Rural and Urban Differences in Physician Resource Use for Low-Risk Obstetrics

L. Gary Hart, Sharon A. Dobie, Laura-Mae Baldwin, Michael J. Pirani, Meredith Fordyce, and Roger A. Rosenblatt

Objective. To explore the hypothesis that rural obstetricians (OBs) and family physicians (FPs) utilized fewer resources during the care of the low-risk women who initially booked with them than did their urban counterparts of the same specialties.

Data Sources/Study Design. A stratified random sample of Washington state rural and urban OBs and FPs was selected during 1989. A participation rate of 89 percent yielded 209 participating physicians. The prenatal and intrapartum medical records of a random sample of the low-risk patients who initiated care with the sampled providers during a one-year period were abstracted in detail and analyzed with the physician as the unit of analysis. Complete data for 1,683 patients were collected. Resource use elements (e.g., urine culture) were combined by standardizing them with average charge data so that aggregate resource use could be analyzed. Intraspecialty comparisons for resource use by category and overall were performed.

Findings/Conclusions. Results show that rural physicians use fewer overall resources in caring for nonreferred low-risk–booking obstetric patients than do their urban colleagues. Resource use unit expenditures showed the hypothesized pattern for both specialties for total, intrapartum, and prenatal care with the exception of FPs for prenatal care. Approximately 80 percent of the resource units used by each physician type were related to hospital care. No differences were shown in patterns of care for most clinically important aspects of care (e.g., cesarean delivery rates), and no evidence suggested that outcomes differed. The overall differences were due to specific components of care (e.g., fewer intrapartum hospital days and less epidural anesthesia).

Key Words. Obstetrical care, practice variation, family physicians, obstetricians, rural

Obstetric care is one of the most common clinical services provided in the United States. The rural or urban residence of a woman has little bearing on her need for obstetric services to ensure a safe delivery for mother and baby alike. In recent years, rural American communities have gone to great lengths to retain their ability to provide obstetric care, a service that has been

threatened by the decision of many rural physicians to discontinue practicing obstetrics.

The major argument for retaining local rural obstetric services has been patient convenience. It is both difficult and costly for rural women to travel to distant providers for a routine service such as obstetrics. This argument has been bolstered by research that supports the safety of rural obstetric care when delivered within the context of a regionalized system (Black and Fyfe 1984; Gortmaker, Clark, Graven, et al. 1988; Hein 1980; Rosenblatt et al. 1988), and by evidence that suggests that the absence or loss of local obstetric services may lead to worse obstetric outcomes (Nesbitt et al. 1990). Although we know that rural obstetric systems are comparable in many ways to their urban counterparts, we know little about how rural physicians differ systematically from their urban peers in terms of the services they provide their patients. The literature is replete with descriptions of poor access to needed medical care providers and technology in rural areas (e.g., U.S. Congress 1990). However, there is limited and mixed evidence, but much hearsay, to the effect that rural residents often receive inadequate medical care in comparison to their urban counterparts because the former receive too little care or care of poor quality from their local providers. For instance, it has been shown that rural women nationally are more likely to receive inadequate prenatal care as measured by the Kotelchuck Index (Larson, Hart, and Rosenblatt 1995).

This research project was designed to examine rural-urban variations in the clinical approach to obstetric care of obstetricians and family physicians, the two physician specialties that account for over 97 percent of physician prenatal care in the United States (Rosenblatt, Mayfield, Hart, et al. 1995). The purpose of this study is to test the hypothesis that rural physicians within a specialty expend fewer total resources (e.g., on visits, tests, procedures)

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than their urban counterparts during prenatal and intrapartum care to similar populations of low-risk women. The study describes variations in the care patterns between rural and urban physicians within Washington state. As the analysis information base we used retrospective physician office and hospital chart abstractions of low-risk pregnant women who initiated care with the study physicians.

For whom do rural-urban variations in medical care hold some significance? Detsky (1995) recently noted that during this time of rapid managed care expansion, patients, managed care administrators, and physicians all have important reasons to care about variations in care. Accordingly, policymakers must also be concerned. The growing literature on variations in clinical practice provides the basis for a better understanding of differences in clinical care in terms of process, outcome, and cost as they relate to variations in patient, practice, provider, and environmental characteristics. Identifying and understanding such clinical variations are necessary steps for developing a more effective medical care system. The first step is to determine and identify any meaningful variations in the provision of care that are not explained by patient case mix. The second step is to determine the reasons for the variations and their consequences. The aim of this study is tied to the former with respect to the obstetrical care of low-risk women.

By way of background, it was shown for Washington state that the rural resident population had overall obstetrical outcomes similar to those of their urban counterparts (Larson, Hart, and Rosenblatt 1992) and that no differences in outcomes were noted for less complex surgical procedures, including cesarean deliveries (Welch et al. 1992). It was further shown that Washington state has a highly developed regionalized perinatal care system (Rosenblatt et al. 1988) and that nearly all prenatal and intrapartum technologies are available in both rural and urban hospitals (Rosenblatt, Sanders, Tressler, et al. 1994). Washington rural physicians were shown not to differ significantly from their urban counterparts in terms of their obstetrical malpractice experience (Baldwin, Larson, Hart, et al. 1991). However, it also was shown that rural communities with limited access to care produce higher perinatal costs (Nesbitt et al. 1990; Nesbitt et al. in press).

