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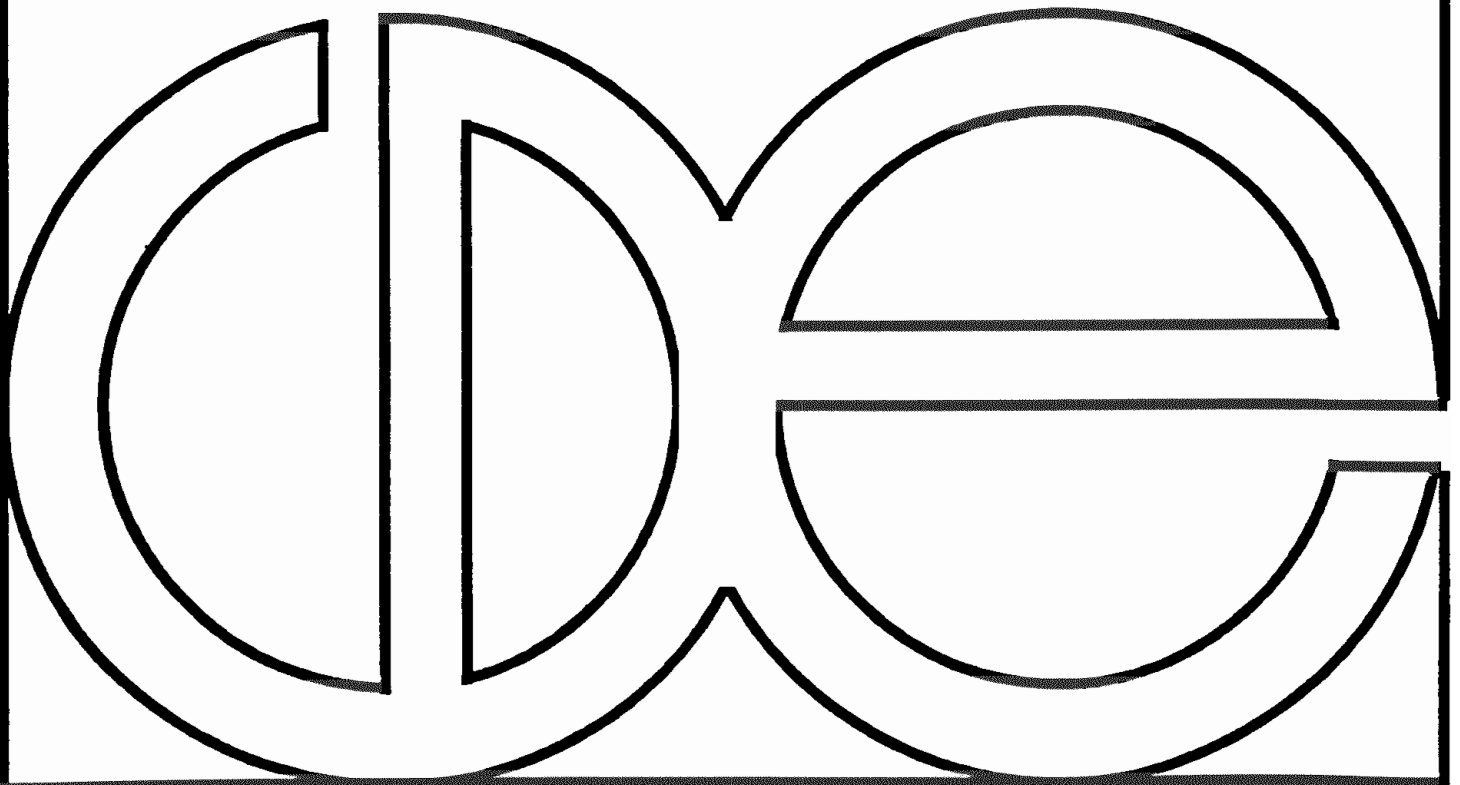
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Nonmetropolitan Mothers: Wisconsin, 1975-1985**

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Trends in Birthing Location Among Nonmetropolitan Mothers: Wisconsin, 1975-1985

Introduction

Rural America is experiencing sweeping change in the delivery of medical services. The tradition of receiving care from one general practitioner who lives in the community is fading. There were once country doctors who cared for generations of townspeople, but such practices are now rare in the United States.

A number of factors have changed the way medical care is delivered in rural areas. The increasing specialization of medical practitioners contrasts with a decline in training for general practice. Very high malpractice insurance costs plus the expense of specialized diagnostic equipment have made it difficult for doctors to stay in business without banding together in larger group practices. Prepaid health systems, such as Health Maintenance Organizations, Preferred Physician Organizations, etc., have sprung up in rural areas as well as in cities during the past two decades, often entering into direct competition with small practices and facilities.

Many surviving private practices and hospitals have prevailed through cutbacks in cost-intensive services such as obstetrics. Some areas have "regionalized" health care, developing large regional medical centers that provide specialized services like cancer treatment, coronary care, and perinatal care, while small local facilities continue providing basic treatment and preventive care. Health costs have soared at every level. Payment of medical bills by third party payers such as insurance companies and governmental health programs is now normative. The cumulative effects of these changes have been reductions both in access to and utilization of local health facilities in rural areas. Such reductions pose serious questions about the quality and future of rural health care. For example, a plethora of evidence indicates the crucial importance

of prenatal care in preventing poor birth outcomes (Hulsey et al., 1991; Institute of Medicine, 1985 and 1988). Because problems with access and availability can constitute formidable barriers to care in rural areas, any trend toward reduced services is of great concern to those who work in the area of prenatal care and childbirth.

On the other hand, Larson, Hart and Rosenblatt (1991) find no direct relationship between rural residence and poor birth outcomes in the state of Washington. Their data show that the incidence of low birthweight and infant death is similar for rural and urban residents, even though rural women are somewhat more likely to have received inadequate prenatal care.

National data indicate that rural areas show higher infant mortality rates than do urban areas, although the gap continues to narrow (NCHS, 1987). More research is needed to spell out the exact nature of the complex and interactive linkages among access to care, prenatal care utilization, and birth outcomes.

Much of the current literature pertaining to rural health focuses on problems of availability (whether services are actually in place) and access (whether persons who need the services are able to utilize them). Regarding availability, the American Hospital Association notes a decline in the number of rural hospitals, especially those having fewer than 50 beds (American Hospital Association, 1978, 1983). Regional studies provide further evidence of the closing of financially vulnerable rural practices and hospitals (Bronstein and Morrisey, 1991; Lawhorne and Zweig, 1989; Taylor, Zweig et al., 1989). Studies have also shown that the rate of hospital closure is inversely proportional to hospital size in both urban and rural areas (Mullner and McNeil, 1986).

