

IDENTIFICATION OF FACTORS ASSOCIATED WITH DELAYED ANTENATAL CARE

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Research has shown that women who do not obtain adequate prenatal care significantly reduce their chances of a favorable pregnancy outcome. Because interventions aimed at circumventing unfavorable pregnancy outcomes, such as low birthweight, are most effective during prenatal care, the need to identify socio-demographic characteristics associated with a delay in the onset of such care is reinforced. In this study of 284 women seeking services at selected public clinics in Detroit, regression analysis was used to examine the simultaneous effects of change in income, insurance status, household members, age, and other variables on the prevalence of delayed prenatal care. Delayed care was found to be associated with a lack of insurance and an education of fewer than 12 years. Insurance status and household members (serving as an adjunct indicator of marital status) were found to be important predictors of late entry. Other variables such as age and race appeared to have no influence on the decision to delay care.

There has been much research to support and demonstrate the association between adequate prenatal care and positive pregnancy outcome. Using data obtained from

California's Maternal and Child Health database, Showstack et al.,¹ using multiple regression analysis, found that adequate prenatal care (defined by number of visits compared with length of gestation and month of entry) was associated with an increase in average birthweight. Similarly, Placek,² using data from a 1972 National Natality Survey, showed that the absence of prenatal care was associated with low birthweight. Sokol and colleagues³ published findings resulting from an evaluation of a Title V Maternity and Infant Care Project, operating from Cleveland Metropolitan Hospital (maternity and infant care), that demonstrated 60% less perinatal mortality in the maternity and infant care group when compared with the nonmaternity and infant care group.³

With such strong research supporting the value of comprehensive prenatal care, the question becomes, "Who delays care, and why?" Hutton et al.,⁴ examined sociologic aspects of attenders and nonattenders of antenatal classes given in the National Women's Hospital, Auckland, New Zealand. Although antenatal classes are seen as a valuable asset to the experience of expectant parents, findings from Hutton's study revealed that those individuals who would probably most benefit from such classes (women of low socioeconomic status, educational achievement, and unmarried) were not attending. A study by Simpson and Walker⁵ examining the characteristics of early and late attenders cites general practitioner referrals as one major reason for delayed care, but reported women seeking appointments later than the 20th week of gestation as more likely to be immigrants and of higher parity. Kaliser and Kidd⁶ compared attendance records of low socioeconomic status women attending antenatal clinics in Dublin and found parity,

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TABLE 1. PARTICIPANT CHARACTERISTICS (N=284): IDENTIFICATION OF FACTORS ASSOCIATED WITH DELAYED ANTENATAL CARE

Characteristic	n	Percent*
Age (years)		
15-19	100	37
20-24	92	34
25-29	61	22
30+	20	7
Missing	11	—
Total	284	100
Race/Ethnic Group		
Black	201	73
White	43	16
Hispanic	22	8
Arab	7	2
Native American	2	<1
Other	1	<1
Missing	8	—
Total	284	100
Household Income Within Past 2 Years		
Increased	34	14
Stayed the same	102	43
Decreased	101	43
Missing	47	—
Total	284	100
Work Status Within Past 2 Years		
Self/household member laid off within past 2 years	49	20
No one in household laid off within past 2 years	198	80
Missing	37	—
Total	284	100
Insurance Status		
Insured	151	56
Uninsured	121	44
Missing	12	—
Total	284	100
Education		
College	73	27
High School	69	25
Not finished high school	131	48
Missing	11	—
Total	284	100

*Percent of all nonmissing responses

age, and employment status to explain the highest percentage of variance in the response variables.

The intent of this article is to describe more fully those sociodemographic characteristics predicting an individual's decision to delay prenatal care. This article focuses

on an urban population in Detroit during the recession of the late 1970s and early 1980s. Unemployment figures reached a high of 11% for the state of Michigan and over 14% for Detroit during this period.

