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ACCESS TO OBSTETRICAL CARE IN RURAL AREAS: EFFECT ON BIRTH OUTCOMES

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ABOUT THE CENTER...

The WAMI Rural Health Research Center is one of five centers funded by the Office of Rural Health Policy, a component of the Health Resources and Services Administration of the Public Health Service. The major focus of the WAMI RHRC is to perform policy-oriented research on issues related to rural health care. Specific interests of the Center include studies of rural hospital function and viability, investigation of the changing patterns of obstetric and neonatal care in rural areas, and investigations into trends in health manpower in rural America.

The WAMI Rural Health Research Center (RHRC) is based in the Department of Family Medicine at the University of Washington School of Medicine, and has close working relationships with the other health science schools at the University, as well as with other major universities in the four WAMI states: Washington, Alaska, Montana and Idaho. The University of Washington has almost 20 years of experience as part of a decentralized educational research and service consortium involving the four WAMI states, and the activities of the Rural Health Research Center are particularly focused on the needs and challenges in these states. The WAMI Rural Health Research Center also works closely with the five Area Health Education Centers in the four WAMI states.

The Rural Health Working Paper Series is a means of distributing pre-publication articles and other working papers to colleagues in the field. Your comments on these papers are welcome, and should be addressed directly to the authors. Questions about the WAMI Rural Health Research Center should be addressed to:

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ABSTRACT

As an increasing number of physicians discontinue obstetrical practice, access to obstetrical care has diminished in rural areas of the United States. We used hospital discharge data to study the relationship between declining local access to obstetrical care and perinatal outcomes in rural Washington State.

The communities served by the 33 rural hospitals in Washington State were categorized by the extent to which patients left their local communities for obstetrical services. Women from communities with relatively few obstetrical providers were less likely to deliver in their local community hospital than women in rural communities with lower ratios of births to number of physicians practicing obstetrics. Women from these high-outflow communities had a greater proportion of complicated deliveries and higher rates of prematurity than women from communities where most patients delivered in the local hospital. Costs of neonatal care for patients living in high-outflow communities were also significantly higher, among those women covered by Medicaid.

We conclude that women living in rural areas where the majority of their obstetrical care is obtained outside their local community are more likely to experience adverse perinatal outcomes. This association suggests that diminished availability of local obstetrical services may constitute increased perinatal risk for rural residents.

INTRODUCTION

A fundamental precept of modern obstetrics is that adequate prenatal care leads to improved perinatal outcomes for mothers and infants. For pregnant women to obtain timely and appropriate perinatal care, they must establish relationships with individual providers: obstetricians, family physicians, midwives, or public health nurses. Women who receive inadequate prenatal care are more likely to have poor obstetrical outcomes, including higher rates of prematurity, lower birthweight babies, and higher infant mortality.[1-3]

In the rural United States - accounting for approximately 23 percent of the nation's population - most obstetrical services are provided by private physicians.[4] The majority of these physicians are general and family physicians; less than 1 percent of the physicians in counties with less than 10,000 are obstetricians.[5] There has been a precipitous decline over the last three years in the number and proportion of family physicians offering obstetrical services in the United States.[6,7,8,9] This decline in obstetrical participation rate has been primarily due to rapid increases in professional liability premiums, largely due to the rising incidence and increased cost of obstetrical malpractice suits.[6,9,10,11] In some areas of the country over 50 percent of family physicians who previously offered obstetrical services no longer offer this service to their patients.[6,7,9] Because family physicians are often the only providers of obstetrical care in rural areas, an increasing proportion of these areas currently are or soon will be without obstetrical services.[12,13,14] Even in communities with adequate obstetric care, a certain porportion of women either choose to leave these communities for obstetric care, or are referred to different physicians or facilities because of

specific complications of pregnancy. However, in towns with little or no obstetrical capacity, most women find they must travel not only for routine deliveries, but to secure basic prenatal care. As a consequence it becomes less likely that they women obtain adequate prenatal care.[15] Delays in care for early labor complications may also result.

This study investigates the extent to which local availability of obstetrics is related to perinatal outcomes. We seek to answer the following questions: 1. What are the characteristics of rural towns where the majority of women obtain obstetrical care outside their local communities (outflow)? 2. Using outflow as a proxy measure for access to care, is there any difference in the outcome or cost of care for women living in communities with diminished obstetrical access as compared to women who have ready access to local obstetrical care? 3. What are the likely health policy implications of increasingly constrained access to obstetrical care in rural parts of the United States?

METHODS

Population Studied

The study was based on all deliveries of women whose primary residence was in a rural area of Washington State and who gave birth during calendar year 1986. The following definitions were used to identify this population:

Rural hospitals were defined as all acute-care, inpatient facilities of fewer than 50 beds and located more than 15 miles from a city of 30,000 population or greater. Thirty-three of Washington's 90 hospitals met those criteria.

A rural area was defined as the medical service catchment area served by these hospitals. A catchment area was the aggregate of all ZIP code areas whose center was closer to a specific rural hospital by public road than any other hospital facility. Travel time calculations were based on figures supplied by the Department of Transportation.

Data Source and Stratification of Rural Areas by Location of Delivery

Washington State maintains a file of all hospital discharges from nonfederal, short-stay hospitals in the state of Washington. Each discharge abstract includes data on the place of residence of the patient, the hospital of discharge, the discharge diagnosis, and hospital charges. Maternal residence was used to identify all patients living within the 33 defined rural medical service catchment areas. By comparing the place of residence with the location of the hospital of delivery, we could determine what proportion of all obstetrical deliveries occured in facilities outside a woman's local hospital catchment area.

