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Did Rural Perinatal Care Systems Stay Regionalized Between 1985 and 1997?

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The WWAMI Rural Health Research Center (RHRC) is one of six centers supported by the Federal Office of Rural Health Policy (FORHP), a component of the Health Resources and Services Administration (HRSA) of the U.S. Public Health Service. The major focus of the RHRC is to perform policy-oriented research on issues related to rural health care and the rural health professional workforce. Specific interests of the RHRC include the adequacy of the supply and education of rural health care professionals, and the availability and quality of health care for rural populations, with particular emphasis on access to high-quality care for vulnerable and minority rural populations.

The WWAMI Rural Health Research Center is based in the Department of Family Medicine at the University of Washington School of Medicine, and has close working relationships with the WWAMI Center for Health Workforce Studies, state offices of rural health, and the other health science schools at the University, as well as with other major universities in the five WWAMI states: Washington, Wyoming, Alaska, Montana, and Idaho. The University of Washington has over 30 years of experience as part of a decentralized educational research and service consortium involving the WWAMI states, and the activities of the RHRC are particularly focused on the needs and challenges in these states.

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ABSTRACT

This study used national birth and infant death data to examine whether rural perinatal care stayed regionalized between 1985-87 and 1995-97, or whether rural hospitals were retaining more higher risk mothers and infants as managed care penetrated rural markets and the technological sophistication of small hospital nurseries increased. Birth outcomes among residents of non-metropolitan counties were examined using the national Linked Birth-Death Data Set. County of maternal residence was compared with the county of birth occurrence at a national level and for two rural sub-populations: residents of non-metropolitan counties that did not have a city with a population of at least 10,000 and residents of “persistent poverty” counties identified by the USDA’s Economic Research Service. Results show that women who experienced adverse birth outcomes were much more likely to deliver outside of their county of residence than women who did not have an adverse outcome. Women in less urbanized counties and residents of persistent poverty counties had higher overall rates of non-local delivery, but the proportions of non-local deliveries with adverse outcomes were concomitantly higher as well. There is no evidence from these analyses to suggest that rural perinatal care systems became less regionalized during the period examined.

BACKGROUND

The regionalization of rural perinatal care during the 1980s contributed substantially to decreased neonatal mortality among infants born to rural residents. Using strategies that included pre-delivery transfer of rural women at high risk of premature delivery to tertiary centers, and enhancement of neonatal stabilization skills in rural hospitals, rural/urban gaps in birthweight-specific mortality were largely eliminated.¹⁻⁵ Concern grew in the mid-1990s that the increasing technological sophistication of small hospital nurseries and the penetration of managed care systems into rural areas might decrease timely referral to tertiary hospitals and encourage retention of higher risk mothers and infants at lower level rural hospitals.⁶⁻⁷ This study used national birth and infant death data to examine the question of whether rural perinatal care stayed regionalized between 1985-87 and 1995-97.

METHODS

The national Linked Birth-Death Data Set (LBDDS) was the principal data source used in this study. Only birth records from singleton births to residents of non-metropolitan counties were included in the study. The poor birth outcomes examined in this study are fairly rare events. To ensure that the estimates of poor birth outcome in the rural population were stable, annual files for the years 1985 to 1987, 1989 to 1991, and 1995 to 1997 were aggregated into three files (1985-87, 1989-91, 1995-97). There were approximately 2.1 million births to rural residents in each time period.

To examine the question of whether rural perinatal care systems stayed regionalized during the study period, the county of residence of the mother was compared to the county of birth occurrence. In a regionalized system of perinatal care, it would be expected that births with poor outcomes among rural residents would be more likely to take place outside of the home county, reflecting the pre-delivery transfer of high-risk women to higher level hospitals. A well-regionalized system

of care, therefore, would have a substantially higher concentration of poor outcomes among births occurring outside the home county. The proportions of rural women delivering locally and non-locally were across the three time periods overall, and for births with one of three adverse outcomes: neonatal deaths, low birthweight (<2,500 grams), and very low birthweight (<1,500 grams). We also examined the extent to which women with higher risk status were more likely to deliver non-locally. (There were no risk status data in the 1985-87 data.) In addition to the overall rural population, the extent of regionalization of perinatal care was examined for two rural sub-populations: residents of non-metropolitan counties that did not have a city with a population of at least 10,000 and residents of “persistent poverty” counties identified by the USDA’s Economic Research Service.⁸