This study focuses on low socioeconomic status women, as these are the women who could most benefit from comprehensive antenatal services. For example, since 1981, Detroit women with fewer than five prenatal visits have been losing their infants at a rate of 7 to 10 times greater than women receiving adequate care.⁷

Identifying those characteristics most likely to influence a woman's decision to delay health care during pregnancy can lead to a better understanding of medical care utilization among low socioeconomic groups as a whole. It is the purpose of this article to present findings describing the association between the prevalence of delayed prenatal care and selected variables, some already well documented, and apply these findings to a setting distinguishable by the effects of recession.

METHODS

Women attending seven clinics offering free or low-cost prenatal care in the Detroit area were asked to participate in the study. The Family Primary Care Network (FPCN) is a system of clinics operated by the Detroit Department of Public Health providing preventive, diagnostic, therapeutic, and rehabilitative ambulatory care to Detroit residents and their families. From February 1, 1984 to February 29, 1984, the FPCN served a total of 14,717 clients—a 20% increase over February 1983, and a 30% increase over February 1982. Six of these clinics that offered free or low-cost prenatal care were surveyed for this study. One other clinic, under the auspices of the Mothers, Infants, and Children, Pre-School, School Age, and Adolescent Children program (MIC-PreScad), offered similar services and was also included.

The number of questionnaires to be completed from each clinic to achieve the most representative sample was determined through the examination of the FPCN Ambulatory Care Report for selected months in the years 1982, 1983, and 1984.

The Instrument

The self-administered questionnaire was developed in English and Spanish. After one pretest, the final instrument was distributed by survey assistants to new obstetric patients reporting for outpatient obstetric services in the seven previously mentioned clinics. The instrument was designed for self-administration (with assistance, when necessary, by trained survey assistants)

TABLE 2. PARTICIPATION IN THE PILOT STUDY BY CLINIC COMPARED WITH PROPORTION OF CLIENTS CONTRIBUTED BY EACH CLINIC TO FPCN NEW OB DURING A REPRESENTATIVE 3-MONTH PERIOD

Clinic	Total New Ob Population from FPN		Sample Population	
	n	%	n	%
Herman Kiefer	117	20.0	60	21.1
Northeast	34	6.0	20	7.0
Community Health and Social Service	125	21.0	58	20.4
Eastside	55	8.0	25	8.8
Grace Ross	167	26.0	69	24.3
Bruce Douglas	59	10.0	22	7.7
Beryl Spruce*	30	10.0 (approx)	30	10.6
Total	587	101	284	99.9

*MIC-PreScad clinic

during the data collection phase, November 1984 to February 1985.

Questions were asked concerning age, race, education, household members (a crude estimate of marital status), changes in income, previous health service utilization, previous pregnancies, work status, insurance status, future plans for health care, timeliness of health services sought during current pregnancy, and reasons for any delay in obtaining care regarding current pregnancy. The term “husband/boyfriend” and “intimate” are both used to refer to the same household member category and will be used interchangeably throughout this article.

Selection of Variables

Data analysis was completed in three stages: a univariate analysis to explore the behavior of a single variable in relation to late entry among participants; a multivariate analysis to control for the effect of independent and intervening variables upon one another; and a logistic regression to determine the individual effect of each variable while holding all others constant.

In the first stage, the entire sample of 284 participants was used. An individual was designated as late entry if she had delayed prenatal care beyond the first trimester of her pregnancy. The risk of late entry was computed for each of the responses to the possible indicators. Significance was assessed using chi-square test statistics.

Multilevel contingency tables were used in the second stage of analysis to examine further any confounding or interactive effects among variables. The intent was to determine those variables or combinations of variables to be used in the process of building the logistic regression model. Those variables that emerged from the second stage of analysis as appearing to be logical predictors of

late entry were then used as independent variables in a stepwise logistic regression.

The objective of logistic regression is to examine the individual and joint effects of a set of variables on the risk of disease, in this case late entry.⁸ Variables retained in the logistic regression model as main effects were age and changes in income, household members, and insurance. When variables were highly correlated but had a similar effect on late entry, only one variable was retained in the model; for example, age and education, change in income, and work status. Stepwise regression allows for second-degree interaction terms at baseline in the model, retaining all main effects and then working backward to determine if any second-degree products need to be included in the model. This stage of the analysis was based on a sample of women for whom the data were complete for all independent variables (205 of the 284 participants).