The 33 rural areas were stratified into three groups on the basis of these determinations. Areas in which more than two-thirds of deliveries

occurred in the local hospital were designated as "low-outflow" communities. "High-outflow" communities were those in which fewer than one-third of deliveries to local women occurred in the local hospital. "Medium-outflow" communities were those between these two extremes.

Availability of Obstetrical Services

The availability of obstetrical services in each of the 33 communities was determined through telephone surveys of hospital administrators and directors of nursing. The response rate was 100%. Information was obtained as to the number and specialty of all physicians providing obstetrical services in each hospital during the study period, as well as in the year prior and the year after the study period.

Determining Outcome and Costs of Pregnancies

Diagnosis-related groups (DRGs) were used as proxies for obstetrical outcome. Maternal complications were defined as all discharges with DRGs 370 or 372. These DRGs denote deliveries - both C-section and vaginal deliveries associated with significant complications or comorbidity. These DRG's are used to designate major intrapartum complications, as well as other conditions such as pregnancy-induced hypertension, diabetes and anemia. The balance of the deliveries were concluded to be uncomplicated for the purposes of this study and included DRG 371 (uncomplicated C-section), 373 (normal vaginal delivery), and 374 and 375 (vaginal delivery with an OR procedure, such as sterilization). Premature births were defined as babies discharged with DRG codes 386, 387, or 388 all of which referred to premature delivery. DRGs 389, 390, and 391 were defined as full term births.

Hospital charges for both maternal and neonatal care, as well as source of payment, were also recorded on the hospital discharge abstracts.

Statistical Analysis

Differences in outcomes between outflow groups were evaluated using standard Chi-Square and Chi-Square for Trend for each of the outcome measures. In addition, analysis of variance was also utilized.

RESULTS

Characteristics of Study Communities

Approximately 350,000 people live in the 33 rural medical service areas defined by this study, eight percent of the population of Washington state. The 33 hospitals serving these areas represent 37 percent of the 90 acute, short-term, general hospitals in Washington State, but account for only eight percent of the total licensed acute care beds. These service areas are dispersed throughout the state; 23 of Washington's 39 counties encompass one or more of the study areas. The 5,554 births which occurred to residents of these areas in 1986 represent 8.1 percent of all births to residents of the state during that year.

As can be seen from Table 1, both the rural communities and the hospitals that serve them are quite small, with the average service area encompassing 10,592 people and the average hospital having 32 beds. High-outflow communities - those in which more than two-third of all births to local residents did not occur in the local hospital - were smaller than communities where larger proportions of pregnant women delivered in their local community hospitals. These high-outflow communities were also somewhat closer to other more sophisticated perinatal facilities, although even for this group average travel times to Level II facilities were more than an hour. Conventional measures of socioeconomic status, such as unemployment rate and the proportion of the population enrolled in Medicaid, did not meaningfully differ among the three groups of communities.

Table 1 about here

The most striking difference between communities in the outflow groups was the local availability of obstetrical care. By the end of the study period in 1986, only eight of the 13 high outflow community hospitals still offered routine obstetrical services. The five communities with no residual obstetrical care had discontinued this service primarily because local physicians had stopped delivering babies. All of the low and medium outflow community hospitals continued to offer obstetrics. Figure 1 shows that the high outflow communities had relatively fewer obstetrically active physicians in the year before the study, and that this disparity has become more pronounced during the study year and in succeeding year. By contrast, there was been no significant attrition in obstetric availability in the comparison communities.

Figure 1 about here

Location of Delivery and Obstetrical Outcome

Obstetrical outcomes differed systematically across the three groups of communities. Women and babies from high-outflow communities experienced a significantly higher rate of intrapartum complications and neonatal morbidity than their counterparts in communities where a greater proportion delivered in local hospitals. It should be emphasized that the study is population based; all measures of outcome are attributed to the community of residence of the patients in this study, not the location of the hospital where deliveries occurred or where neonatal care was rendered.

As Figure 2 demonstrates, there is a strong association between the proportion of deliveries that occur outside of the community and the rate of

complications associated with childbirth. Women living in high outflow communities were 34% more likely to experience birth-associated complications or comorbidity than women from medium outflow communities, and 67% more likely than women from low-outflow communities.

Figure 2 about here

The proportion of premature births follows the same gradient. As in the case of maternal complications, children of women from high-outflow communities have higher rates of prematurity, an association significant at the .001 level (Figure 3). Neonatal length of stay - a measure presumably correlated with neonatal outcome - also shows significant difference across community type. Babies born to mothers residing in high-outflow areas were much more likely to spend longer than five days in the hospital after delivery than their counterparts from low outflow communities and medium-outflow communities, an association statistically significant at the .01 level (Figure 4).

Figure 3 and 4 about here

The apparent excess morbidity observed for the high outflow communities is attributable to those women who delivered outside their local communities. The residents of high outflow communities that delivered locally actually had somewhat fewer complicated births than residents of other outflow groups. It is unlikely that observed disparities are due to intrapartum transfers of patients with complications since less than 5% of complicated births to

residents from high-outflow communities arrived at the remote facility as the result of a transfer from another hospital.