METHODS

The information for this study came from a stratified random sample of rural and urban obstetricians and family physicians in Washington state. Patient

information came from a retrospective abstraction of prenatal and intrapartum obstetric records for patients who initiated care between September 1, 1988, and August 31, 1989. These women delivered between February 10, 1989, and April 26, 1990. Patient data were aggregated to the physician for this study's analyses (i.e., the physician is the unit of analysis).

PHYSICIAN SAMPLING LISTS

The sampling frames were created from rosters of all general and family physicians, obstetricians, and obstetrician-gynecologists maintained by the major relevant professional organizations in the state, including the Washington State Medical Association, the Washington Academy of Family Physicians, the Washington Chapter of the American College of Obstetricians and Gynecologists, and the Washington State Obstetrical Association. Physicians were divided into groups based on their geographic location and specialty. General and family physicians were considered to be one specialty (henceforth referred to as FPs) as were obstetricians and obstetrician-gynecologists (henceforth referred to as OBs). Urban practice locations were defined as those within counties designated as Metropolitan Statistical Areas (MSAs) by the Office of Management and Budget (Butler 1990). All other counties were considered rural. By this definition, 11 of Washington's counties were urban and 28 were rural. The study identified 1,951 physicians: 69 rural OBs; 461 urban OBs; 287 rural FPs; and 1,134 urban FPs.

SELECTING THE PROVIDER SAMPLE

Power Considerations and Sample Size. The variable used in the power calculations was the total charge for obstetric care. We set the sample size to detect a difference of $500 per patient between strata for a one-tailed significance test with 95 percent confidence and a power of 0.80. To achieve this power requires approximately 60 physicians in each physician stratum of the sample (i.e., urban OBs, rural OBs, urban FPs, and rural FPs).

Sample Frame and Selection. Of the 1,951 physicians identified in Washington state, we randomly selected physicians by stratum for inclusion in the study based on our prediction of eligibility and participation rates. In order to be eligible for the study, a physician had to personally attend a minimum of ten births during calendar year 1988, be in practice, be locatable, and be in the same stratum as sampled. After a telephone screening that determined eligibility, we approached 235 physicians, requesting their participation in the study: 33 rural OBs (all who were eligible), 70 urban OBs, 68 rural FPs, and 64 urban FPs.

PROVIDER RECRUITMENT AND PARTICIPATION RATE

To attain high rates of participation, we created a physician encouragement network using the methods developed by Kosecoff (Kosecoff, Kanouse, Rogers, et al. 1987). We established a policy advisory board composed of state obstetric care leaders representing the physician specialties of this study and certified nurse midwife. Project staff, working with the Policy Advisory Board, then created and trained a policy encouragement network of influential, obstetrically active clinicians throughout the state representing the two specialties and geographic areas of interest. The physicians of the policy advisory board contacted the sampled physicians and urged them to participate.

The overall participation rate was 89 percent (88 percent [29] of the rural OBs, 77 percent [54] of urban OBs, 99 percent [67] of the rural FPs, and 92 percent [59] of the urban FPs). The burden of performing the patient abstractions was far greater in the offices of the OBs than for the FPs, which may explain why their participation rates were lower. Rural and urban OBs averaged 101 and 114 booking patients whereas the comparable averages for the FPs were 25 and 28. The 209 participating physicians represented 88, 24, 65, and 18 percent of their respective estimated statewide in-scope populations. While the 29 rural OBs were far fewer than the target of 60, they did include nearly 90 percent of the state's entire in-scope population. Demographic and practice information was acquired for each provider by mail questionnaire with a telephone follow-up. Information was obtained on all physicians and their practices for nearly all data items.

SELECTION OF PATIENT SAMPLE AND INFORMATION COLLECTED

Information was collected by trained medical abstractors working within the offices of the participating physicians and in the inpatient facilities where their patients delivered. The abstraction instruments were reviewed by study staff and policy advisory board members, pretested on physicians not selected for the study, and revised accordingly. In order to determine which patients met the inclusion criteria for the detailed patient information extraction, a roster was created of all patients who initiated obstetric care (i.e., had an obstetric booking visit) with participant physicians (i.e., index physicians) during the study year. Physicians almost universally schedule booking visits of extended duration to initiate their obstetric care of women (e.g., prenatal screening, history taking, and obstetrical file opening). Women usually have had their

pregnancies confirmed by a test before their obstetric booking visit. Women were excluded from this study if (1) they were originally referred to the index physician by another provider because of medical problems, (2) they began their obstetric care with a provider other than the index physician, or (3) they were referred by the index physician to another provider at the time of the booking visit (i.e., the index physician did not take responsibility for obstetric care). Demographic and risk information were collected on the 12,450 obstetric patients who initially booked with participants during the one-year study period.

These data were then used to determine the risk status of each patient at the completion of her initial booking visit. Only patients deemed low-risk were eligible for inclusion in the study. Low-risk was defined as patients with the following characteristics: (1) ages 18 through 34; (2) insured (private or Medicaid); (3) first prenatal visit before 15th week of pregnancy (during first trimester); (4) not more than three previous live births; (5) no previous stillbirths; (6) not more than four previous spontaneous abortions before 14 weeks gestation; (7) no previous births of less than 36 weeks gestation; (8) no previous cesarean delivery; (9) no history of alcohol or drug abuse; (10) no other previous serious obstetric-related complications (such as gestational diabetes and preterm labor); and (11) no history of a concurrent major medical condition (for instance, hypertension and asthma). These criteria were developed by the study staff and policy advisory board based on what was available in the medical record at the time of a booking visit, the objectives of the study, experience, and examination of the literature.