RESULTS

Univariate

A total of 288 women were asked to participate in the study with only four refusing to do so. Of the 284 women participating, 42% had delayed prenatal care beyond the first trimester of pregnancy (late entry). The average age of participants was 22 years, and the majority of these women (73%) were black (Table 1).

To assess the representativeness of the sample, the distribution of participants by clinic was compared with that of the FPCN population. Proportions were comparable, thereby supporting the conclusion that the pilot study sample was a more than adequate representation of the new obstetrics population at FPCN (Table 2).

Insurance status and education were strongly associated with late entry. Persons with no health insurance

TABLE 3. CRUDE ODDS OF LATE ENTRY FOR SELECTED PARTICIPANT CHARACTERISTICS

Variable	No. Late Entry (n)	Percent	OR (95% CI)
Age (years)			
15-19	48 (100)	48	1.13 (0.43, 3.00)
20-24	42 (89)	47	1.09 (0.42, 2.82)
25-29	19(59)	32	0.58(0.21,1.62)
30+*	9 (20)	43	1.00
Education			
Not yet finished high school	68 (131)	52	2.22 (1.21, 4.00)
High school	29 (69)	42	1.49 (0.83, 2.70)
College*	24 (73)	33	1.00
Household Member			
Parent	47 (89)	53	1.33 (0.85, 2.58)
Intimate	27 (69)	39	0.64 (0.30, 1.32)
Alone	21 (60)	35	0.76 (0.37, 1.55)
Other (relative/child)*	27 (59)	46	1.00
Change in Household Income (within past 2 years)			
Increased	15 (34)	44	1.00
Decreased	42 (100)	42	0.92 (0.52, 1.63)
Stayed the same*	43 (100)	43	1.00
Insurance Status			
Uninsured	66 (121)	55	2.19 (1.35, 3.56)
Insured*	54 (150)	36	1.00
Work status (within past 2 years)			
Self/household member laid off	25 (52)	48	1.15 (0.61, 2.14)
No one in household laid off*	27 (59)	46	1.00

*Comparison group

were at more than twice the risk of delayed care than insured individuals (OR = 2.2; 95% CI: 1.35, 3.56). Education was inversely associated with late entry; the largest effect being illustrated by comparison of the two extreme categories: individuals who had not completed high school having slightly over twice the risk of late entry when compared with those women with college experience (OR = 2.22; 95% CI: 1.21, 4.00).

Among household member categories, residing with parents increases the risk of late entry when compared with individuals residing with another relative or child (“other”). Conversely, living with an “intimate” or “alone,” appear to be protective against late entry (OR < 1) when compared with “other”; slightly more for those dwelling with an intimate.

In general, any changes in income within the past two years appear to have minimal effect on the decision to delay care. An increase in income or an income that stayed the same resulted in a calculated odds of late entry = 1; ie, there is no difference between the two groups. A

decrease in income, on the other hand, suggests a protective effect. Similarly, work status was weakly associated with late entry, the risk being slightly greater for those individuals who had experienced the loss of a job either personally or through another household member. The odds of late entry appeared to decrease with each increasing age level, but the 95% CI for these age-specific odds ratios contained 1.

Although age was only weakly associated with late entry, it was found to be an effect modifier for the association between late entry and insurance. Similarly, work status and change in income did little to influence the risk of late entry, but were strong effect modifiers for the association between late entry and insurance (Table 4).

Multivariate

A logistic regression model was created to examine the effect of all variables simultaneously (Table 5). Insurance and the “parents” versus “others” household cate-

gory were significantly associated with late entry when all other variables were held constant. Thus, possession of insurance is inversely related to late entry (multiply “-1” by coefficient) as is a decrease in income and residing with an intimate or alone. Residing with a parent, however, is positively associated with a delay in prenatal care. All of these findings are consistent with those of univariate analysis.