Access to Care and Perinatal Costs

A major consequence of adverse perinatal outcomes is increased cost of medical care, with most of the cost attributable to the care of sick and premature newborns in neonatal intensive care units. Table 2 examines the difference in hospital charges used as a proxy for cost for neonatal care across the three community groups. Newborn patients from high-outflow communities have dramatically higher average charges than their counterparts in better served communities.

Although the differences are significant using one-way analysis of variance without regard to payer type, differences are most dramatic for those enrolled in the Medicaid program. It should be noted, however, that lower income women with adverse birth outcomes generating high hospital charges are more likely to be encouraged, and even assisted in enrolling in Medicaid.

Table 2 about here

Although a few outliers with extremely high charges can generate enormous charges, that does not explain the finding displayed here. As shown in Figure 5, there are 3 times as many babies with charges exceeding $5,000 in the high outflow communities compared to the low outflow communities - a measure less affected than average charges by the influence of extreme outliers.

Figure 5 about here

DISCUSSION

There has been a precipitous decline over the last few years in the number of physicians offering obstetrical services.[6-14,16,17] Although a variety of forces play a role in explaining this pervasive change in physician practice patterns, the most powerful component of the decision for most physicians appears to be issues related to medical malpractice.[6-13,16,17]

The declining proportion of practitioners offering obstetrical services has had a disproportionate impact on rural areas for two reasons. First, rural areas have fewer physicians per capita than urban regions and thus are more susceptible to changes in the spectrum of clinical services offered by those physicians who do practice in rural America. Secondly, a larger proportion of deliveries in rural areas have been provided by general and family physicians, a group that has experienced a much higher rate of attrition from obstetrics than their specialist counterparts.[5,6-14,16,17]

This study demonstrates that there is an association between the availability of obstetrical care in rural communities, the proportion of women living in those areas who deliver in local hospitals, and the costs and outcome of care. Women living in rural Washington communities with little or no obstetrical care available locally tend to deliver in hospitals outside the community. These women are more likely to have complicated labor and premature deliveries, and their infants are more likely to have longer and more expensive hospital stays than the children of their rural counterparts who deliver in local facilities.

The design of this study does not permit us to conclude that there is a casual relationship between impaired access to rural obstetrical care and adverse perinatal outcome, although this appears to be a tenable hypothesis.

There are several possible mechanisms which would explain a casual relationship between access to care and outcome. First, women living in communities without obstetrical services must travel to obtain routine prenatal care, a barrier associated with poorer prenatal compliance.[15] Women on marginal incomes or women without adequate transportation would be likely to delay or forego prenatal care, an might have more difficulty getting to all their prenatal visits. Even if these patients are able to arrange for transportation to other communities, they may encounter difficulties in obtaining obstetrical care in a state where most physicians limit the number of pregnant Medicaid patients for whom they will provide care.[11]

Secondly, obtaining obstetrical care and delivering outside one's local community may in itself constitute a risk factor for adverse outcome, even if obstetrical care has been arranged. Patients from remote, rural communities may have difficulty adhering to prenatal protocols or treatment regimens prescribed by physicians in distant communities. There may be significant delays in presentation to the hospital after the onset of labor. And the increased stress - physiological and psychological - associated with travel and parturition in unfamiliar settings may interfere with the normal process of labor.

There are alternative explanations for the patterns observed here. Because the data are derived from hospital discharge abstracts, we lack precise information about the prenatal, intrapartum, and neonatal course of the patients in the study. DRGs and costs are used as proxies for outcome, and it is possible that there is a systematic bias in which larger urban hospitals are more likely to intervene medically during the intrapartum period, assign DRG codes denoting increased medical intensity, and keep

neonates longer in their nurseries than smaller rural hospitals. Even if such a bias is the cause of the apparent differences in biological outcomes, the increased charges and lengths of stay associated with deliveries outside rural communities are real.

A second alternative explanation for the observed disparities is that women from communities with high-outflow are not comparable to the women living in medium - and low-outflow communities. Perhaps the 13 communities in this group have populations of women with higher risks for adverse perinatal outcomes. However, there are no indications that these high-outflow communities differ systematically from those with lower outflow for obstetrical care. Although the high-outflow communities are slightly smaller than the average rural Washington town or medical service area, the previous county infant mortality rates (80-83), county unemployment, and the percent of obstetrical patients on Medicaid from these communities are similar to that of communities with less outflow and better outcomes.

Policy Implications

Despite the limitations of this study, the data strongly suggest that recent declines in the availability of obstetrical care in rural areas leads to poorer perinatal outcomes. From the experience in Washington State it appears that the critical event is the decision by rural family physicians to discontinue providing obstetrical services. In many cases this leads to a substantial curtailment or total discontinuation of obstetrical services in the local hospital. Women who would have previously delivered in their local hospital are forced to travel to other communities for their obstetric care.

The discontinuation of local obstetrical services may have an impact that goes beyond perinatal care. Many rural hospitals are economically

vulnerable, and the loss of obstetrical services may lead to the ultimate closure of the facility. A lack of adequate hospital facilities exacerbates the already difficult task faced by rural communities in recruiting and retaining competent medical practitioners. Rural communities, in turn, depend upon the presence of a viable health system for their social and economic integrity.[4]

Although in this study loss of local services and associated higher rates of adverse outcomes were observed only in a handful of relatively small communities, this may be the leading edge of a more pervasive phenomenon. If larger numbers of practitioners drop out of obstetrics, larger rural communities will lose their capacity to provide routine perinatal services. And although the problem is more graphic and easily demonstrated in rural populations, impaired obstetrical access may have the same social and biological consequences in urban settings.