The objective was to abstract 11 complete patient charts for each physician or all of the eligible charts if there were fewer than 11 available. Patients were randomly selected from among each physician's low-risk patients. If during the course of prenatal chart abstraction the abstractor determined that a record was not complete through delivery, then that record was excluded and an additional eligible prenatal chart was randomly selected. When the prenatal care abstractions were completed, the inpatient facility delivery records were also abstracted.

In total, 1,942 of the 5,385 low-risk charts were selected for abstraction, of which 1,683 (87 percent) were complete and included in this study (rural OBs, 308; urban OBs, 552; rural FPs, 424; and urban FPs, 399). On average, rural and urban OBs had approximately ten complete record abstractions while FPs had six. If complete prenatal and intrapartum charts were not available, the abstractor attempted to determine the reason. For the 259 incomplete records the reasons were as follows: miscarriage (3.9 percent), patient changed

provider (3.3 percent), patient moved (1.8 percent), incomplete information (0.3), and induced abortion (0.3 percent). In addition, 1.4 percent of the charts terminated without explanation, and for 2.4 percent of the cases the hospital intrapartum record could not be located. None of the reasons for losing complete records varied meaningfully across physician strata. Interestingly, urban OBs was the group with the highest rate of incomplete records owing to provider change. In addition, comparisons of the prenatal care provided during the first prenatal visit did not differ meaningfully between those women with complete records and those with incomplete records.

All in-scope physicians with none or a single low-risk woman qualifying for the study during the study year were excluded because of the potential volatility and bias introduced into the analyses (e.g., outlier patients would not have their influence ameliorated through averaging). Thus, six rural and five urban FPs and their patients were excluded from further analysis.

All pertinent data in the patients' prenatal and intrapartum charts were abstracted and entered into the study database. For instance, the number and timing of all patient visits were included as well as detailed information on each diagnostic test and therapeutic procedure. In addition, Washington state birth certificate information, which included information on infant deaths during the first year of life, was matched to the study data. These data were matched to provide information on infant mortality.

CREATION OF STANDARDIZED RESOURCE USE UNITS

In order to compare the intensity of resources used across the various study strata, we created standardized resource use units to measure the care rendered to each patient. The standardized resource use units were constructed by taking the Blue Cross of Washington mean charge (Becker 1993; Stamm 1990) for each specific resource use item (e.g., laboratory test and physician visit) for the study period and aggregating these charges for each patient in accordance with the resources each patient received. Mean charges for some aspects of resource use (e.g., daily hospital room charge) were obtained–when Blue Cross information was unavailable–from analysis of the 1989 Commission Hospital Abstract Recording System (CHARS) data of the Washington State Department of Health. CHARS contains 100 percent of the state abstracts for hospital discharges and includes information on diagnoses and charges by hospital cost center. The resource use units were divided by a constant so that they would not be mistaken for actual charges. All resource use items were calculated individually with no bundling of service charges. The standardized resource use unit is neither the true cost of the care

rendered, nor is it the actual charges imposed by the physician; rather, it is an approximation of the general cost of care. The use of the standardized resource use units essentially adjusts for differences in charging and pricing practices. The method does not compensate for actual differences in the cost of producing a service (e.g., specific tests may be more costly or less expensive to produce in a rural locality).

The standardized resource use units are reported for the prenatal and intrapartum periods and are reported by various categories of resources that are explained as they are presented. This was necessary because literally hundreds of labs, tests, procedures, and other resources were being analyzed. The exact composition of the categories is available from the authors upon request. Micro analysis of the specific resource information was performed but was often problematic because of the large number of different items, their substitutability and complementarity, and their non-exclusiveness (e.g., many tests subsumed others or were performed as panels that included combinations of tests). Resource units were aggregated for each patient without respect to whether the index physician personally provided or ordered the service.

STATISTICS

The results for all patients managed by an individual physician are summed and averaged for each physician. Because the physician is the unit of analysis in this study, standard tests of statistical significance (e.g., *t*-tests and chi-square tests) were applied with a .05 significance criterion when making intraspecialty rural-urban comparisons. The study objectives necessitated that one-tailed tests be performed related to total prenatal, total intrapartum, and overall standardized resource use units; that is, it was hypothesized that within specialty urban physicians would use more resource use units than their rural counterparts. In all other cases, two-tailed tests were applied because there were no directional hypotheses about specific services. For instance, some services might be used more but result in less overall resource use. While there were data for only 29 rural OBs and they represented nearly 90 percent of their population, finite population adjustments were not made in calculating the statistical significance of differences although significance levels at the .10 level were reported.

Because the sampling methodology was based on a stratified random sample of physicians wherein physicians from different strata had differential probabilities of being sampled and of participating, weights were constructed for each physician stratum by taking the reciprocal of the estimated ratio of the study participants to the associated in-scope population. These weights were

then applied to the data to produce overall in-scope population estimates for Washington state. Urban OBs represented 32 percent of the state's in-scope physicians and urban FPs represented 48 percent, while their rural counterparts represented 5 and 15 percent, respectively. In terms of all of the booking women for whom these physicians cared, the urban OBs are estimated to have cared for 64 percent and urban FPs for 21 percent, while rural OBs and FPs cared for 8 percent and 7 percent. The corresponding estimates for the low-risk women are 68, 20, 7, and 5 percent. The differences between the estimated percentages of physicians and of patients by stratum are a consequence of the OBs averaging far more patients than the FPs.