The shift to third-party payment of medical bills has also weakened the financial base of smaller hospitals, since the diagnosis-based reimbursement schedules employed by federal and state governments, health maintenance organizations, and many private insurance companies tend

to reduce hospital admissions and shorten the stays of those who are hospitalized (Hein, 1986). In addition, the increasingly competitive business world of contemporary medicine has forced hospitals to make cost-oriented decisions about services like obstetrics, which require a high level of commitment to "stand-by" staff and facilities for an unpredictable and varying demand (Klein, 1986). Bronstein and Morrissey note that rural hospitals are hindered by "aging physical plants, difficulty in hiring and retaining technical staff, lower proportions of private-pay patients, local and regional competition, and perceived (or actual) deficits in quality of care" (1991:88).

The American Medical Association (1986) reports a shortage of gynecologists, obstetricians, and pediatricians in rural areas. Some authors posit the rising cost of malpractice liability insurance and its impact on physician income as key reasons for the shrinking of services by rural practitioners (Koska, 1988; Paxton, 1986; Rostow, Osterweis and Bulger, 1989; Rosenblatt and Detering, 1988; Rosenblatt, 1989). A recent study in Arizona supports a widely held belief that the high cost of malpractice insurance has affected practitioners' willingness to deliver babies (Gordon et al., 1987; Gordon, 1990). The authors estimate that almost one-third of rural practitioners in Arizona have ceased delivering babies since 1982. This is supported by a recent national survey of family physicians, in which about one-third of those respondents who had practiced obstetrics earlier in their careers were no longer doing so at the time of the survey (Kruse et al., 1989).

Regarding the accessability of these services, it is important to note the changing patterns of utilization. Over time, the American public in both rural and urban areas has become much more sophisticated and knowledgeable about the range of medical services available. As health care has become more corporate, individuals have grown increasingly aware of their options in choosing a medical approach to meet their needs, taking into account personal style,

specializations available, and practice location.

The decisions that rural residents make play a part in the deterioration of access as well. Bronstein and Morrisey (1991) contend that patient decisions to bypass local rural facilities contribute to the explanation of rural hospital failures. Their study of hospital use patterns in Alabama from 1983 to 1988 shows an increasing tendency among pregnant rural women to bypass local maternity facilities, often in favor of those located in metropolitan areas. Their data suggest that patient decisions are crucial to the survival or demise of rural hospital maternity services.

Much scholarly attention has been drawn to the interplay among hospital availability, travel distance and patient utilization. For some, distance serves as a measure of access, and is modeled as an independent variable which explains such utilization behavior as the frequency of physician visits (McGuirk and Porell, 1984; Shannon, Skinner and Bashshur, 1973). Others model travel distance itself as a dependent variable; for example, Mayer (1983) found that specific diagnosis as well as recommended diagnostic and treatment procedures explained much of the distance variation in his data.

In an approach which combines these two possibilities, Bronstein and Morrisey (1990) show that the distance travelled by pregnant women seeking obstetric care in rural Alabama increased somewhat over a five-year period in which 23 rural hospitals stopped providing obstetrics services. Issues of access and availability alone were found to be insufficient in explaining patient decisions. They hypothesize that public perception of hospital quality, convenience, and cost may influence many patient decisions, and that women with resources (such as cars and insurance coverage) have greater latitude in deciding to bypass local facilities in favor of more distant hospitals often located in metropolitan areas.

Present Study

This research focuses on obstetrics and birthing, an area of care which has undergone rigorous change in rural areas. Using data from birth records for the state of Wisconsin for the years 1975, 1980 and 1985, we analyze changes in expectant mothers' utilization of hospitals located outside their counties of residence. We know that prenatal care and birthing comprise a health care process that occurs over an extended period in a woman's life and may be subject to a great deal of thought and planning. Building on the implications of Bronstein and Morrisey's findings, we propose that the analysis of utilization in this context requires a complex model which takes into account not only factors of travel distance but also individual characteristics, special medical needs, and aspects of the social and health care systems in rural areas.

Aday and Andersen (1975) propose that individuals' utilization behavior is determined by three different sets of factors which they label predisposing, enabling, and need. In addition to illness or symptoms of illness (need factors), Aday and Andersen argue, the decision to seek care is an outcome of predisposing socio-demographic characteristics such as age, marital status, education and gender, and enabling factors such as health insurance and access to physicians.

This model has been utilized in many previous studies of utilization patterns. In one case with similarities to our own, Kurz and Wolinsky (1985) used the Aday-Andersen model to analyze whether it was the patient or the practitioner who decided which hospital to utilize. Through interviews with patients, they found that patient perception of who made the decision was predicted by three groups of variables corresponding to the "predisposing," "enabling," and "need" categories. They found that some predisposing patient characteristics were related to their role as decision-maker in selecting a hospital. They were more likely to be young, single, and

mobile, and were more susceptible to hospital advertising. But a need variable, the reason for the episode (e.g., inpatient or outpatient care, emergency room, inpatient medical or surgical care, obstetrics, etc.) also was strongly related to the patient making the decision. Emergency care, outpatient care and obstetrics (in that order) were most highly related to patients rather than physicians choosing the hospital (Kurz and Wolinsky, 1985).

In the present study, we are concerned not so much with who makes the hospital decision; rather, we want to understand the factors that contribute to a decision to leave the county of residence when giving birth. Our study is an attempt to further specify the Aday-Andersen model and assess its usefulness in explaining this dimension of hospital utilization.

This analysis will examine two patterns: first, mothers who leave their nonmetro county of residence to give birth; and second, a subset of the first group: mothers who leave home and go to a metro county to give birth. These two patterns may reflect different motivations by the expectant mothers. For example, women who leave their counties may go to other nonmetro counties, or may choose to go to a metro county. Leaving the county may simply reflect the fact that there are no adequate facilities in a woman's home county. In five counties with no short term hospital, women have no choice but to cross county lines to give birth in a hospital. In 1975 there were 99 women in the sample in these five counties; in 1980, 144 women; and in 1985, 136 women. They are among those whose decisions to go to another county are based on "push" factors.