This study suggests that society will benefit both medically and economically from providing a solution to this problem. It was more than twice as expensive to provide neonatal care to infants from high-outflow rural communities as it was to infants from low - and medium-outflow communities. The excess cost generated was more than $1.5 million during 1986 alone, most of it paid for by public subsidies through the Medicaid program. This does not include additional costs associated with the increased medical needs in the post hospital period which has been shown to be higher for Medicaid infants whose mothers received inadequate prenatal care.[18] The additional Medicaid expenditures for neonatal care alone would have been more than adequate to pay the entire malpractice insurance premiums of all physicians practicing in high-outflow rural communities in Washington State. In

conclusion, this study suggests that diminished rural access to obstetrical care leads to poorer and more expensive perinatal outcomes for women who travel outside their local communities for obstetrical care. Programs that maintain local availability of obstetrical care are likely to improve perinatal outcomes and be cost effective.

REFERENCES

1. Moore TR, et al: The Perinatal and Economic Impact of Prenatal Care in a Low-Socioeconomic Population. Am J ObGyn 1986;154:29.

2. Institute of Medicine, Preventing Low Birthweight, National Academy Press, Washington, D.C., 1985.

3. The Alan Gutmacher Institute. The Blessed Event and the Bottom Line. An Alan Gutmacher Institute Publication. New York, New York, 1987.

4. Rosenblatt RA, Moscovice IS: Rural Health Care New York. John Wiley and Sons, 1982.

5. Kendig DA, Movassaghi MS: Is Physician Availability Adequate in Small Rural Counties in the United States. (in press) 1987.

6. American Academy of Family Physicians (AAFP) 1987. Family physicians in obstetrics: A professional liability study. Kansas City, Missouri.

7. Heland KV: Who Will Deliver Our Babies: The Future of Obstetrics and the Primary Care Physician. Mal Practice Prevention, Nov/Dec 1987.

8. Smucker DR: Obstetrics in Family Practice in the State of Ohio. Journal of Family Practice 1988;26:2.

9. Scherger J, Tanji J: Family Physician Strive to Continue Obstetrics. California Family Physician, 1987;38:12-13.

10. Gordon RJ, et al: The Effect of Malpractice Liability on the Delivery of Rural Obstetrical Care. The Journal of Rural Health, 1987;3:1.

11. Rosenblatt RA: The Changing Pattern of Obstetrical Practice in Washington State: The Impact of Tort Reform. Family Medicine, 1988;20:2.

12. Area Health Education Council of Montana Bulletin, January 1988. Impact of the Liability Crisis in Montana: Jan 1988.

13. Cianciolo MS, et al: A Survey of Obstetric Malpractice Liability in Western Frontier Areas. 1987 (Submitted) University of Utah

14. Spalding J: Chapter succeeds in urging state funds to keep FP's in OB. AAFP Reporter, 1988:15:11.

15. McDonald TP, Coburn AF: Predictors of Prenatal Care Utilization Social Science Medicine, 1988;27:2.

16. Chiles L: Malpractice and Liability: An Obstetrical Crisis. Washington, DC, The National Commission to Prevent Infant Mortality, 1988.

17. Changes in Practice of Obstetrics-Gynecologists ANA's Professional Liability Update. Chicago, American College of Obstetricians and Gynecologists, 1988.

18. Maternity Care Access Division of Medical Assistance Department of Social and Health Services Office of Analysis and Review, State of Washington Working Paper, October 13, 1987.

TABLE 1
Characteristics of Study Communities Stratified by Differential

Obstetrical Outflow, Washington State, 1986

	Low Outflow (<33%) n=8	Medium Outflow (33-67%) n=12	High Outflow (>67%) n=13	All Communities n=33
Total number of hospital births to residents of service areas	1,155	2,781	1,618	5,554
Percent of births occurring outside community	19.9%	48.8%	80%	52%
Miles to Level II nursery - mean	79	63	41	58
Mean beds in local hospital	37	33	27	32
Mean percent of obstetrical patients enrolled in Medicaid	31.3%	28%	27.4%	28.8%
Mean county unemployment rate (1985)	12.6%	11.8%	11.1%	11.7%
Percent of births to women under 18 or over 35 (1986)	9.4%	11.0%	8.8%	9.7%
Infant Mortality Rates/1000 births (County rates 1980-1983)	11.6	11.8	10.5	11.2

TABLE 2

Hospital Charges for Births to Rural Washington Mothers Stratified by Community Outflow for Obstetrical Care and Insurance Type (1986)

	Mean Newborn Charges			
	Low Outflow (<33%)	Medium Outflow (33-67%)	High Outflow (>67%)	
	N=1210	N=2897	N=1597	Significance*
All Insurance Types	$1,046	$1,048	$2,103	.029
Medicaid	$1,014	$1,084	$4,627	.01
Non-Medicaid	$1,061	$1,035	$1,128	.7

*Significance reported for one way ANOVA with hospital charges as the dependent variable and outflow level as the independent variable.