RESULTS

POOR OUTCOME AND RISK FACTOR PREVALENCE

Comparisons of rural and urban rates of poor birth outcome during the study period have been discussed in detail elsewhere.⁵ To frame the analysis of regionalization below, raw rates of adverse outcomes and the prevalence of various perinatal risk factors in the rural population are shown in Table 1. Neonatal mortality declined among rural residents during the study period, while the occurrence of low birthweight increased among singletons from 5.6% to 6.1%.

Table 1. Poor Birth Outcomes and Prevalence of Maternal Risk Factors Among Women Resident in Rural Counties of the United States, 1985-87, 1989-91, 1995-97 (Singletons Only)

	1985-87 (n = 2,280,237)	1989-91 (n = 2,185,157)	1995-97 (n = 2,057,822)
Poor outcomes			
Neonatal mortality rate (per 1,000 live births)	5.5	4.8	4.2
% Very low birthweight	0.9	0.9	1.0
% Low birthweight	5.6	5.7	6.1
Risk status			
% Preexisting medical conditions*	—	3.1	3.7
% Complications of pregnancy†	—	7.9	9.4
% Previous pre-term delivery	—	1.5	1.5
% High risk‡	—	11.7	13.7
Overall			
% Poor outcome§	5.7	5.8	6.2
% Poor outcome or high risk	—	15.9	17.9

* Cardiac disease, chronic hypertension, established or gestational diabetes.

† Pregnancy-induced hypertension, eclampsia, oligohydramnios, incompetent cervix, abruptio placenta, placenta previa.

‡ Preexisting conditions and/or complications of pregnancy and/or previous pre-term delivery.

§ Low birthweight and/or neonatal mortality.

|| High risk and/or poor birth outcome.

LOCAL VS. NON-LOCAL DELIVERY—ALL RURAL BIRTHS

Analysis of county of residence compared to county of birth occurrence indicates that women experiencing adverse birth outcome were much more likely to deliver outside of their county of residence than women who did not have an adverse outcome. For example, as shown in Table 2, 40% of the 2.2 million rural women who gave birth in 1985-87 delivered outside of their county of residence. However, 52.1% of the 126,437 rural women who delivered low-birthweight infants delivered outside of their home county, suggesting a higher rate of referral for women at risk of a low-birthweight outcome. Over 69% of the 19,944 very low-birthweight infants were delivered non-locally.

Across the study period, the overall proportion of births to rural residents that occurred outside the county of residence increased from 40.0% in 1985-87 to 46.3% in 1995-97. Among women experiencing any of the three poor outcomes, the rate of non-local delivery increased from 51.8% in 1985-87 to 59.3% in 1995-97.

Women with maternal risk factors and/or complications of pregnancy were somewhat more likely to deliver non-locally than women who did not have those risk factors or complications. Overall, the differences were not as pronounced as they were between women with/without adverse outcomes. Women with previous pre-term deliveries were just about as likely as the overall rural population to deliver non-locally.

Table 2. Local and Non-local Delivery for Rural Women with Adverse Birth Outcome and Maternal Risk Factors, 1985-87, 1989-91, 1995-97 (Singletons Only)

