | 17 | |
| No | 0 | | 8 | |
| Information missing | 33 | | 195 | |
| Obstetric/gyn history | | | | |
| Infertility | 4 | 12 | 29 | 13 |
| Past spontaneous abortion | 0 | * | 19 | 9 |
| Past elective abortion | 4 | 12 | 14 | 6 |

* $P < 0.05$ by maximum likelihood chi-square.

† $P < 0.02$ by chi-square test.

Table 2. Maternal Characteristics for the Low-Risk Population.

| Maternal Characteristics | Homemakers (n = 24*) | | White-Collar Workers (n = 141*) | |
|------------------------------|-------------------------|---------|---------------------------------------|---------|
| | Number | Percent | Number | Percent |
| Health habits | | | | |
| Smokers (< ½ pack/day) | 0 | | 14 | 10.8† |
| Unknown smoking history | 5 | | 22 | |
| Alcohol (< 7 drinks/week) | 7 | 35 | 70 | 55 |
| Unknown alcohol history | 5 | | 27 | |
| Obstetric/gyn history | | | | |
| Infertility | 3 | 12.5 | 17 | 12.1 |
| Past spontaneous abortion | 0 | | 9 | 6.5 |
| Past elective abortion | 0 | | 10 | 7.2 |

*The n for homemakers ranges from 20–24 and for WCW from 127–141 due to pregnancies ending in spontaneous abortion and incomplete outcome data available for some of the variables.

† $P < 0.05$ by maximum likelihood chi-square.

week), but it did not reach significance (chi-square, $P = 0.09$).

Occupational categories were divided into white-collar workers and blue-collar workers based on the criteria discussed in the previous section. There were 220 white-collar workers from the total sample of 300 women (72 percent), 28 blue-collar workers (9.3 percent) and 34 homemakers (11.3 percent). The remaining 18 women included 6 who were unemployed, 4 students, 7 workers with unspecified job titles, and 1 for whom this information was missing. Blue-collar occupations and selected white-collar occupational categories were eliminated from the analysis because of potential occupational exposure to ergonomic conditions and teratogenic agents. Specific job categories among WCW are shown in Table 3.

Pregnancy Complications

The rates of complication during pregnancy were similar between full-time homemakers (H) and full-time, white-collar workers (WCW) for low-risk cases ($n = 165$). These included 7 women

who developed pregnancy-induced hypertension (2/24 H and 5/141 WCW), 3 who developed pre-eclampsia (1/24 H and 2/141 WCW), 17 with vaginal bleeding in the first trimester (3/24 H and 14/138 WCW), 14 with bleeding in the second trimester (2/24 H and 12/138 WCW), and 10 women hospitalized during pregnancy (10/138 WCW). There were no cases in either low-risk group of diagnosed gestational diabetes.

Delivery and Infant Outcomes

White-collar workers were more likely to have undergone a Cesarean section delivery for maternal reasons (failure to progress or cephalopelvic disproportion) than were homemakers (16 percent versus 0 percent, $P < 0.05$). The overall Cesarean section rate for these low-risk women was 18.5 percent of which 70 percent were performed for maternal reasons, all among WCW. There were no significant differences in the Cesarean section rates across practice groups. A significant difference between white-collar workers and homemakers was found on the summary index. There was 1 homemaker with poor outcome (4 percent) compared to 30 white-collar workers with poor outcomes (21 percent, $P < 0.05$). There were no significant differences between these low-risk workers and homemakers for delivery complications, which included placental abruption, placenta previa, and prolonged rupture of membranes.

Discussion

The 1980 National Natality Survey found that 82 percent of employed white pregnant women with no previous children work full-time, the majority in white-collar occupations.¹ The current sample is consistent with these population estimates. Further, the majority of working women in this sample were employed in occupations traditionally held by women such as clerical workers, nurses, teachers, salespersons, and bank tellers. These occupations, with the exception of infectious disease concerns among nurses and teachers, have not been previously reported as associated with adverse pregnancy outcomes. The lack of descriptive information on job activities or exposures and the small sample size limit our ability to interpret these findings clearly.