FIGURE 1

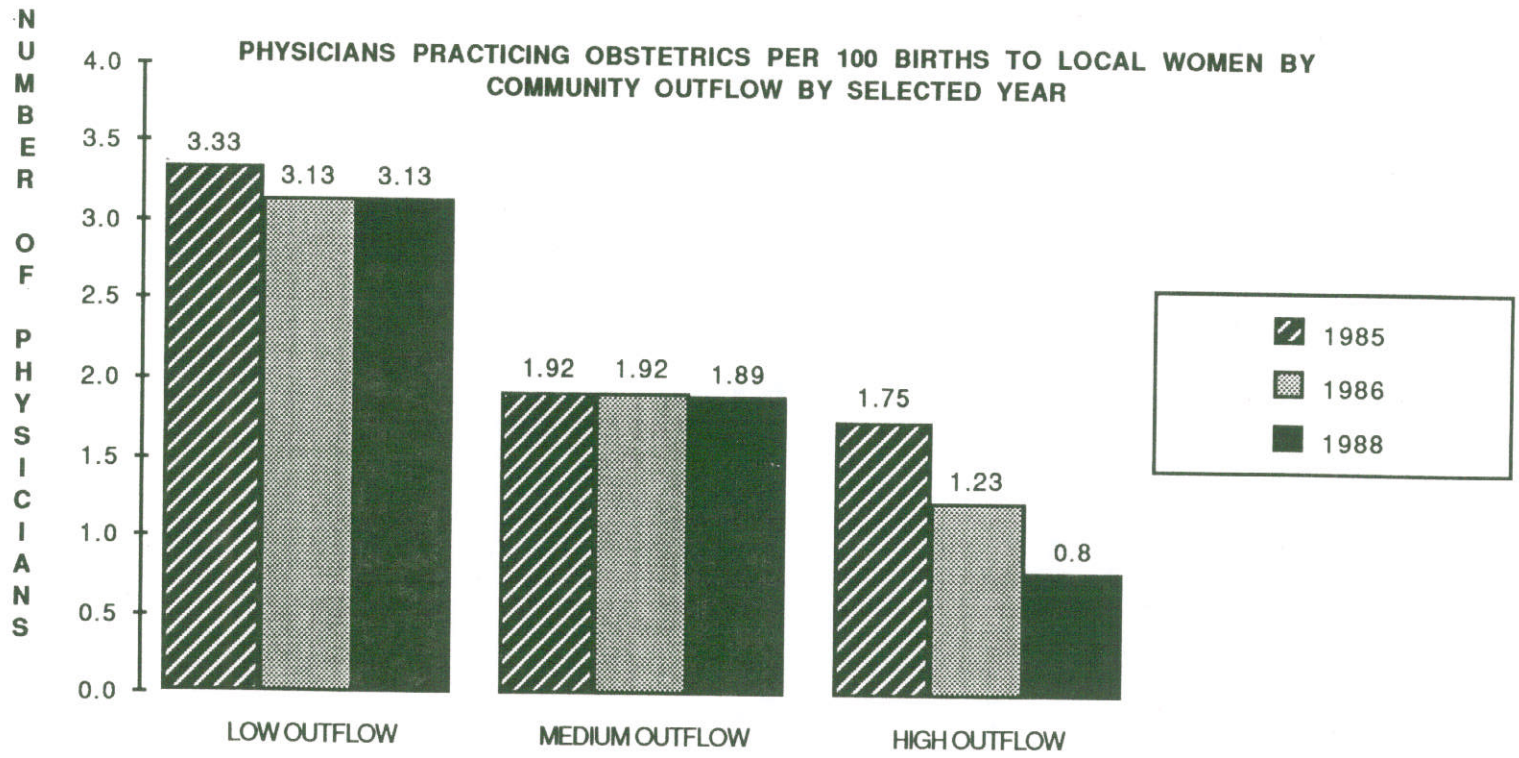
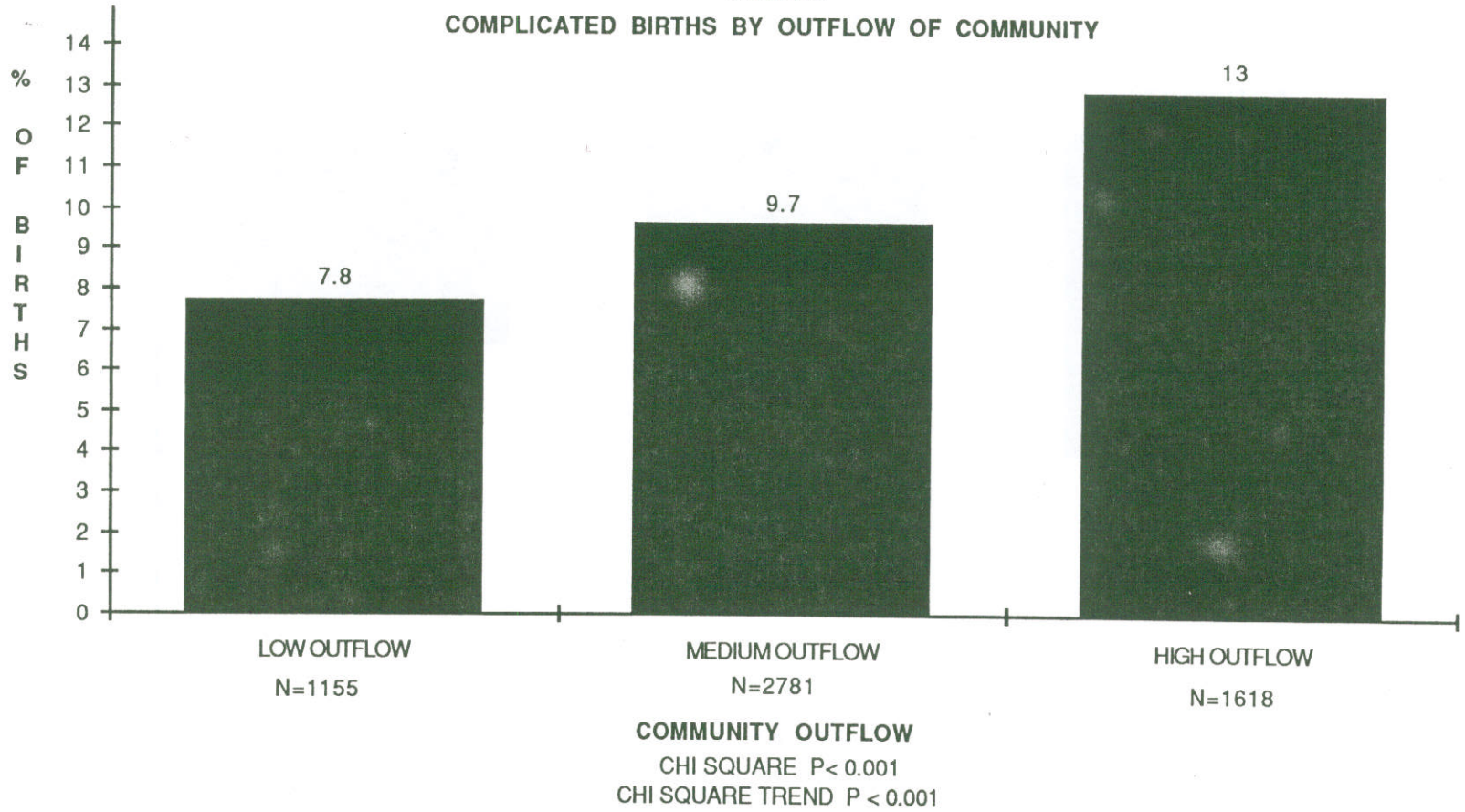