RESULTS

PHYSICIAN AND PRACTICE CHARACTERISTICS

Small differences were found between rural and urban physicians within specialty (Table 1). Significantly fewer rural FPs were board certified than their urban counterparts.

As shown in Table 2, there were several significant intraspecialty differences between rural and urban physician practices. Rural OBs were more likely to be in multi-specialty groups and less likely to be in single-specialty groups when compared to their urban OB counterparts. Rural FPs were far more likely than urban FPs to be in private practice, with more of the latter involved in health maintenance organizations and hospital or university clinics. Rural physicians of both specialties shared call with fewer other

Table 1: Physician Characteristics

	Obstetricians		*Family Physicians*	
	Rural	*Urban*	*Rural*	*Urban*
Age (mean)	46.7	45.8	42.4	40.8
Female (%)	10.3	20.4	11.5	18.5
Residency completed (%)	96.6	100.0	87.9	94.4
Board certified (%)	89.7	96.3	90.2**	100.0
Years practicing medicine (mean)	18.4	18.9	15.9	13.9
Years practicing at current location (mean)	10.3	12.0	11.2	9.5
Years practicing obstetrics (mean)	12.8	13.8	11.5	10.2
Number of physicians	29	54	61	54

Statistical significance of differences between rural and urban within specialty:
*$p \leq .10$; **$p \leq .05$; ***$p \leq .01$; ****$p \leq .001$.

Table 2: Physician Practice Characteristics

	Obstetricians		*Family Physicians*	
	Rural	*Urban*	*Rural*	*Urban*
Practice Type (%)				
Solo	31.0	27.8	11.5**	25.9
Single-specialty group	27.6**	51.9	52.5	46.3
Multi-specialty group	41.4*	20.4	36.1	27.8
Practice Arrangement (%)				
Private practice	96.6	92.6	95.1****	72.2
Health maintenance organization	0.0	3.7	0.0**	11.1
Hospital or university clinic	0.0	3.7	0.0*	5.6
Community clinic	3.5	0.0	4.9	11.1
Reimbursement Type (%)				
Salary only	17.2*	35.2	8.2	18.5
Salary and production	27.6	25.9	32.8**	14.8
Production only	55.2	38.9	59.0	66.7
Providers with whom obstetric call is shared (mean)	2.2****	4.0	3.1**	4.0
Patients Per Year				
1989 prenatal care	147.2	153.6	35.4*	47.4
1989 deliveries	161.3	153.5	34.9	44.3
Total initial booking (study period)	101.4	114.0	29.5	27.0
Total low-risk booking (study period)	39.3***	55.6	9.7	11.8
Number of physicians	29	54	61	54

Statistical significance of differences between rural and urban within specialty:
*$p \leq .10$; **$p \leq .05$; ***$p \leq .01$; ****$p \leq .001$.

Note: Resource units may not seem to total 100 because of rounding.

providers than their urban counterparts. Although most of the differences are not statistically significant, rural physicians reported fewer patients per year in all of the various tabled categories than did urban physicians, with the exception that rural OBs had slightly more deliveries than urban OBs. Rural OBs had significantly fewer low-risk booking patients than their urban counterparts.

PATIENT PROFILES OF PHYSICIAN PRACTICES

Rural and urban differences in patient characteristics were generally inconsequential (Table 3). Rural OBs on average had a slightly younger average patient profile than their urban counterparts. For rural OBs and FPs, the average percentage of Medicaid patients was significantly higher than for their urban counterparts although the FP difference was much more

Table 3: Patient Characteristics of Physicians' Practices

	Average Physician Estimates†			
	Obstetricians		*Family Physicians*	
Patient Characteristics	*Rural*	*Urban*	*Rural*	*Urban*
Sociodemographic Characteristics				
Age (mean)	25.4****	26.9	25.5	25.4
% Not married	13.8	13.2	21.2	16.6
% Nonwhite	10.7	14.1	10.9	13.3
% Medicaid	15.4****	11.5	29.2***	16.4
Obstetrical Characteristics				
Gravidity (mean)	2.1*	2.3	2.2**	2.1
Parity (mean)	.68	.74	.78*	.66
% Nulliparous	31.6	29.1	31.0*	36.9
Number of physicians	29	54	61	54

Statistical significance of differences between rural and urban within specialty:
*$p \leq .10$; **$p \leq .05$; ***$p \leq .01$; ****$p \leq .001$.

† Patient data were averaged for each physician and then averaged by physician type.

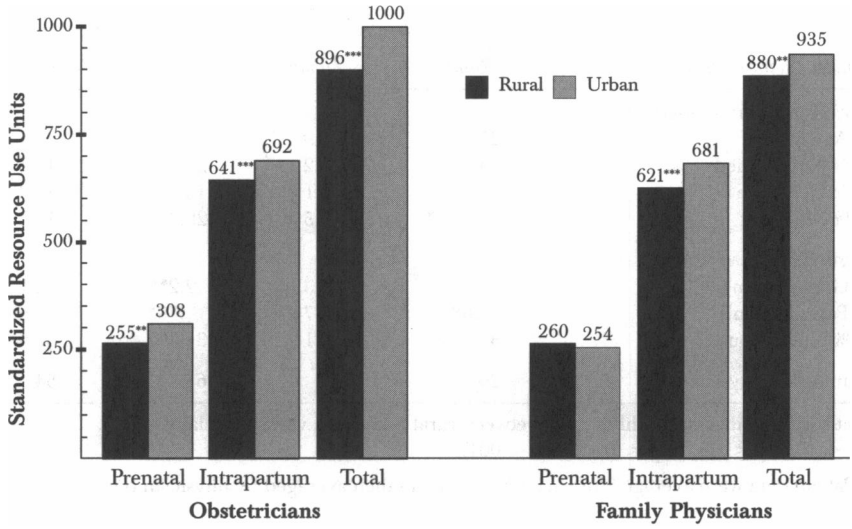
meaningful. Differences in obstetrical characteristics were small and not clinically meaningful.