On the other hand, women who leave a nonmetro county to birth in a metro county may be choosing a specific facility because of their special medical needs or desires. This may include referrals by their physicians to perinatal centers; all but one of the seven in Wisconsin are located in metro counties. Thus birthing in a metro county may more likely be due to a

"pull" factor.

Of course, the picture is more complex than this. Our analysis depends on the mothers crossing a county line to give birth. But we do not examine here how close to a county line the mother lives, nor whether the adjoining county is a nonmetro or metro county. For example, a woman who lives 10-20 miles from the county line may choose to go to a metropolitan complex in the next county which may in actuality be physically closer than going to the hospital located in her county of residence. This is a limitation of the present study which we address in the conclusions and recommendations for further research.

Hypotheses

Based on previous research, we applied Aday and Andersen's categories to develop the following hypotheses:

Predisposing conditions: Nonmetropolitan mothers who are married, have high educational attainment, and/or are in their mid-childbearing years, are more likely to leave their home counties to give birth than are their counterparts who are unmarried, have lower educational status, and/or are younger or older.

Enabling conditions: Nonmetropolitan mothers with higher income, and those in areas lacking local medical facilities, will be more likely to leave their home counties to give birth.

Need conditions: Nonmetropolitan mothers who experience some problems in pregnancy, labor or birth, or whose infants are born prematurely (as indicated by low birthweight) are more likely to leave their home counties to give birth.

Methodology

Computerized files of data from birth certificates from the Center for Health Statistics, Division of Health, State of Wisconsin¹ serve as the basis for this analysis. About 65,000 births occurred to Wisconsin women in 1975; 75,000 in 1980; and 74,000 in 1985.² We began by sorting the birth records by residence of the mother into metropolitan and nonmetropolitan counties.³ Approximately one-third of the births occurred in nonmetropolitan counties in each of the three years. We randomly sampled the birth certificates, applying sampling ratios of 1:25 and 1:4 for metropolitan and nonmetropolitan areas, respectively. This resulted in a sample of approximately 2,000 metropolitan and 6,000 nonmetropolitan births for each year. We selected a much higher sampling ratio of nonmetropolitan birth records in order to have sufficient cases for comparison within nonmetropolitan counties. The 25 percent random sample of nonmetropolitan mothers provides the basis of the analysis and findings presented in this paper.

We constructed a data file from three sources. First, we included the following variables from the birth certificates:

- age of mother
- place of residence (county)
- place where birth occurred (name of hospital and county)
- number of prenatal visits⁴
- marital status
- educational attainment of mother
- weight of infant at birth
- complications in pregnancy
- complications in labor and/or delivery
- birth process: spontaneous or involving intervention

Second, in order to measure availability of medical resources, we added the number of short-term hospitals and the number of physicians in private practice in the mother's county of residence, using data from the Bureau of Health Professions' Area Resource File. Third, because no income data are included on the birth certificate, we added per capita income for each

Wisconsin county, using data from the Bureau of Economic Assistance. Unfortunately, we were not able to obtain information about how medical bills were paid.

Characteristics of Mothers and Newborns

Analyses of the Wisconsin birth records for 1975, 1980 and 1985 show that very little distinguishes the characteristics and utilization patterns of expectant mothers in nonmetropolitan counties from those in metropolitan counties. In fact, metro and nonmetro residents are becoming more alike over time. As shown in Table 1, a higher proportion of unmarried mothers live in metro areas than nonmetro areas, but over time the proportion of unmarried mothers in both places is increasing; parents living in metro areas are slightly older than nonmetro parents, but both groups are getting older, on average, over time. This convergence also applies to health behavior. A slightly higher proportion of nonmetro mothers start prenatal care in the 4th or later month, although the gap is narrowing, and the mean number of prenatal visits fluctuates between 10 and 11 for metro and nonmetro residents, although in each of the three years, the mean number is slightly higher for metro mothers. A smaller proportion of nonmetro babies than metro babies are born weighing less than 2500 grams, although the gap has virtually disappeared in 1985. Finally, the highest proportion of all births still appears to be first births, among both metro and nonmetro mothers. However, differences between the metro and nonmetro mothers in parity have narrowed over time.

(Table 1 about here)

Findings: Nonmetro women who birthed out of their home county

Chart 1 displays the proportion of nonmetro mothers who birthed out of their county of residence in 1975, 1980 and 1985. For women who live adjacent to a metropolitan county, the proportion rose from 34% in 1975 to over 40% in 1980 and 1985. But for those living further

from metro counties, the proportion rose from 45% in 1975 to 48% in 1980 and 1985.

(Chart 1 about here)

Using the model explicated above, predisposing, enabling, and need variables were entered into a Multiple Classification Analysis (MCA), with birthing out of the county of the mother's residence as the dependent variable. MCA is a statistical technique similar to multiple regression analysis, and is appropriate when the dependent variable is a bi-variate one, such as the proportion of births occurring out of the county. Table 2 shows this proportion of births for each variable. The grand mean indicates that, for the total group, 36% in 1975, 42% in 1980 and 51% in 1985 gave birth out of their county of residence. The "eta" statistic is equivalent to a zero order correlation for each variable. The first column of figures in each year (labelled "Unadjusted") indicates the deviation of the specific category from the grand mean. The second column ("Adjusted") presents the deviation from the mean, adjusted for the effect of all of the other variables in the model. Two variables, marital status and problems with labor and/or delivery, were dropped from the multivariate equation because they indicated no relationship with the dependent variable in all three years.

(Table 2 about here)

We note immediately that the predisposing variables -- mother's age, education and marital status -- show very little association with the proportion who leave the county. The enabling conditions, however, are more highly related. When there are no doctors or hospitals in the county, almost no babies are born in those counties. But even when there are one to four doctors residing in a county, an additional 35% above the mean (or 70-75% altogether) of the expectant mothers leave the county. Mothers living in counties with per capita income in the lowest quartile also are more likely to leave the county. Finally, we note that the smaller the size

of the largest place in the county, the greater the likelihood that the mother will leave to give birth.

The need variables also indicate that the expectant mother is more likely to leave the county if there is a problem in pregnancy or a low weight baby. Births that require some intervention are also more likely to occur out of the county, especially in 1980 and 1985. The data also show a very modest relationship between leaving the county and early vs. late prenatal care, with women staying in the county more likely to start getting care late in pregnancy. These "Unadjusted" relationships are similar for 1975, 1980 and 1985.