Because a greater proportion of white-collar working women reported the use of cigarettes and

Table 3. Specific Job Categories of Working Women in the Study Population.

| White-Collar Workers' Job Description | Total Cases (n = 300) | | Low-Risk Cases (n = 197) | |
|--|-----------------------|---------|--------------------------|---------|
| | Number of Patients | Percent | Number of Patients | Percent |
| Clerical | 60 | 27 | 41 | 29 |
| Nurses | 39 | 18 | 28 | 20 |
| Teachers | 28 | 13 | 20 | 14 |
| Salesperson/bank teller | 23 | 11 | 15 | 11 |
| Managers | 13 | 6 | 10 | 7 |
| General public service workers | 10 | 4 | 8 | 6 |
| Social workers | 7 | 3 | 4 | 3 |
| Physicians/dentists | 7 | 3 | 5 | 3 |
| Laboratory technologists* | 6 | 3 | — | — |
| Dental hygienists* | 6 | 3 | — | — |
| Computer programmers | 4 | 2 | 3 | 2 |
| Lawyers | 3 | 1 | 1 | 0.7 |
| X-ray technicians* | 3 | 1 | — | — |
| Other | 11 | 5 | 6 | 4 |
| Total | 220 | | 141 | |

*These occupational groups were removed from the low-risk group because of potential occupational exposure to teratogenic agents.

alcohol, these habits may contribute to the higher rate of poor outcomes for this group. While the hazards of smoking, including increased perinatal mortality, spontaneous abortion, and shortened length of gestation were attributed primary to > 1 pack per day smokers, a dose-response relationship has been reported for many of these effects.¹⁴ The trend towards some alcohol use in pregnancy among workers in this study was identical to the 58 percent figure reported from the National Natality Survey for white mothers.¹⁵ While adverse effects including spontaneous abortion,¹⁶ low birth weight,¹⁷ and fetal alcohol syndrome,¹⁸ have been attributed to moderate and heavy drinking before and during pregnancy, there are no known negative effects with consumption of smaller amounts. It is therefore unlikely that alcohol consumption alone was responsible for the differences in outcome between these groups of low-risk women. It is possible, however, that the quantification of smoking and alcohol consumption was underreported and that poor outcomes among WCW may be attributed to these factors. These differences may represent differences in global health behavior, possibly representing a response to the work environment or a difference in prioritizing health concerns among these women. With the small numbers of women in this sample, these data must be viewed cautiously.

Several possible sources of bias exist in the individual components of the summary index. First,

spontaneous abortions in an indeterminate number of women may occur before presentation for prenatal care. While there was no evidence for a selective effect between homemakers and workers, this remains a potential source of bias. Axelson noted that there is a bias in overestimating the prevalence of previous spontaneous abortions among women employed at the time of a study. This is due to continued employment for women experiencing miscarriages compared to women whose pregnancies end in live births.¹⁹ This effect may have been responsible for the significant difference in past history of spontaneous abortion for this population. Finally, the gestational age at delivery was based on maternal dating, with or without ultrasound confirmation, and not newborn maturity rating. While this may decrease the validity of this outcome measure, there was no reason to suspect a differential effect between groups.

Potential adverse effects of occupation can be viewed as originating from physical and/or psychological stress factors. Physical conditions such as prolonged standing,^{8,10} physically hard work,¹³ and hazardous exposures²⁰⁻²³ have been associated with adverse pregnancy outcomes. Although most white-collar jobs are primarily sedentary, two occupations, nursing and sales, often require prolonged standing. Additional analysis of the data with these occupational groups excluded from the white-collar group did not significantly alter the results presented.

Table 4. Delivery and Infant Outcome for Low-Risk Cases.

| Outcome | Homemakers* | | White-Collar Workers* | |
|---|-------------|--------|-----------------------|--------|
| | Percent | Number | Percent | Number |
| Delivery outcome | | | | |
| Spontaneous abortion | 0 | | 6 | |
| Prolonged 1st stage of labor (> 24 hrs) | 0 | | 3 | |
| Prolonged 2nd stage of labor (> 2 hrs) | 12 | | 5 | |
| Type of delivery | | | | |
| Spontaneous vaginal delivery | 75 | 18 | 63 | 87 |
| Forceps | 17 | 4 | 16 | 23 |
| C-section fetal reasons | 8 | 2 | 5 | 7 |
| C-section maternal reasons | 0 | 0† | 16 | 21 |
| Delivery complications | | | | |
| Abruption | 0 | | 1 | |
| Placenta previa | 0 | | 0 | |
| Prolonged rupture of membranes | 0 | | 2 | |
| Infant complications | | | | |
| Fetal distress | 4 | | 4 | |
| Meconium | 21 | | 19 | |
| Infant outcome | | | | |
| Stillbirth | 0 | | 0 | |
| Neonatal death | 0 | | 0 | |
| Malformation | 4 | | 2 | |
| Birth injury | 0 | | 2 | |
| Apgar 1 minute \leq 5 | 4 | | 12 | |
| Apgar 5 minutes \leq 5 | 0 | | 3 | |
| Birth weight < 2500 g | 0 | | 3 | |
| Birth weight > 4090 g | 15 | | 8 | |
| Admission to special care | 4 | | 3 | |
| Summary index of poor delivery and/ or infant outcome‡ | 4 | 24† | 21 | 141 |