RESOURCE USE

Figure 1 shows the resource use results with respect to the standardized resource use units for prenatal, intrapartum, and total care by specialty and rural or urban status. As can be seen, total resource use was significantly greater for urban OBs than for rural OBs for prenatal, intrapartum, and total care. Overall, urban OBs employed 10.4 percent more resource units (21 percent more prenatal and 8 percent more intrapartum) in their care of in-scope women than did their rural counterparts. Urban FPs similarly employed more overall total and intrapartum resources than did their rural equivalents (i.e., 6 percent and 10 percent more), but the prenatal difference was not significant (2 percent less). Each of the four physician groups, on average, had close to 70 percent of their total standardized resource use units expended during the intrapartum period. However, even when aggregate resource use is similar, there still can be substantial differences in the patterns of care.

Prenatal Resource Use. The mean use of resource use units by category for prenatal care is shown in Table 4. There were no significant rural and

Figure 1 Mean Physician Resource Use by Specialty



Statistical significance of differences between rural and urban within specialty (one-tailed *t*-tests): $*p \leq .10$ $**p \leq .05$ $***p \leq .01$ $****p \leq .001$

Number of physicians: rural OBs, 29; urban OBs, 54; rural FPs, 61; and urban FPs, 54.

Table 4: Prenatal Resource Use

	Average Physician Resource Unit Use†			
	Obstetricians		*Family Physicians*	
Resource Use Categories	*Rural*	*Urban*	*Rural*	*Urban*
Physician visits	93**	89	89*	92
Consults and referrals	2**	3	1***	3
Prenatal hospital resources	75**	129	101	74
Ultrasounds	38	34	27	32
Tests of fetus	6	10	4	5
Basic labs/screening	33	31	30****	37
Blood and urinalysis tests	2**	3	1***	3
Hematology tests	4***	6	4****	6
Other labs and tests	2	4	2	3
Total	255**	308	260	254
Number of physicians	29	54	61	54

Note: Resource units may not seem to total 100 because of rounding.

Statistical significance of differences between rural and urban within specialty: $*p \leq .10$; $**p \leq .05$; $***p \leq .01$; $****p \leq .001$.

† Patient data were averaged for each physician and then averaged by physician type.

urban differences in resource use units for OBs for the ultrasounds, tests of fetus (e.g., fetal lung maturity), basic labs/screening tests (e.g., one-hour glucola), and other labs and tests (e.g., gardnerella) categories. Rural OBs averaged significantly fewer resource use units than urban OBs related to the physician visits (12.4 versus 13.1 in terms of actual mean visits); consults and referrals (.1 versus .2 mean visits); prenatal hospital resources; blood and urinalysis tests (blood urea nitrogen, creatinine, uric acid, thyroid, and mini panel tests each significantly differed); and hematology tests (complete blood count [CBC] and platelet tests each significantly differed) categories. In terms of absolute differences in actual use of tests, the largest of the rural-urban mean differences for the statistically different tests of the latter two categories were: CBC (1.08 versus 1.39 mean tests) and platelet (.03 versus .14 mean tests). Much of the overall prenatal difference was the result of resource use associated with the prenatal hospital resources category (75 versus 129 resource use units).

Table 4 also shows the differences between rural and urban FPs with respect to prenatal resource use. Rural FPs averaged fewer resource use units than urban FPs for every category except prenatal hospital resources. In terms of actual prenatal visits, rural FPs averaged 12.7 while urban FPs averaged 13.2 ($p = .067$). Rural FPs used significantly fewer resources for the consults and referrals (.06 versus .18 mean visits); basic labs/screening tests (hepatitis screen, chlamydia, gonorrhea/gonococcus, and Pap tests each significantly differed); blood and urinalysis tests (albumin, alkaline phosphotase, mini panel, uric acid, max chem tests each significantly differed); and hematology tests (differential and platelet tests each significantly differed) categories. In terms of absolute differences in actual use of tests, the largest of the rural-urban mean differences for the statistically different tests of the latter three categories were as follows: differential (.22 versus .74 mean tests), chlamydia (.32 versus .66 mean tests), and gonorrhea/gonococcus (.34 versus .62 mean tests). As stated before, the difference between mean rural and urban total prenatal resource use was not statistically significant. The prenatal hospital resource category had a large difference and was not quite significantly different ($p = .136$) because of its large variance and limited cases, which were not associated with large outliers.

Intrapartum Resource Use. Differences in total intrapartum resource use units between rural and urban OBs and FPs were highly significant (Table 5). Rural OBs expended fewer average resources for the hospital daily bed (3.0 versus 3.4 for mean length of stay days); anesthesia (combined anesthesia provider and anesthesia); and lab, test, and procedure (herpes culture; cervical

Table 5: Intrapartum Resource Use

	Average Physician Resource Unit Use†			
	Obstetricians		Family Physicians	
Resource Use Categories	Rural	Urban	Rural	Urban
Hospital daily bed	198****	222	193****	223
Operating room	19	15	15	17
Other hospital services	168	165	165	166
Anesthesia	29****	63	26****	51
Episiotomies	26****	21	23	20
Labs, tests, and procedures	8***	12	8	9
Provider resources	194	193	190	195
Total	641***	692	621***	681
Number of physicians	29	54	61	54

Note: Totals may not seem accurate because of rounding.