Examining the "Adjusted" deviations from the grand mean, we note that only a few components require discussion. These percentages take into statistical account the effect of all other variables in the model. All of the predisposing variables remain relatively unimportant. The enabling variables, however, still show some important trends. The relationships of per capita income to the county of birthing has reversed: that is, after controlling for the effects of all of the other variables in the equation, expectant mothers living in the counties with the lowest per capita incomes tend to birth in their own counties, whereas those in the counties with the highest per capita incomes tend to leave. This is contrary to the findings in the "Unadjusted" quartiles. One explanation is that the poorest counties are also those with few medical resources. Thus if numbers of doctors and hospitals are statistically controlled, then women in the poorer counties may be likely to birth in their home counties, and less likely to leave.

Size of largest place in county seems to be gaining in importance over time. That is, there is a stronger relationship in 1985 than there was in 1975, mainly because expectant mothers living in less populated counties are more likely to leave their county in 1985 than they were in 1975, even controlling for the numbers of doctors and hospitals existing at the time of the birth.

Neither the predisposing nor enabling variables appear to affect the importance of the need variables. Women with problems in pregnancy, low birth weight babies, or births that require medical intervention still are more likely to leave their county of residence, controlling for the effect of other variables.

Note that the total multiple correlation for the model was .421 in 1975, .443 in 1980, and .398 in 1985 -- explaining approximately 16% to 20% of the variance in moms leaving their nonmetro county of residence for birthing.

Findings: Nonmetro women who birthed in a metro county

Of all the mothers who left their home counties to give birth, a subgroup chose metropolitan counties as their destination. Since 1975, this percent has increased. Chart 2 shows that 19% gave birth in metro counties in 1975, and about 24% in 1980 and 1985.

(Chart 2 about here)

For expectant mothers who lived in nonmetro counties that were adjacent to metro counties, the proportion who gave birth in a metro county rose from 17% in 1975 to 22% in 1980 and 1985. For those who lived in nonmetro-nonadjacent counties, the proportion going to metro counties rose from 4.5% in 1975 to just over 8% in 1980 and 1985.

Table 3 presents the results of the Multiple Classification Analysis for nonmetropolitan women who birthed in metro hospitals. Once again, looking at the Unadjusted values, there is very little variance among the predisposing conditions of moms who birth in a metro area. And again, the enabling conditions seem to indicate greater variation. This time, however, the proportions of moms residing in counties with no or few hospitals going to metro counties is not very different from those who live in counties with moderate numbers of hospitals. However, very few women (2% in 1975, 8% in 1980 and 13% in 1985) leave counties with 50 or more

doctors. Size of the largest place in county was also no clear indicator of going to a metro county to give birth. In 1980, the larger the population the greater the likelihood one would go to a metro county, but in both 1975 and 1985, there was no clear relationship with size. The need variables remained consistent with the previous analysis. If women had problems in pregnancy or labor, had a low birthweight baby or intervention at birth, they were more likely than average to go to a metro hospital.

(Table 3 about here)

Examining the "Adjusted" deviations from the grand mean, there were no differences in predisposing conditions. Under the enabling conditions category, women in low per capita income counties were less likely than others to go to a metro hospital. For facilities available (number of doctors and number of hospitals), the greater the number, the less likely the woman is to leave. Size of largest place in the county still holds no clear relationship with leaving the county for a metropolitan hospital.

Once again, the need variables all hold up after controlling for the other variables in the equation. If an expectant mother has problems in pregnancy, low birth weight baby, or a non-spontaneous birth procedure, she is more likely to give birth in a metro hospital. The multiple correlations for these complete models of birthing in a metro county are lower than for the models for women leaving their county of residence for any county. In 1975, the multiple correlation was .290; in 1980, .403, and in 1985, .305, explaining between 8 to 16 percent of the variance.

To summarize these results, Chart 3 displays the proportion of variance explained by individual components of the model both for mothers who left their county of residence and for the subset of mothers who went to a metro county, dividing it among the amount explained by

predisposing, enabling and need factors.

In the terms of Anderson and Aday's model, in all three years the "enabling" conditions explained most of the variance in birthing location. The most important enabling conditions were number of hospitals in the county and size of largest place in the county.

(Chart 3 about here)

With regard to metropolitan births, by far the greatest explanatory power again resides in the "enabling" variables. That is, in 1975, 1980, and 1985 the number of doctors and hospitals in the county seemed to be the strongest contributing factor. In 1980 and 1985, the "need" variables also contributed a sizable portion, resulting in about half of the explained variance by 1985. The MCA analysis indicates that problems in pregnancy, low birthweight, and intervention in birth process contributed significantly to mothers going to metro counties to give birth.

In order to investigate further whether women who birthed in metro counties were taking advantage of the state-designated regional perinatal care hospitals located in metropolitan counties, we ran the birth certificate data for two groups: first, for all nonmet mothers, and second, for nonmet mothers who birthed in metro counties. We compared the characteristics of those who gave birth in a perinatal center with those who went elsewhere. Table 4 shows the proportion of each group of mothers who birthed in a regional perinatal hospital. Over time, a greater proportion of mothers are giving birth in a perinatal center. The proportion increased from 9.2% in 1975 to 11.8% in 1985. Among nonmetropolitan women who gave birth in metro counties since 1980, about 30% did so in a perinatal center.

(Table 4 about here)

We examined the predisposing, enabling and need characteristics of the nonmetropolitan mothers who birthed in these specialized perinatal centers, testing each relationship with chi-

square statistics. Table 5 presents the probability that these characteristics are related to whether or not mothers birthed in a perinatal hospital.

(Table 5 about here)

First, for all the nonmetro mothers as well as nonmetro mothers who birthed in metropolitan hospitals, age and education have significant relationships among the "predisposing" conditions. That is, the older the woman and the more education she has, the more likely she is to give birth in a perinatal center. These relationships do not hold, however, for those mothers who birthed in metropolitan perinatal centers. "Enabling" conditions turned out to have some unpredicted, but significant, relationships. For example, the number of hospitals in the mother's county of residence was significantly related to whether or not she birthed in a perinatal center, but it was not a linear relationship. Women who were most likely to birth in the perinatal center came from counties with two hospitals, whereas those with none or one, or three or more were less likely to do so. This was true for all three years, 1975, 1980, and 1985. Another puzzling, but consistent, relationship was that mothers who came from counties with the lowest and highest quartile of per capita income were more likely to birth in a perinatal center than those from counties with mid-level per capita income. Finally, most of the "need" variables, i.e., problems in pregnancy, low birthweight infants, and intervention in the birthing process, were significantly related to birthing in the perinatal center at $<.001$ level of probability.