Using these logistic regression parameters and their interactions, the probability of late entry based on an individual’s characteristics is obtained by the following:

$$1 / 1 + \exp (-[\beta_o + \beta_{1x1} + \beta_{2x2} \dots \beta_{ixi} + \text{interactions}]^8)$$

For example, the probability of a 25-year-old, uninsured woman experiencing a reduction in income and living with parents delaying antenatal care beyond the first trimester is 0.84 (Table 6). This probability increases to 0.91 when a woman of the same age experiences an increase or has no change in her income with all other characteristics remaining the same. Compare this with the probability of delayed care for a woman of the same age with same income experience, but with insurance and residing with an intimate: 0.62.

The odds of late entry can also be computed using the following:

$$\exp (\beta_1 (x^* - x) + \beta_2 (x^* - x) \dots \beta_i (x^* - x) + \text{interactions})^8$$

Thus, the odds of late entry for a 25-year-old uninsured woman with an income that increased within the past two years is:

$$\exp(0.4677[2] + 0.12754[2] + 0.22630[4]) = 8.13$$

The odds of this individual delaying care beyond the first trimester are nearly eight times that of an insured woman of the same age, even if her income has increased.

DISCUSSION

The role of insurance coverage in the delay of prenatal care is supported by a clear association between insurance status and the prevalence of late entry within this sample. Further examination suggests that this effect of insurance on late entry can be exacerbated by both work status and change in income; eg, 73% of participants defined as late entry and reporting a decrease in income also reported having no insurance. Similarly, of those late entry participants reporting a lay off, or household

TABLE 4. ASSOCIATION BETWEEN LATE ENTRY AND INSURANCE CONTROLLING FOR AGE, WORK STATUS, CHANGE IN INCOME, AND HOUSEHOLD MEMBER

Confounding Variable	OR	95% CI
Age (years)		
15-19	2.95	(1.30, 6.67)
20-24	2.20	(0.90, 5.36)
25-29	2.65	(0.85, 8.24)
30+*	0.95	(0.13, 6.90)
Work Status (within past 2 years)		
Household member/self		
laid off	4.00	(1.27, 12.55)
No household member/self	1.85	(1.04, 3.28)
laid off		
Income (within past 2 years)		
Increased	0.65	(0.13, 3.31)
Decreased	4.03	(1.72, 9.42)
Stayed the same	2.27	(1.01, 5.08)
Household		
Parents	2.94	(1.24, 6.96)
Intimate	2.32	(0.86, 6.26)
Alone	1.12	(0.34, 3.68)
Other (relative/child)	1.90	(0.65, 5.58)

member being laid off, within the past two years, 64% reported having no insurance. The weak association between these variables and late entry is plausible since a drastic reduction in income qualifies an individual for unemployment compensation or Medicaid (a slightly protective effect against late entry suggested by a reduction in income), and the loss of a job by a sibling or a partner in a two-income household need not lead to a sudden loss of health insurance coverage.⁹

Thus, an individual experiencing a reduction in income because of job loss may have concurrently been forced to relinquish insurance benefits as well. On the other hand, cuts in welfare grants usually do not immediately disqualify one from Medicaid.

Historically, studies have supported maternal age as an adequate predictor of delayed care.⁴⁻⁶ Hutton⁴ similarly found nonattenders of antenatal classes to be young, unmarried, and poor. Kaliser and Kidd⁶ found that the time to first attendance decreased with increasing age in Dublin. A plot of age versus late entry based on univariate proportions is comparable to the conclusions of Hutton and Kaliser, ie, older, married women delay care less frequently.

Although the results and trends suggested by the effects of income, insurance, and household category on late entry are credible, it is unlikely that the strictly

TABLE 5. LOGISTIC REGRESSION PREDICTING LATE ENTRY

Independent Variable	Coefficient	P Value
Age	0.03474	NS
Change in Income (1=increase, -1=decrease)	0.12754	NS
Insurance: (1=no, -1=yes)	0.46776	P<0.005
Household: (all categories compared with "other")		
Parents (1=parent, -1=other)	-2.8346	P<0.05
Intimate (1=intimate, -1=other)	1.8409	NS
Alone (1=alone)	2.2926	NS
Age × Household: (based on above Household categories)		
Parents × age	0.12578	NS
Intimate × age	-0.08057	NS
Alone × age	-0.09007	NS
Change in income × insurance	0.22630	NS
Constant	0.35421	—