Statistical significance of differences between rural and urban within specialty:
*$p \leq .10$; **$p \leq .05$; ***$p \leq .01$; ****$p \leq .001$.

† Patient data were averaged for each physician and then averaged by physician type.

culture; hematocrit, creatinine, differential, electrocardiogram tests; catheter insertion; and use of Prostaglandin gel each significantly differed) categories than did urban OBs. In terms of absolute differences in actual use of tests, the largest of the rural-urban mean differences for the statistically different tests for the lab, test, and procedure category were as follows: catheter insertion (.22 versus .33 mean insertions) and differential (.10 versus .38 mean tests). Clearly, the most important of these differences involved the hospital daily bed and anesthesia resource categories (differences of 120 and 184 resource use units). Rural OBs performed significantly more episiotomies than did urban OBs (.69 versus .56 per patient). No significant differences in resource use units were expended with respect to the operating room, other hospital charges (e.g., medical and surgical supplies), and provider resources (e.g., delivery method and hospital days of care) categories.

Rural and urban FPs differed significantly on only two of the resource use categories. Rural FPs used fewer resource units connected with the hospital daily bed (2.9 versus 3.4 for mean length of stay days) and anesthesia categories.

Of course, the differences in Table 5 are associated with rural and urban intraspecialty differences in physician labor and delivery behavior. There were no meaningful differences in presentation type (e.g., breech and transverse), but several other aspects of labor and delivery are exceedingly

Table 6: Labor and Delivery Characteristics

	Average Physician Estimates†			
	Obstetricians		*Family Physicians*	
	Rural	*Urban*	*Rural*	*Urban*
Labor Type (%)				
Spontaneous	66.1**	55.8	65.6*	58.8
Induced	11.8***	20.9	14.0	13.7
Augmented	19.2	21.0	17.7**	26.3
No-labor cesarean delivery	2.9	2.3	2.6	1.2
Delivery Type (%)				
Normal vaginal	68.4	65.0	75.1	70.4
Forceps	5.0***	11.5	2.7**	6.6
Vacuum	10.0	9.9	8.3	7.9
Cesarean delivery	16.7	13.6	13.9	15.1
Vaginal Deliveries‡ *(%)*				
Local	79.6****	47.6	78.3***	61.4
Epidural	7.0****	44.7	10.0****	34.4
Pudendal	17.0**	7.0	10.3*	4.8
Spinal	.4	.9	.4	.0
General	.3	.2	.2	.0
Other anesthesia	1.4	1.7	2.8	2.2
None	1.7**	5.0	4.9	6.0
Cesarean Deliveries‡ *(%)*				
Local	.0	2.4	8.1	6.3
Epidural	4.8****	70.3	20.3****	74.5
Pudendal	.0	.0	.0	.0
Spinal	63.7****	21.1	57.9****	22.4
General	28.7***	5.7	22.4***	7.8
Other anesthesia	2.4	.0	5.4	3.1
Number of physicians	29	54	61	54

Note: Totals may not seem accurate due to rounding.

Statistical significance of differences between rural and urban within specialty:
*$p \leq .10$; **$p \leq .05$; ***$p \leq .01$; ****$p \leq .001$.

† Patient data were averaged for each physician and then averaged by physician type.

‡ Percents can add to more than 100 percent because more than one anesthesia type could be administered.

relevant. For both OBs and FPs, rural practitioners on average had significantly more spontaneous labors and fewer induced labors (Table 6). Rural FPs also had significantly fewer augmented labors and rural OBs had fewer induced labors. Forceps were significantly less likely to be used by the average

rural OB and FP. There were no significant rural-urban differences in the rate of cesarean deliveries.

Finally, there were substantial and systematic rural-urban differences in the use of anesthesia for both OBs and FPs (Table 6). For both specialties, rural physicians were significantly more likely to use local and pudendal and less likely to use epidural anesthesia during their vaginal deliveries. For cesarean deliveries for both specialties, rural physicians on average provided far fewer epidurals and more spinal and general anesthesia than their urban counterparts.

Interestingly, variation was significant with regard to the propensity of index physicians to deliver their initially booked women personally. On average, index rural OBs were more likely to deliver their booked patients themselves than were their urban counterparts (80.5 versus 59.6 percent). The pattern for rural FPs was similar but of less magnitude and not statistically significant (72.4 versus 67.6 percent). Not surprisingly, for all four physician groups those in solo practice were much more likely to deliver their study patients.

Table 7: Obstetrical Outcomes

	Average Patient Characteristics†			
	Obstetricians		*Family Physicians*	
	Rural	*Urban*	*Rural*	*Urban*
Birthweight (mean grams)	3,450	3,475	3,500	3,489
Birthweight < 2500 grams (%)	5.2	4.6	2.7	3.9
Birthweight > 4000 grams (%)	10.4*	15.6	14.1	16.2
Gestational age (mean weeks)	39.9***	39.5	39.7	39.7
Gestational age < 37 weeks (%)	2.9*	5.3	3.8	4.1
Gestational age > 41 weeks (%)	7.8*	5.1	8.9	8.4
5-minute Apgar (mean)	9.0**	8.8	9.1***	8.9
Apgar less than 7 (mean %)	96.8	96.9	98.2	97.1
Live births‡ (mean %)	100.0	99.8	99.8	99.4
Infant mortality§(mean %)	0.0	.6	.8	.4
Number of physicians	29	54	61	54

Statistical significance of differences between rural and urban within specialty:
*$p \leq .10$; **$p \leq .05$; ***$p \leq .01$; ****$p \leq .001$.