Conclusions and Recommendations for Further Research

In sum, this analysis indicates that the predisposing characteristics of age, marital status, and educational attainment contribute very little to explaining departures from the county of residence to give birth. The explanation seems to lie rather in the availability of services in the women's home counties and their personal need for more specialized prenatal and birthing

medical services. This analysis indicates that mothers who have problems are more likely to leave their nonmetropolitan home and seek medical services out of their county. Unfortunately, these data cannot give us the specific reasons why individual mothers left their counties. But by 1985, the regional perinatal centers that had been established to provide services for high risk pregnancies and births were attracting a sizable portion of nonmetro mothers. The "pull factors" of specialized care facilities may continue to grow in importance over time.

This analysis has examined "crossing county lines" as the dependent variable. We considered leaving the county of residence a proxy for distance -- women who went to a hospital in another county were probably travelling farther than those who chose to give birth in their home counties. However, we are aware that county lines may not be salient boundaries for women deciding where to give birth. Indeed, for a woman living near a county line, the neighboring county's hospital may be closer in miles than her "home county" facility.

Estimated travel distances would constitute a better measure of access to birthing care in nonmetropolitan counties. We were unable to measure travel distances during the time allowed for this study, but new technologies make it possible to compute and analyze this information now. Future research will attempt to measure distance from the mother's residence to the place of birth, using the recently available GIS coding of places. This may help to explain some of the movement from county to county.

Additionally, future research may be able to include detailed information on each mother's health insurance. There now exists a matched file of 1990 Wisconsin birth certificates linked to the physician's licensing file and to hospital inpatient discharge data submitted to the state Office of Health Care Information. These files have not yet been made available to analysts outside the Wisconsin Center for Health Statistics, but when they become available they will enable

researchers to estimate both the health care resources of new mothers and the type of physician they used (general or family practitioner, internist, or OB/GYN specialist). In short, these improved tools and data sources present us with the opportunity to build on the findings of the present study and achieve a clearer picture of the circumstances that inform nonmetropolitan women's decisions about where to go for birthing care.

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NOTES

1. The authors appreciate the cooperation of the Center for Health Statistics, State of Wisconsin for providing the birth certificate computer tapes. Data from the Bureau of Health Professions Area Resource File were made available by the Inter-University Consortium for Political and Social Research. We are also indebted to Mohammed Sjachrani for cleaning the data tapes and constructing the initial variables, and to Michelle Allen for her excellent work as Research Assistant. Funds were provided for this research from a Biomedical Research Support Grant in 1989, and U.S.D.A. Wisconsin Hatch Project #3218. Computer facilities were provided by the Center for Demography and Ecology, through NICHD Grant #HD05876. The primary investigator was able to complete further analytical work during a year as Visiting Research Sociologist in the Department of Applied Behavioral Sciences at the University of California-Davis in 1991-92. An earlier version of this paper was presented at the Rural Sociological Society annual meeting at Pennsylvania State University, August, 1992.
2. We omitted all births which occurred in Wisconsin to women who were residents of other states.
3. Metropolitan counties were identified by using the U.S. Bureau of the Census definition of Metropolitan Statistical Areas, which include counties with cities of 50,000 or more, and adjoining counties which are integrated into the metropolitan economy. All other counties were designated as nonmetropolitan. The classification of counties changed after the 1980 Census. Thus, in 1975 there were 16 metropolitan and 56 nonmetropolitan counties. In 1980 and 1985, three counties changed status from nonmet to metro,

resulting in 19 metro and 53 nonmet counties.

4. The number of prenatal visits is notoriously inaccurate on birth certificates because the data are retrospective, often from the memory of the health provider. Rarely are records reviewed to provide an accurate account.

Table 1. Characteristics of Mothers and Births from Wisconsin Birth Certificates: 1975, 1980 and 1985

	1975		1980		1985	
	<u>Residence of Mother</u> Met	Nonmet	<u>Residence of Mother</u> Met	Nonmet	<u>Residence of Mother</u> Met	Nonmet
Unweighted N	1,556	6,432	1,998	6,165	2,048	6,010
Marital Status of Mother						
Married	87.0%	92.1%	84.4%	90.4%	80.6%	87.4%
Other	13.0	7.9	15.6	9.6	19.4	12.6
Mean Age						
Mother	25.3 yrs.	24.7 yrs.	25.5 yrs.	25.1 yrs.	26.3 yrs.	25.8 yrs.
Father	28.0	27.6	28.2	27.9	29.4	28.6
Race of Mother						
White	88.7%	98.1%	88.0%	97.8%	85.3%	97.3%
Black	9.5	0.4	9.0	0.2	10.3	0.0
Am. Indian	0.7	1.1	0.4	1.5	0.8	1.6
Asian	1.1	0.4	1.7	0.2	0.2	0.1
Hispanic	na		0.9	0.2	1.5	0.5
Unknown					2.0	0.5
Month of First Prenatal Visit						
None	0.3%	0.4%	0.2%	0.5%	0.5%	0.5%
1, 2, 3	83.7	76.0	85.8	78.8	82.7	79.4
4, 5, 6	13.3	20.3	11.5	17.0	13.4	15.7
7, 8, 9	2.2	2.4	2.4	2.2	2.4	2.8
Unknown	0.4	0.9	0.3	1.7	1.0	1.7
Prenatal visits						
Mean Number	10.7	9.8	10.9	10.3	11.1	10.9
Low Birth Weight (< 2500 gr. or < 5 lb. 8 oz.)						
	7.5%	4.9%	5.5%	4.3%	4.3%	4.4%
Total Live Births*						
1	41.8%	42.1%	43.2%	40.5%	38.1%	37.5%
2	31.6	30.3	32.0	32.6	34.9	34.3
3	15.1	14.4	16.0	15.9	16.6	17.6
4	5.7	6.5	5.1	6.2	6.8	6.5
5-8	5.0	6.0	3.4	4.4	3.3	3.6
9+	1.0	0.7	0.6	0.3	0.2	0.3

*Including present birth

Table 2. Proportion of Nonmet Mothers giving birth out of their county of residence, using Multiple Classification Analysis, Wisconsin: 1975, 1980 and 1985. (Figures shown are deviations from the grand mean)