	1985-87		1989-91		1995-97	
	% Local Delivery	% Non-local Delivery	N	% Local Delivery	% Non-local Delivery	N
All rural residents	60.0	40.0	2,280,237	55.8	44.2	2,185,157
Poor outcomes						
Neonatal deaths	45.0	55.0	12,488	40.0	60.0	10,448
Very low-birthweight births	30.8	69.2	19,944	25.6	74.4	20,045
Low-birthweight births	47.9	52.1	126,437	43.5	56.5	124,491
Risk status						
Women with preexisting medical conditions*	—	—	—	49.0	51.0	66,976
Women with complications of pregnancy†	—	—	—	53.7	46.3	172,465
Women with previous pre-term delivery	—	—	—	56.7	43.3	33,777
Women with high medical risk‡	—	—	—	53.2	46.8	256,073
Overall						
Births with poor outcome§	48.2	51.8	130,354	43.7	56.3	127,756
Births with poor outcome and/or high medical risk	—	—	—	51.0	49.0	347,790
				% Local Delivery	% Non-local Delivery	N
				53.7	46.3	2,057,822
				38.3	61.7	8,687
				22.1	77.9	21,094
				40.6	59.4	125,213
				47.1	52.9	76,580
				50.6	49.4	193,059
				53.3	46.7	31,825
				50.3	49.7	282,006
				40.7	59.3	127,684
				48.6	51.4	368,521

* Cardiac disease, chronic hypertension, established or gestational diabetes.

† Pregnancy-induced hypertension, eclampsia, oligohydramnios, incompetent cervix, abruptio placenta, placenta previa.

‡ Low birthweight and/or complications of pregnancy and/or previous pre-term delivery.

§ Low birthweight and/or neonatal mortality.

|| High risk and/or poor birth outcome.

LOCAL VS. NON-LOCAL DELIVERY—RESIDENTS OF LESS URBANIZED RURAL COUNTIES

When the analysis was confined to residents of less urbanized counties (counties without a city of at least 10,000 population), higher overall rates of non-local delivery were observed. In 1985-87, for example, 55.3% of residents delivered non-locally. By 1995-97, 64.9% of deliveries occurred outside home counties. However, the proportions of non-local deliveries with adverse outcomes were concomitantly higher as well. Almost 80% of the 10,884 very low-birthweight infants born in 1985-87 to women from this group were delivered non-locally, as were 66.4% of the 68,699 low-birthweight infants. Women with complications of pregnancy or pre-existing medical conditions were only slightly more likely than the general population to deliver non-locally. Women with previous pre-term deliveries were slightly *less* likely to deliver non-locally than women with no previous pre-term deliveries. (See Table 3.)

Table 3. Local and Non-local Delivery for Rural Women with Adverse Birth Outcome and Maternal Risk Factors in Non-metropolitan Counties with No City Over 10,000 Population, 1985-87, 1989-91, 1995-97 (Singletons Only)

	1985-87		1989-91		1995-97	
	% Local Delivery	% Non-local Delivery	% Local Delivery	% Non-local Delivery	% Local Delivery	% Non-local Delivery
All low urbanization rural county residents	44.7	55.3	37.8	62.2	35.1	64.9
Poor outcomes						
Neonatal deaths	31.5	68.5	27.5	72.5	24.3	75.7
Very low-birthweight births	20.1	79.9	16.1	83.9	12.8	87.2
Low-birthweight births	33.6	66.4	28.1	71.9	25.0	75.0
Risk status						
Women with preexisting medical conditions*	—	—	31.0	69.0	29.3	70.7
Women with complications of pregnancy†	—	—	36.3	63.7	32.7	67.3
Women with previous pre-term delivery	—	—	39.6	60.4	36.8	63.2
Women with high medical risk‡	—	—	35.7	64.3	32.5	67.5
Overall						
Births with poor outcome§	33.8	66.2	28.3	71.7	25.1	74.9
Births with poor outcome and/or high medical risk	—	—	34.0	66.0	31.2	68.8
				1,156,116		1,084,342
				5,806		4,639
				10,841		11,258
				66,920		67,279
				36,180		41,114
				93,249		103,128
				18,139		16,942
				138,246		150,851
				70,878		68,594
				187,358		197,092

* Cardiac disease, chronic hypertension, established or gestational diabetes.

† Pregnancy-induced hypertension, eclampsia, oligohydramnios, incompetent cervix, abruptio placenta, placenta previa.