*The n for homemakers ranges from 20–24 and for WCW from 119–141 due to pregnancies ending in spontaneous abortion and incomplete outcome data available for some of the variables.

† $P < 0.05$ by chi-square test.

‡Any one of the following: Spontaneous abortion, Gestational age < 35 weeks, Neonatal death, Birth injury, Apgar 1 minute \leq 5, Stillbirth, Birth weight < 2500 g.

The finding of few spontaneous vaginal deliveries among low-risk working women was unexpected, particularly in light of the fact that the mean birth weight among low-risk workers (3,397 g) was slightly less than the mean birth weight for infants of homemakers (3,592 g). Previous investigations focusing on the physical aspects of occupational stress have not reported similar findings. Maternal anxiety has been associated with adverse pregnancy outcome, including poor progress in labor, in several studies.^{24,25} Lederman, et al.²⁶ studied 32 married, normal primigravid women and found self-reported anxiety

significantly associated with higher epinephrine levels and lower uterine contractile activity. It is possible that the Cesarean section rate in this study was related to higher anxiety levels among this set of women workers. It is also possible that physician bias in performing Cesarean sections was in part responsible for these differences. Previous studies have shown a higher Cesarean section rate in private versus government hospitals²⁷ and for reasons of dystocia, the leading indication for primary Cesarean sections, among private versus ward patients.²⁸ The debate continues as to the impact and potential contribution of factors

such as patient demand and economic, legal, or organizational concerns on the increased Cesarean section rate. While there was a significant difference in this study on Cesarean section rates between homemakers and WCW, caution in interpretation of these findings is necessary due to the small sample size.

Physical fitness differences between homemakers and white-collar workers, whose jobs are often sedentary, could be another factor contributing to dysfunctional labor, although few data were available to allow comparison of fitness levels between these groups. A study by Pomerance²⁹ on physical fitness and pregnancy outcome identified an inverse relationship between physical fitness scores and length of labor in multiparas. Insufficient data were available from this retrospective sample to address this issue.

Summary

The results of this study suggest an increased risk of operative delivery and poor outcome associated with white-collar employment among low-risk women. Previous research has not looked exclusively at a low-risk group and has not compared homemakers with white-collar workers. The medical records reviewed for the 300 obstetrical patients include little information on many specific aspects of occupation (including teratogenic exposures) or exercise participation and no information on stress or satisfaction with occupational and personal lives. To infer a direct association of adverse pregnancy outcomes with paid employment, it is necessary to obtain prospective information on stress, psychosocial resources, physical fitness, and changes over the course of the pregnancy. Thus, while provocative, this preliminary investigation points to the need for further study. This study does suggest that the safety of white-collar workers should not be assumed but deserves the same careful investigation that women in more hazardous occupations have received in relation to effect on pregnancy outcome.

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ANNOUNCEMENT

ALL DIPLOMATES OF THE AMERICAN BOARD OF FAMILY PRACTICE *Certified or Recertified in 1982 or 1983*

Pre-application materials for the 1989 Recertification Examination of the American Board of Family Practice are scheduled to be mailed by September 1, 1988.

The pre-application materials must be completed and returned to the American Board of Family Practice by *September 30, 1988*, in order for formal application materials to be produced and mailed to the Diplomate. Deadline for the return of the formal application is *November 30, 1988*.

Diplomates who were last certified or recertified in 1982 are reminded that they must be recertified in 1989 lest they lose their Diplomate status.

Recertification Examination Date — July 14, 1989