	1975*		1980		1985	
	Grand Mean = .36 Unadjusted	Adjusted	Grand Mean = .42 Unadjusted	Adjusted	Grand Mean = .41 Unadjusted	Adjusted
PREDISPOSING						
Mother's Age						
<20	.00	-.01	-.02	-.02	-.03	-.03
20-24	-.02	-.02	.01	.00	.00	.00
25-29	.01	.02	-.01	.00	-.01	-.01
30-34	.03	.03	.01	.01	.01	.01
35+	.02	.01	-.01	.00	.06	.06
eta		.04		.02		.04
Education						
<HS diploma	.01	.00	-.03	-.04	-.05	-.05
HS diploma	-.02	-.01	.00	.01	.01	.01
Some college	.03	.02	.01	.01	.00	.00
eta		.04		.02		.04
Marital Status						
Not married	.03	*	-.02	*	-.01	*
Married	.00	*	.00	*	.00	*
eta		.02		.01		.01
ENABLING						
Number of MDs in county						
None	.64	.36	.52	.08	.59	.29
1-4	.35	.32	.36	.33	.34	.08
5-9	.08	.28	.08	.09	.19	.10
10-19	.07	.19	.12	.19	.10	.09
20-49	-.02	-.06	.02	-.02	.02	.05
50+	-.26	-.47	-.28	-.28	-.23	-.19
eta		.32		.36		.33
Number of hospitals in county						
None	.63	.44	.58	.45	.58	.41
1	.07	.00	.04	.03	.04	.03
2	-.02	-.06	.02	-.01	.00	.02
3	-.15	.04	-.15	-.07	-.12	-.08
4	-.18	.04	-.15	-.16	-.23	-.44
5	-.10	-.08	.04	-.12	--	--
eta		.26		.24		.23
Per capita income (quartiles)						
1 (Low)	.09	-.15	.08	-.17	.10	-.09
2	-.05	-.17	-.06	-.05	.09	.01
3	-.05	.06	-.02	.15	-.06	.05
4 (High)	.01	.24	-.02	.08	-.16	.03
eta		.12		.11		.22
Size of largest place in county						
<2,500	.17	.02	.19	.09	.20	.16
2,500-9,999	.05	-.02	.07	.01	.05	.01
10,000+	-.14	.02	-.16	-.04	-.15	-.08
eta		.23		.26		.24

Table 2, continued

	1975*		1980		1985	
	Grand Mean = .36 Unadjusted	Adjusted	Grand Mean = .42 Unadjusted	Adjusted	Grand Mean = .41 Unadjusted	Adjusted
NEED						
Problem with pregnancy						
No	-.01	.00	-.02	-.01	-.01	-.01
Yes	.08	.05	.16	.07	.09	.15
eta		.05		.11		.07
Problem with labor/delivery						
No	.00	*	.00	*	.01	*
Yes	.02	*	-.02	*	-.03	*
eta		.01		.02		.04
Low birthweight						
No	.00	.00	-.01	.00	-.01	-.01
Yes	.06	.06	.15	.11	.19	.15
eta		.03		.06		.08
Birth						
Spontaneous	-.01	.00	-.05	.03	-.03	-.03
Intervention	.02	.01	.11	.08	.07	.06
eta		.02		.15		.10
Prenatal Care						
1-3 mos	.00	.00	.00	.00	.00	.01
4+ mos	-.01	-.01	-.01	-.01	-.03	-.04
eta		.05		.05		.06
R		.421		.443		.398
R²		.178		.197		.158

*1975 counties are coded metro/nonmetro using the same designation as in 1980 and 1985.

* Variable dropped from complete model.

Table 3. Proportion of Nonmet Mothers giving birth in a metropolitan county, using Multiple Classification Analysis, Wisconsin: 1975, 1980, and 1985. (Figures shown are deviations from the grand mean)

	1975*		1980		1985	
	Grand Mean = .19 Unadjusted	Adjusted	Grand Mean = .24 Unadjusted	Adjusted	Grand Mean = .24 Unadjusted	Adjusted
PREDISPOSING						
Mother's Age						
<20	.00	.01	-.03	-.01	-.03	-.01
20-24	-.02	-.02	.00	-.01	-.01	-.02
25-29	.02	.01	.01	.00	.00	.00
30-34	.04	.04	.01	.02	.02	.02
35+	.00	-.01	.01	.00	.05	.04
eta		.05		.03		.03
Education						
<HS diploma	-.02	-.02	-.05	-.05	-.06	-.06
HS diploma	-.01	-.01	.00	.00	.01	.01
Some college	.04	.03	.03	.02	.02	.01
eta		.06		.06		.05
Marital Status						
Not married	.02	*	-.04	*	-.04	*
Married	.00	*	.00	*	.01	*
eta		.01		.03		.02
ENABLING						
Number of MDs in county						
None	.26	.22	.69	.65	-.06	-.06
1-4	-.08	-.02	-.11	.02	-.01	.10
5-9	.03	.13	-.02	.03	.05	.07
10-19	.06	.11	.11	.18	.09	.10
20-49	.02	-.01	.07	.00	.02	.00
50+	-.12	-.22	-.16	-.20	-.11	-.12
eta		.17		.26		.18
Number of hospitals in county						
None	.03	.15	.04	.13	.02	.09
1	.02	.00	.00	.01	.00	.00
2	.01	-.03	.02	-.01	.02	.01
3	-.03	.04	-.04	-.01	-.02	.00
4	-.09	.00	-.05	-.05	-.11	-.09
5	-.04	-.11	--	--	--	--
6	--	--	.11	-.10	--	--
eta		.07		.07		.04
Per capita income (quartiles)						
1 (Low)	-.04	-.14	-.06	-.19	-.01	-.10
2	.00	-.07	-.01	.00	.12	.05
3	.03	.06	.06	.15	-.05	.01
4 (High)	.02	.14	.01	.06	-.06	.04
eta		.06		.11		.16
Size of largest place in county						
<2,500	-.02	-.01	-.02	.02	-.01	-.05
2,500-9,999	.05	.02	.07	.02	.06	.04
10,000+	-.07	-.03	.09	-.04	-.08	-.04
eta		.14		.17		.16