TABLE 6. AGE-ADJUSTED PREDICTIVE VALUES BASED ON LOGISTIC REGRESSION PARAMETERS FOR SELECTED VARIABLE COMBINATIONS: IDENTIFICATION OF FACTORS ASSOCIATED WITH DELAYED ANTENATAL CARE

	With Insurance	Without Insurance
Income increased or stayed the same:		
Residing with parents	0.72	0.91
Residing with intimate	0.62	0.87
Residing alone	0.66	0.88
Income decreased:		
Residing with parents	0.76	0.84
Residing with intimate	0.66	0.76
Residing alone	0.71	0.80

linear relationship between increasing age and late entry is a true representation of the effect of this quantitative variable as univariate analysis of late entry by age suggested. (Thus, predictive values and odds of late entry calculated from logistic regression parameters are presented as age-adjusted values. Nonetheless, household category can be used as an adjunct indicator of age as well as marital status, since women living with their parents tend to be young and single. Thus, the increased risk of late entry for individuals residing with parents may, in fact, indicate a decreasing risk with age in addition to a heightened risk for single expectant mothers.

Still, the findings of this study suggest that viable health insurance is more a determinant of whether prenatal care is delayed than is age. With 1982 estimates of Detroit unemployed workers without insurance approx-

imating 66%, it becomes reasonable to assume that visits to primary care physicians are being avoided or put off in an effort to pay mortgage, utility, and food bills.

Although the causal chain of events leading to poor pregnancy outcome may be initiated long before a woman becomes pregnant, it is during prenatal care that possible interventions are most effective in helping to alter the most undesirable circumstances. To quote Dr. John G. Frey in a letter to the *British Medical Journal*¹⁰:

The inadequacies of the US system of medical care are most glaring when health care suddenly becomes a luxury . . . In Britain, hard times produce additional work for physicians caring for patients suffering from the physical and emotional consequences of poverty; in the US, hard times produce doctors with nearly empty waiting rooms.

Acknowledgments

The author gratefully acknowledges the support of the following people in the development of this paper: Dr. Betsy Foxman, University of Michigan; Ms. Terri D. Wright of The Infant Health Promotion Coalition, Detroit Department of Public Health; Mr. Yahya Daoud, Sinai Hospital of Detroit; and Ms. Marilyn Lapadat for expert manuscript preparation. This work was performed as partial fulfillment of the requirements for the degree of Master of Public Health at the University of Michigan, Ann Arbor.

Literature Cited

1. Showstack JA, Budetti PP, Minkler D: Factors associated with birthweight: An exploration of the roles of prenatal care and length of gestation. *AJPH* 1984; 74(9):1003-1008.
2. Placek PH: Maternal and infant health factors associated with low infant birthweight; findings from the 1972 National Natality Survey, in Reed DM, Stanley FJ (eds): *The Epidemiology of Prematurity*. Baltimore, Urban & Schwarzenber, 1977.
3. Sokol RJ, Woolf RB, Rosen MC, et al: Risk, antepartum care, and outcome: Impact of a maternity and infant care project. *Obstet Gynecol* 1980; 56(2):150-158.
4. Hutton JD, Boyle K, Lyman J, et al: Sociological aspects of attenders and non-attenders of antenatal classes. *NZ Med J* 1982; 95:143-145.
5. Simpson H, Walker G: When do pregnant women attend for antenatal care? *Br Med J* 1980; 281(6233):104-107.
6. Kaliser M, Kidd M: Some factors affecting attendance at ante-natal clinics. *Soc Sci Med* 1981; 15D:421-424.
7. Detroit Department of Public Health: Biostatistics and Epidemiology Division. Infant mortality statistics for Detroit health areas, 1981, 1982. Provisional data 1983, 1984.
8. Schlesselman JJ: *Case-Control Studies: Design, Conduct, Analysis*. New York, Oxford University Press, 1982.
9. Brenner MH: Health costs and benefits of economic policy. *Int J Hlth Stud* 1977.
10. Frey JJ: Unemployment and health in the United States. *Br Med J* 1982; 284:1120-1121.