‡ Preexisting conditions and/or complications of pregnancy and/or previous pre-term delivery.

§ Low birthweight and/or neonatal mortality.

|| High risk and/or poor birth outcome.

LOCAL VS. NON-LOCAL DELIVERY—RESIDENTS OF PERSISTENT POVERTY COUNTIES

Compared to all rural residents, residents of persistent poverty counties were more likely to deliver non-locally: 52.5% in 1985-87 and 57.8% in 1995-97. As was the case with residents of the less urbanized counties, however, residents of persistent poverty counties with adverse outcomes delivered non-locally at somewhat higher rates than in the overall population (though not as high as among residents of less urbanized rural counties (see Table 4).

Table 4. Local and Non-local Delivery for Rural Women with Adverse Birth Outcome and Maternal Risk Factors in Persistent Poverty Counties, 1985-87, 1989-91, 1995-97 (Singletons Only)

	1985-87		1989-91		1995-97	
	% Local Delivery	% Non-local Delivery	% Local Delivery	% Non-local Delivery	% Local Delivery	% Non-local Delivery
All persistent poverty county residents	47.5	52.5	44.7	55.3	42.2	57.8
Poor outcomes						
Neonatal deaths	37.6	62.4	35.5	64.5	32.1	67.9
Very low-birthweight births	26.4	73.6	25.2	74.8	21.3	78.7
Low-birthweight births	40.4	59.6	38.3	61.7	34.6	65.4
N	456,554	458,788	456,554	458,788	456,554	458,788
Risk status						
Women with preexisting medical conditions*	—	—	40.7	59.3	37.8	62.2
Women with complications of pregnancy†	—	—	44.9	55.1	41.7	58.3
Women with previous pre-term delivery	—	—	49.2	50.8	41.8	58.2
Women with high medical risk‡	—	—	44.4	55.6	40.9	59.1
N	—	—	—	—	—	—
Overall	40.6	59.4	38.4	61.6	34.7	65.3
N	33,263	34,828	33,263	34,828	33,263	34,828
Births with poor outcome and/or high medical risk	—	—	42.8	57.2	39.6	60.4
N	—	—	—	—	—	—

* Cardiac disease, chronic hypertension, established or gestational diabetes.

† Pregnancy-induced hypertension, eclampsia, oligohydramnios, incompetent cervix, abruptio placenta, placenta previa.

‡ Preexisting conditions and/or complications of pregnancy and/or previous pre-term delivery.

§ Low birthweight and/or neonatal mortality.

|| High risk and/or poor birth outcome.

DISCUSSION

There is no evidence from the analysis described above that suggests that rural perinatal care systems became less regionalized during the period examined. Generally, rural women with higher levels of medical risk, or who experienced adverse outcomes, were more likely to deliver away from their home county than women who did not experience adverse outcome or higher levels of risk. Overall, there was a substantial increase in the proportion of rural births that occurred outside of the mother's county of residence, from 40% in 1985-87 to 46.3% in 1995-97. The movement away from home county delivery overall was accompanied by an increased concentration of adverse outcomes in non-resident counties over time. This finding suggests that rural perinatal care systems may have become more regionalized during the study period rather than less so. However, caution should be employed in drawing that conclusion too strongly. The proximate causes of the overall trend towards more non-local deliveries certainly include rural hospital closures, the closure of rural hospital nurseries (even if the hospital remains open), and declining participation in obstetrics by family physicians, who have historically provided the majority of maternity care for rural residents. The ensuing disruption of local access to maternity care may impair local systems of obstetrical care that facilitate the timely transfer of pregnant women at risk of adverse outcome to higher levels of care.

The improvement in neonatal survival among infants born to rural residents that is associated with the regionalization of perinatal care during the 1980s and 1990s is one of the great success stories in rural health in the United States. Maintaining and increasing the effectiveness of rural portals to tertiary level perinatal care through the use of telemedicine, clinical networks, and improved communication between providers is essential to continued improvement⁹ and should be a focus of future research.

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