Table 3, continued

	1975*		1980		1985	
	Grand Mean = .19 Unadjusted	Adjusted	Grand Mean = .24 Unadjusted	Adjusted	Grand Mean = .24 Unadjusted	Adjusted
NEED						
Problem with pregnancy						
No	-.01	-.01	-.01	-.01	-.01	.00
Yes	.09	.07	.09	.08	.06	.01
eta		.07		.12		.05
Problem with labor/delivery						
No	.00	*	-.00	*	.01	*
Yes	.02	*	.02	*	-.04	*
eta		.02		.01		.05
Low birthweight						
No	.00	.00	-.01	.00	-.01	-.01
Yes	.04	.03	.17	.11	.19	.16
eta		.02		.08		.09
Birth						
Spontaneous	-.01	.00	-.06	-.04	-.04	-.04
Intervention	.02	.01	.13	.10	.09	.07
eta		.03		.20		.14
Prenatal Care						
1-3 mos	.00	.00	.00	.00	.00	.00
4+ mos	-.03	.02	-.03	-.02	-.05	-.04
eta		.08		.05		.11
R		.290		.403		.305
R²		.084		.162		.093

*1975 counties are coded metro/nonmetro using the same designation as in 1980 and 1985.

* Variable dropped from complete model.

Table 4. Proportion of Nonmetropolitan Women Who Birthed in a Regional Perinatal Care Hospital: Wisconsin, 1975, 1980, 1985

	1975		1980		1985	
	N	%	N	%	N	%
Total Nonmetropolitan Sample	5,304	100.0	6,165	100.0	6,010	100.0
Birthed in Perinatal Center*	490	9.2	686	11.2	708	11.8
Nonmet Mothers Who Birthed in Metro County	1,000	18.9	1,488	23.6	1,461	24.3
Birthed in Perinatal Center in Metro County	266	5.0	438	7.1	424	4.7
Percent of Metro Births Occurring in Perinatal Center		26.6		29.4		29.0

* One of the six perinatal centers is located in a nonmetropolitan county.

Table 5. Chi-square relationship* of characteristics of nonmetropolitan mothers and infants to birthing in a metropolitan regional perinatal center. Wisconsin, 1975, 1980, and 1985

Variable	1975		1980		1985	
	Relationship	p	Relationship	p	Relationship	p
Total Nonmetropolitan Sample who Birthed in a Perinatal Center						
<u>Predisposing</u>						
Age		.06		.02		.02
Education		<.001		.002		.005
Not married		ns		ns		ns
<u>Enabling</u>						
Per capita income	b	<.001		<.001	b	<.001
No. of MDs		<.001	a	<.001		ns
No. of hospitals	a	<.001	a	<.001	a	<.001
Size	Lg highest	<.001	a	<.001	a	<.001
<u>Need</u>						
Problems in pregnancy		<.001		<.001		<.001
Low birth weight		<.001		<.001		<.001
Intervention		<.001		<.001		.02
Prenatal	Early high	.01	Late high	.08		ns
Nonmet Mothers Who Birthed in a Perinatal Center in Metro County						
<u>Predisposing</u>						
Age		ns		ns		.02
Education		ns		ns		ns
Not married		ns		ns		ns
<u>Enabling</u>						
Per capita income	b	<.001	b	<.001	b	<.002
No. of MDs	a	<.001	a	<.001		<.001
No. of hospitals	a	<.001	a	<.001	a	<.001
Size	Lg highest	.01	a	<.001	a	.09
<u>Need</u>						
Problems in pregnancy		<.001		<.001		<.001
Low birth weight		<.001		<.001		<.001
Intervention		<.001	Spont higher	.002	Spont higher	<.001
Prenatal care		ns	Late high	.08		ns

* Relationship is linear, in predicted direction, unless specified.

ns Not significant

^a Curvilinear relationship, with mid value highest.

^b Curvilinear relationship, with mid value lowest.

Chart 1. Percent of Nonmetro Mothers Giving Birth Out of County or Residence, Wisconsin 1975-1985

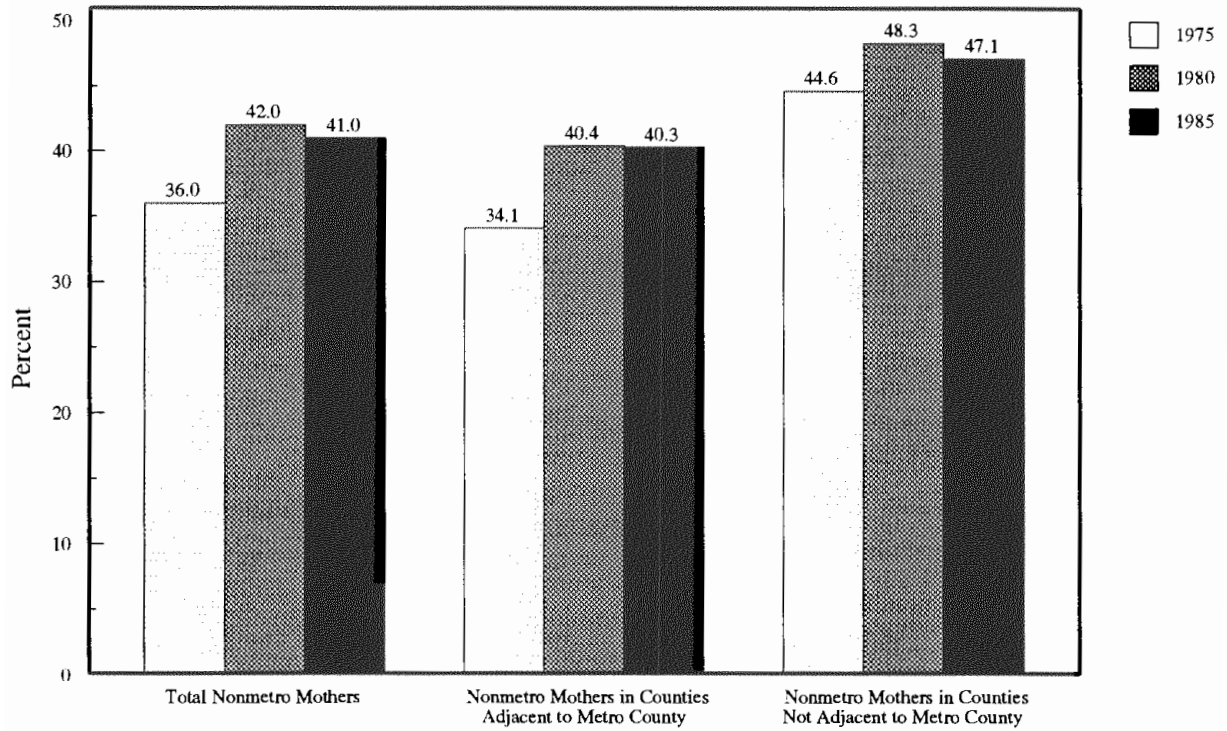


Chart 2. Percent of Nonmetro Mothers Giving Birth in Metro Counties, Wisconsin, 1975-1985