PHYSICIANS PRACTICING OBSTETRICS PER 100 BIRTHS TO LOCAL WOMEN BY COMMUNITY OUTFLOW BY SELECTED YEAR
NUMBER OF PHYSICIANS
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3.33
3.13
3.13
1.92
1.92
1.89
1.75
1.23
0.8
1985
1986
1988
LOW OUTFLOW
MEDIUM OUTFLOW
HIGH OUTFLOW
COMMUNITIES BY LEVEL OF OUTFLOW FOR OBSTETRICAL CARE

FIGURE 2

COMPLICATED BIRTHS BY OUTFLOW OF COMMUNITY

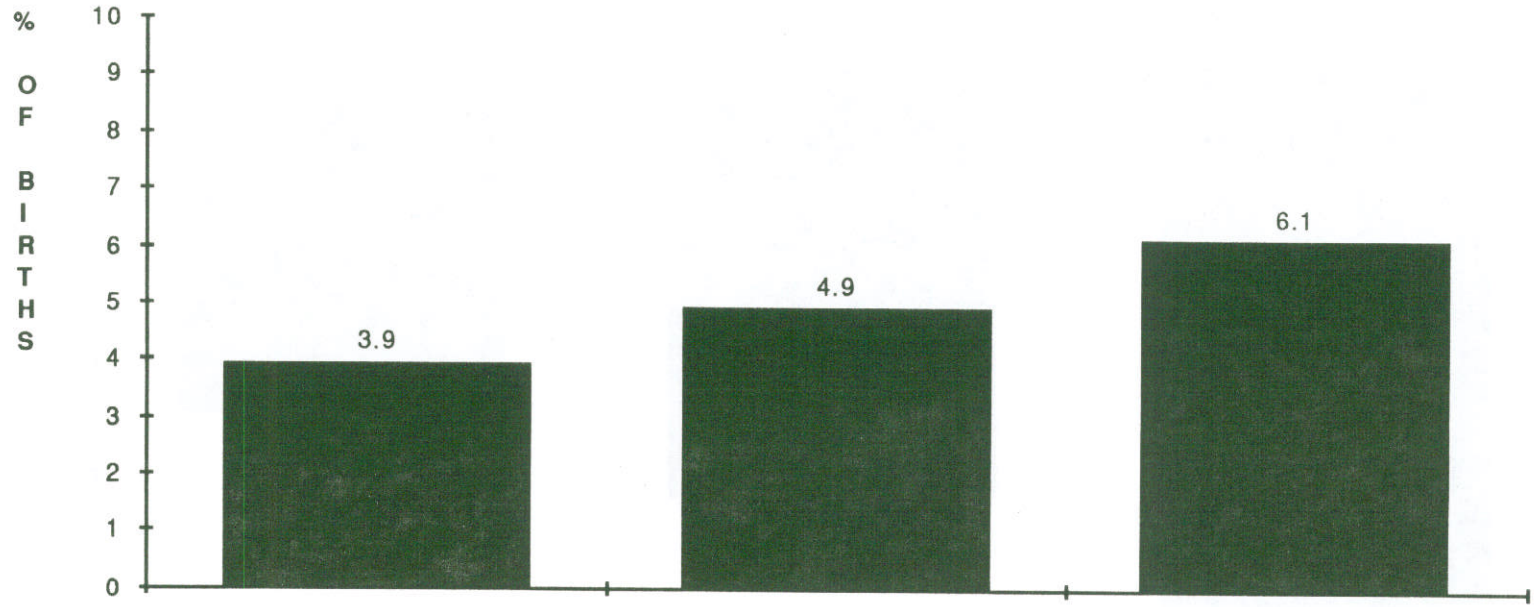


CHI SQUARE $P < 0.001$

CHI SQUARE TREND $P < 0.001$

FIGURE 3

PREMATURE BIRTHS BY OUTFLOW OF COMMUNITY



CHI SQUARE P< 0.001
CHI SQUARE FOR TREND P< 0.001

FIGURE 4

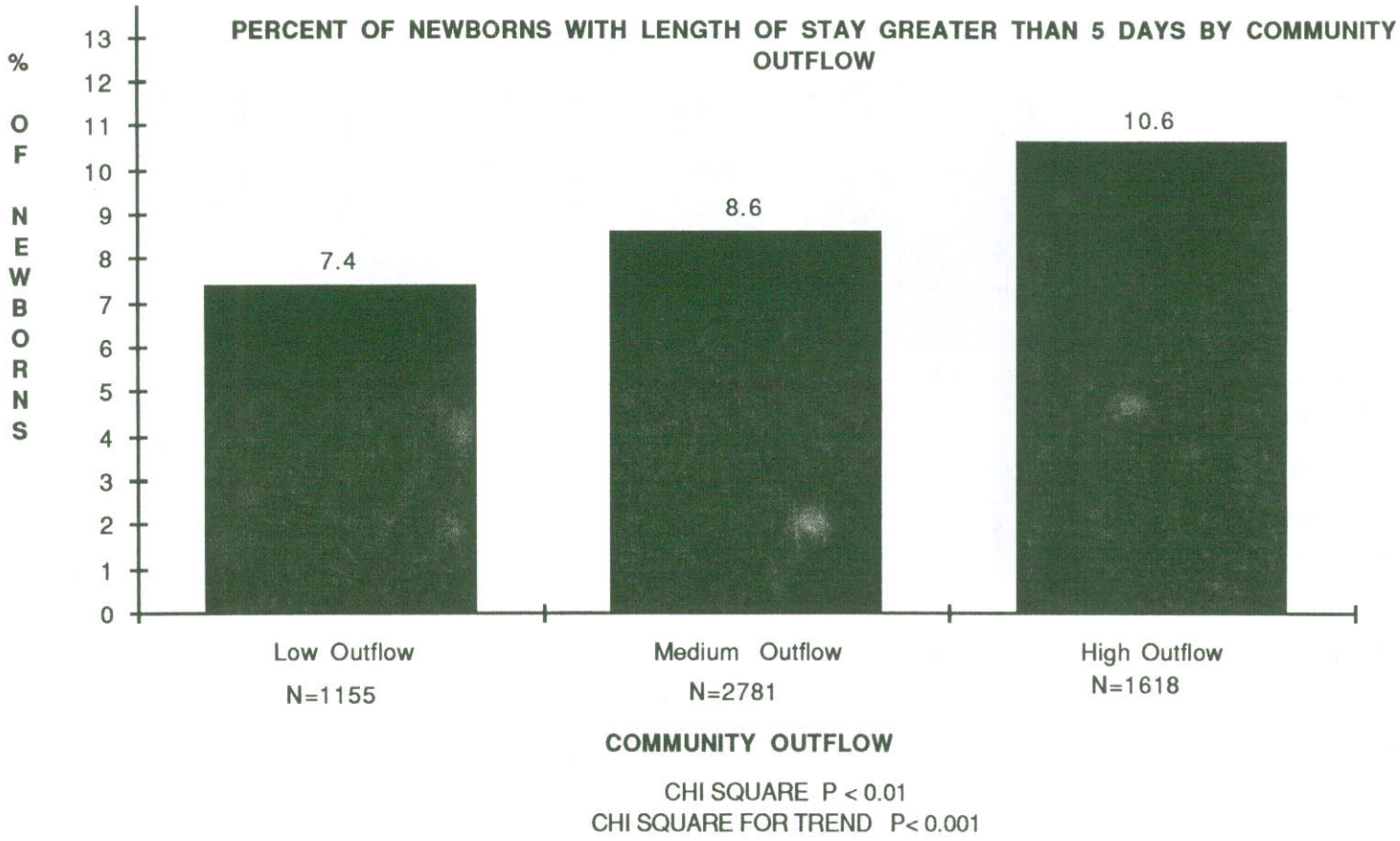
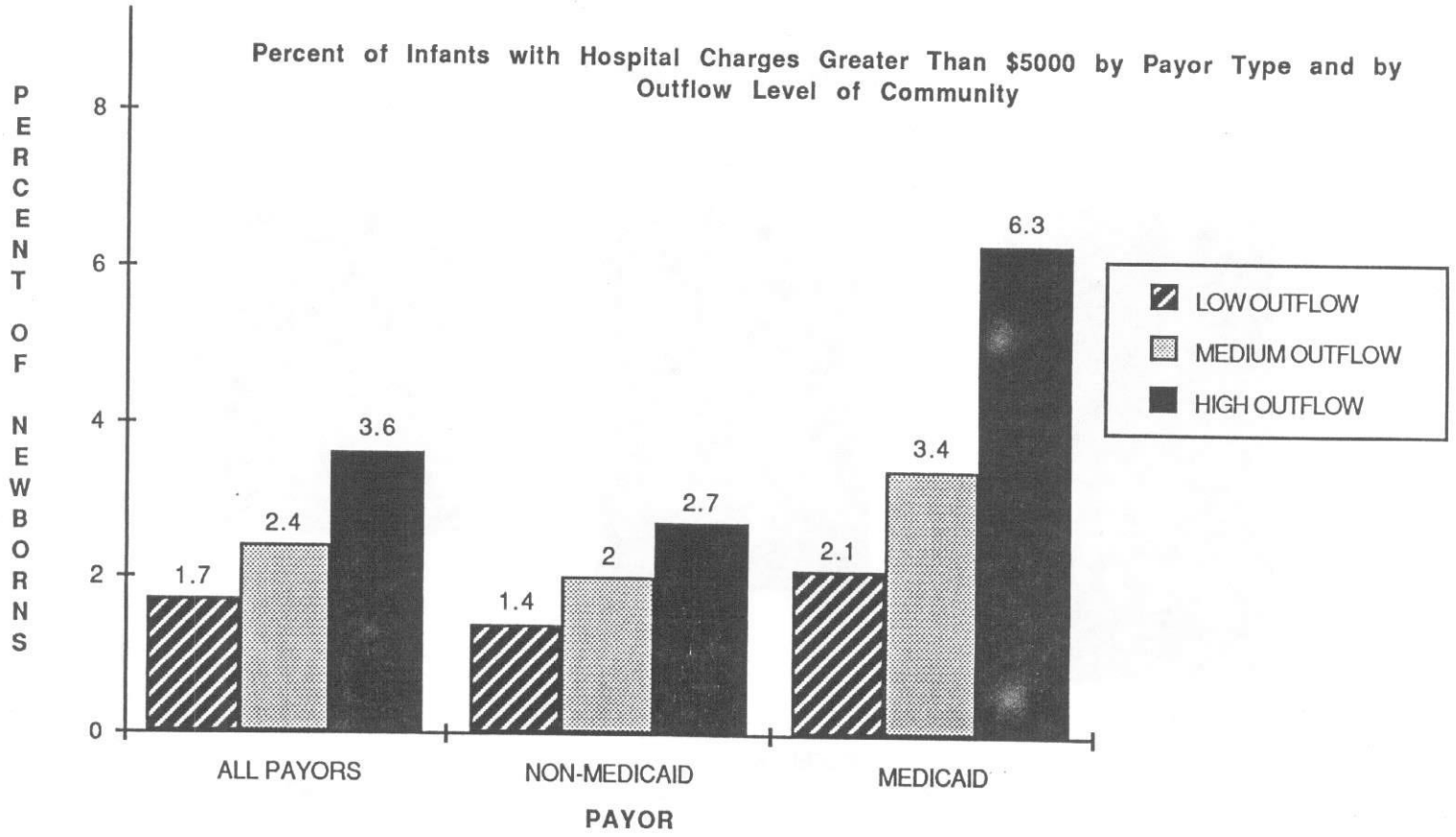