† Patient data were averaged for each physician and then averaged by physician type.

‡ Overall there were four non-live births for 1,672 hospital births.

§ Percentages are based on those infants that were matched with the linked birth/death certificates. Overall there were nine infant deaths during the first year after live birth out of 1,593 matched births.

OUTCOMES

Although this study was not designed with the statistical power to be an outcome study per se, outcomes measures were collected with respect to the study births. There was almost no rural-urban intraspecialty difference in percentage of live births, infant mortality, births with an Apgar greater than seven, and several measures of gestational age and birthweight (Table 7). In fact, average rural FP mean birthweight was only 11 grams different from that of the average urban FP and only 25 grams between OB groups. Three other rural-urban differences are significant at the .05 level but the differences are relatively small and not meaningful.

SUPPLEMENTAL ANALYSES

Although this study limited the patients to initially booking low-risk women, it remains possible that the rural-urban differences just described are a function of differences in the risk status of the study women. Only 43.1 percent of the booking women were eligible for the study after the risk screens were applied. Nevertheless, some criteria that would have been used to determine the risk status of the women were found to be not routinely included in the medical records and, accordingly, were not utilized. Consequently, several analyses were performed to further control for factors that may have biased this study's results. It was found that the patterns of prenatal, intrapartum, and total overall resource use were very similar to those presented here when the analyses were constrained to include only women who were non-Medicaid, white, ages 20 through 29, and/or non-nulliparous. In addition, other analyses were performed that examined the data separately by delivery method (i.e., normal vaginal delivery, instrumental delivery, and cesarean delivery). Subsequent analyses were also performed using the patient as the unit of analysis, and consequently a slightly different study question was asked (one that controlled for patient, physician, and practice factors) (Dobie, Hart, Fordyce, et al. 1995). In all of these additional analyses, the results presented earlier proved to be remarkably robust. The lack of differences in outcomes is further evidence that the patients were comparable.

DISCUSSION

The findings of this study support the hypothesis that rural physicians use fewer overall resources in the care of non-referred low-risk obstetric patients than do their urban colleagues. In fact, unit expenditures for resource use

showed the hypothesized pattern for both specialties for total, intrapartum, and prenatal care, with the exception of FPs for prenatal care. Close examination of the differences in resource use reveals that these overall differences are generally not the result of an across-the-board difference in the use of all resources by urban physicians when compared to rural physicians. Instead, the differences were confined to certain components of care, as described earlier.

Notwithstanding the presence of findings that generally support the study hypothesis, it is important to recognize the similarity in resource use between rural and urban physicians. For the majority of resource components of care, only small unit differences for intraspecialty standardized resource use were noted between rural and urban physicians. This was so despite measured and unmeasured differences in the physicians, their practice situations and incentives, and their environments. Even some of the statistically significant differences were not large. In addition, no differences appeared in patterns of care for many clinically important components of care (e.g., cesarean delivery rates), and there was no evidence that outcomes differed. The outcome finding is substantiated by an earlier study (Larson, Hart, and Rosenblatt 1992).

Each of the four physician groups, on average, expended close to 70 percent of the total standardized resource use units during the intrapartum period. Depending on the physician group, an additional 8 to 13 percent of the average total resource use units were associated with prenatal hospital visits (e.g., overnight hospital stays). Hence, only approximately 20 percent of the average resource use units expended were used outside the hospital. Only about 10 percent of the resource use units were utilized on prenatal physician visits, excluding the associated labs and tests. These findings are affirmed by data from a recent study of the payments and costs of obstetric care (Long, Marquis, and Harrison 1994).

For prenatal care, most of the rural-urban differences for OBs were accounted for by resource use connected with visits to the hospital, although there were small significant differences for consults and referrals, blood and urinalysis tests, and hematology tests. Rural FPs did not differ in their overall prenatal resource use from urban FPs. Nonetheless, rural FPs used fewer resources for selected prenatal categories. For example, rural FPs performed substantially fewer hepatitis screen, chlamydia, and gonorrhea/gonococcus tests than urban FPs. Whether this reflects a difference in quality of care cannot be determined from these data. The observed differences could simply reflect the more intimate personal knowledge that rural FPs have of their patients and area, or it could reflect a more haphazard practice style caused

by the hectic demands of small town rural practice or a list of other factors including inadequate training.

However, another study of these data that concentrated on whether providers adhered to recommended obstetric guidelines of the American College of Obstetrics and Gynecology (ACOG) (American Academy of Pediatrics and American College of Obstetricians and Gynecologists 1988; American College of Obstetricians and Gynecologists 1959) showed that adherence to the recommended testing protocols generally was good and that, in general, little difference related to guideline recommendation adherence was found between rural and urban physicians (Baldwin, Raine, Jenkins, et al. 1994). While there were small differences for most of the recommended prenatal lab tests, rural OBs and FPs did record performing significantly fewer prenatal Pap smears than did urban OBs and FPs. Larger differences in average testing behavior were apparent only with regard to tests that were suggested but not recommended by ACOG (such as the test for Chlamydia). Thus, little systematic rural-urban difference in adherence to ACOG recommendations was found.