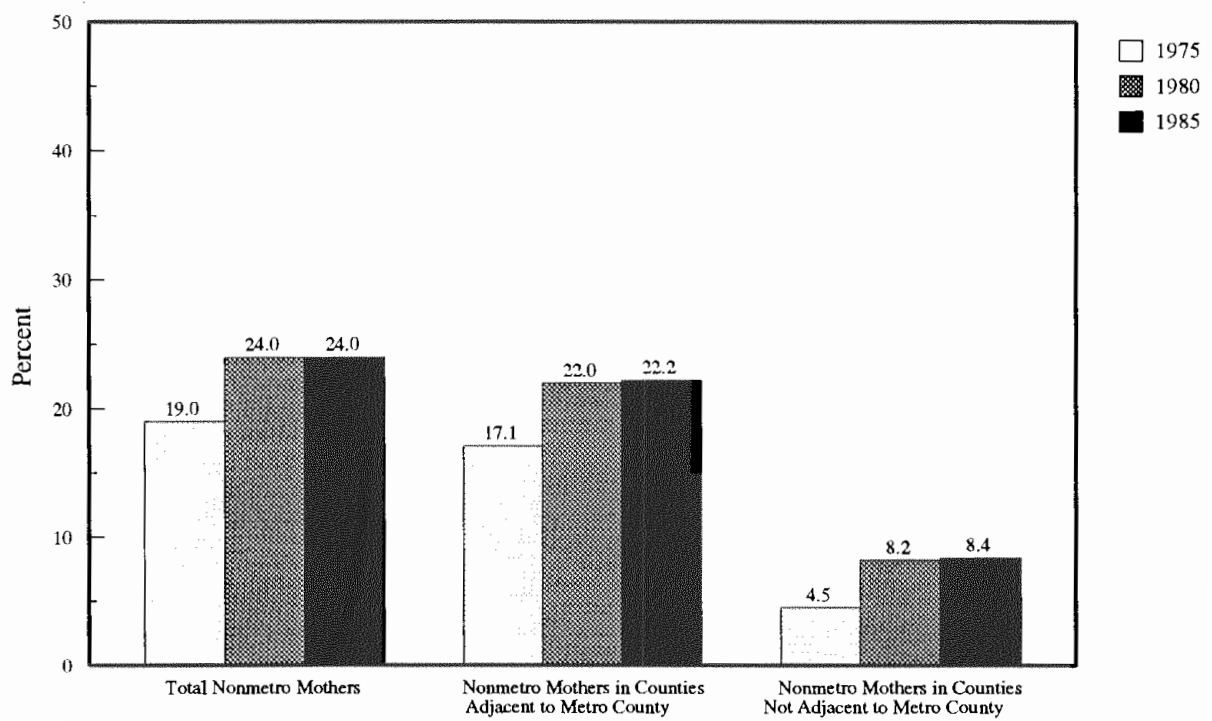
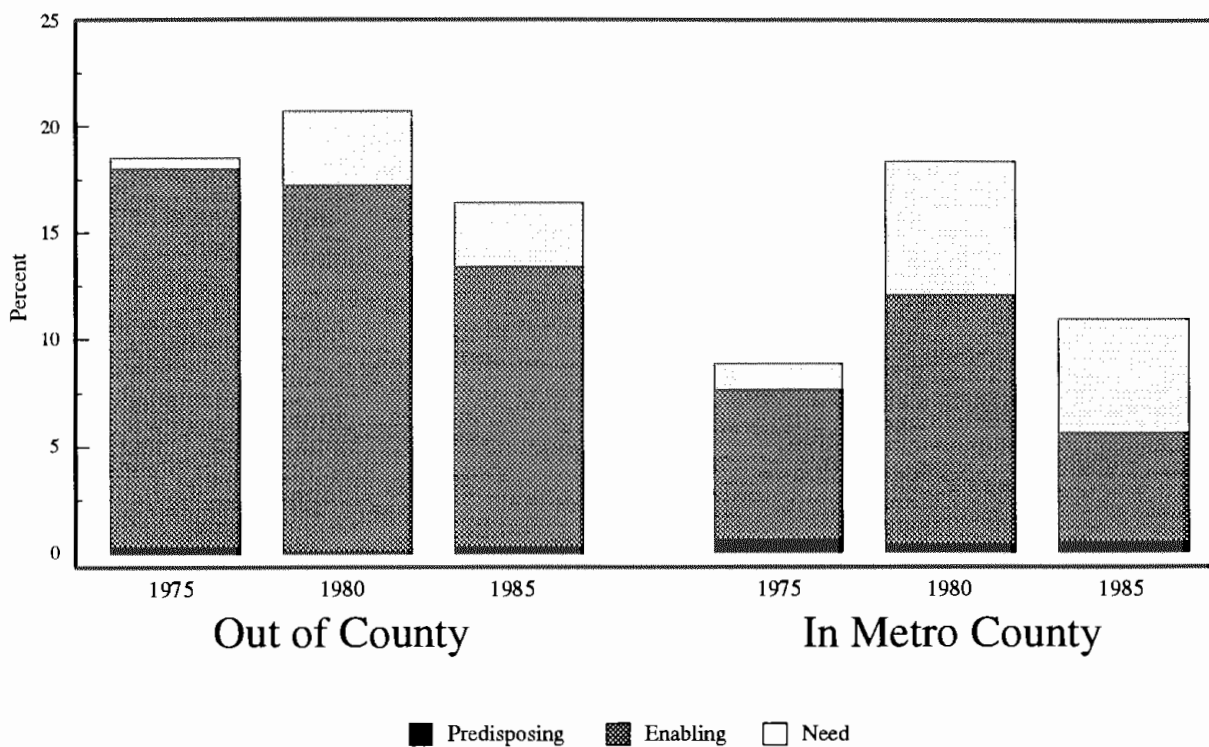


Chart 3. Percent of Variance Explained by Predisposing, Enabling and Need Factors Related to Birthing, Wisconsin, 1975-85



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