PERCENT OF NEWBORNS WITH LENGTH OF STAY GREATER THAN 5 DAYS BY COMMUNITY OUTFLOW
% OF NEWBORNS
13
12
11
10
9
8
7
6
5
4
3
2
1
0
7.4
8.6
10.6
Low Outflow
N=1155
Medium Outflow
N=2781
High Outflow
N=1618
COMMUNITY OUTFLOW
CHI SQUARE P < 0.01
CHI SQUARE FOR TREND P< 0.001

FIGURE 5



CHI SQUARE $P < 0.01$

RURAL HEALTH WORKING PAPERS

1. Hart, L. Gary; Rosenblatt, Roger A.; and Amundson, Bruce A. Is There a Role for the Small Rural Hospital? No. 1, January, 1989.

2. Hart, L. Gary; Rosenblatt, Roger A.; and Amundson, Bruce A. Rural Hospital Utilization: Who Stays and Who Goes? No. 2, March, 1989.

3. Amundson, Bruce A. and Hughes, Robert D. Are Dollars Really the Issue for the Survival of Rural Health Services? No. 3, June, 1989.

4. Nesbitt, Thomas S.; Rosenblatt, Roger A.; Connell, Frederick A.; and Hart, L. Gary. Access to Obstetrical Care in Rural Areas: Effect on Birth Outcomes. No. 4, July, 1989.

5. Schleuning, Dianne; Rice, George; and Rosenblatt, Roger A. Addressing Barriers to Rural Perinatal Care: A Case Study of the Access to Maternity Care Committee in Washington State. No. 5, October, 1989.

6. Rosenblatt, Roger A.; Whelan, Amanda; and Hart, L. Gary. Rural Obstetrical Access in Washington State: Have We Attained Equilibrium? No. 6, January, 1990.

Forthcoming:

7. Rosenblatt, Roger A; Weitkamp, Gretchen; Lloyd, Michael; Schafer, Bruce; Winterscheid, Loren C.; Vaughn, J. Daniel; and Hart, L. Gary. Are Rural Family Physicians Less Likely to Stop Practicing Obstetrics Than Their Urban Counterparts: The Impact of Malpractice Claims.

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