The rural versus urban differences in resource use during intrapartum care were significant for both OBs and FPs. In both cases, most of the differences were accounted for by the categories of hospital daily bed resource use and anesthesia resource use. The difference in hospital daily bed resource use is caused by longer length of stay for the patients of urban physicians. The cause of this behavior is not apparent, although it may be related to patient income and insurance coverage. Because the patient populations and outcomes were so similar, there is little evidence to suggest that the urban patients had more pregnancy complications. Other possible explanations for this and other study differences include better social support in rural settings; systematic differences in the expectations and desires of rural and urban women related to social and other conditions; the effects of long geographic distances in rural areas; differences in the quality and appropriateness of the care rendered; differences in the training, personalities, and norms of rural physicians; and differences in the availability of technology and personnel. Explanations of differences in prenatal use of the hospital also may be linked to these and other explanations.

The rural-urban intraspecialty anesthesiology use variations are an important part of the observed disparity in resource use. For both OBs and FPs, rural physicians on average used fewer resource use units than their urban counterparts for anesthesia. Rural physicians were less likely to induce and augment labor and clearly had a different mix of types of anesthesia than

did their urban colleagues. For patients who underwent cesarean deliveries, rural physicians used far fewer epidurals and far more spinal and general anesthetic than did urban physicians. Likewise, for vaginal deliveries there was a dramatically lower rate of epidural anesthetic use by rural than by urban physicians.

One of the more probable explanations of these differences is related to differences between rural and urban places in access to technologies and anesthesia providers. A recent study of hospital-related obstetric technologies in Washington state showed that certain technologies were not available in rural hospitals (Rosenblatt, Sanders, Tressler, et al. 1994). Some rural hospitals may not have the personnel trained to provide epidural blocks or, because of limited personnel, may be less prone to call them in during the night. Thus, rural physicians may differ with respect to their usage of anesthesia type because of differences in what is available to them, and not because of differences in training, competence, or judgment. However, one should not conclude that lower resource use by rural physicians always represents poorer-quality care. For instance, recent studies show that the use of epidural anesthesia is associated with prolonged first and second stages of labor, increased need for oxytocin augmentation, slowing of the rate of cervical dilation, and increased rates of malposition and cesarean delivery (Ramin, Gambling, Lucas, et al. 1995; Thorp, Eckert, Ang, et al. 1991; Thorp, Hu, Albin, et al. 1993).

LIMITATIONS

This study has several limitations. It was performed for one state in one year, so its generalizability may be limited. The results apply only to women who were low-risk at the time of their booking visit. During the data collection, many aspects of health care delivery could not be quantitatively measured from the records. For instance, a prenatal office visit was assigned the same resource units for all physicians in terms of visit duration (tests and therapies were dealt with separately). Likewise, differences in the real costs of producing the care that are related to geographic and practice configuration were measured. In addition, there could be nonrespondent bias by rural-urban status, although the high response rates minimize this danger.

It is also possible that physicians in rural areas differed from urban area physicians in recording information in their charts. For example, it is known that rural FPs work substantially more hours and have more patient visits than urban FPs (American Medical Association 1994), which could result in their keeping less complete records. However, obstetrics is known to be a

clinical area in which rather complete records are kept because of the long history of guidelines and malpractice litigation.

And finally, because the patients were not randomly assigned to the study physicians, it is possible that the observed differences are, in part, the result of patient differences and not physician or practice differences. We have attempted to make the patients of each physician as equivalent as possible while retaining enough of them to make the study meaningful. Supplemental analyses showed that results patterns were not sensitive to excluding different subsets of patients from the analyses. While we feel that the patients are very similar, there is still the possibility of unmeasured differences (e.g., patient preferences for intervention) that are associated with the practice variations reported in this study.

CONCLUSION AND IMPLICATIONS

We have demonstrated that rural physicians practicing obstetrics in Washington state used fewer overall standardized resource units in caring for nonreferred low-risk women than did their urban counterparts. This was found for both OBs and FPs, and there were no apparent differences in outcome. The major source of this difference was somewhat shorter hospital stays and less use of relatively costly obstetrical anesthesia, such as epidural anesthesia for both vaginal and cesarean deliveries, by rural physicians. However, there were many other differences in clinical resource use, some of them probably related to access to resources and personnel. For example, the most likely explanation for the delivery anesthesia variations is that epidural anesthesia is less available in rural hospitals because fewer anesthesia personnel are available. However, other differences (e.g., lower mean of performing chlamydia tests) may be associated with other factors such as inadequate training, heavy workload, and more intimate knowledge of patients and the local population.

We need a better understanding of whether the observed variations make a difference in terms of patient outcomes and costs, starting with the variations that make the largest differences. Guidelines, report cards, and payment incentives should subsequently encourage or discourage the use of particular services based on specific findings. Those involved in these activities must be cognizant of the real world implementation of their findings related to rural populations. The research and policy debates must be broad enough to include all of the relevant outcomes and costs associated with viable alternatives. In addition, the implications of such policies must be

reviewed in terms of their relationship to the preferences, behaviors, and economic well-being of rural populations. In other words, it needs to be clear that ameliorative programs actually produce more effective overall care in a fashion acceptable to the rural population.

Despite the relatively small but statistically significant differences in overall resource use shown in this study, the clinical approach is much more similar than it is different between rural and urban settings. This and the apparent similarity of outcomes seems to be indicative of a generally similar quality of care in rural and urban areas. Creating baseline information on the clinical provision of care is essential if we are to safeguard the quality of care for pregnant rural women in this time of expanding managed care and cost consciousness.

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