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# MATERNAL, INFANT, AND CHILD HEALTH IN RURAL AREAS: A LITERATURE REVIEW

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## SCOPE OF PROBLEM

- Infant mortality is higher in rural areas in the South and Western regions.<sup>3</sup>
- Adolescent mortality is higher in rural areas in all four regions of the country.<sup>3</sup>

## GOALS AND OBJECTIVES

Improving the health of women, infants, children, and families, a Healthy People 2010 goal, involves identifying and eliminating health disparities in underserved populations. The key Healthy People 2010 objectives addressed in this review are as follows:

- 16-1. Reduce fetal and infant deaths.
- 16-6. Increase the proportion of pregnant women who receive early and adequate prenatal care.
- 16-8. Increase the proportion of very low birth weight (VLBW) infants born at Level III hospitals or subspecialty perinatal centers.
- 16-11. Reduce preterm births.

Differences across these key indicators of maternal and infant health have been observed across urban and rural locations. This article reviews the current state of these indicators of maternal and infant health as highlighted in Healthy People 2010<sup>1</sup> and identifies the extent of inequality by urban and rural residence. Several definitions are utilized to examine maternal and infant health:

- *Fetal Mortality* refers to the death of a fetus between 20 weeks of gestation and birth. There are two measures for this indicator of perinatal health: fetal death rates (the number of deaths reported for every 1,000 live births and fetal deaths combined) and fetal death ratios (the

number of fetal deaths for every 1,000 live births in the same year).

- *Neonatal Mortality* includes deaths within the first 28 days of life.
- *Postneonatal Mortality* identifies deaths from day 29 to one year of age.
- *Infant Mortality* is defined as the death of an infant before one year of age.

## IDENTIFIED BY PEOPLE LIVING IN RURAL AREAS AS A HIGH PRIORITY HEALTH ISSUE FOR THEM

According to the Rural Healthy People 2010 survey, maternal, infant, and child health was ranked as the ninth highest rural health priority and was nominated by 25 percent of state and local rural health respondents as a rural health priority. Maternal, infant, and child health was in a virtual tie with substance abuse, and educational and community-

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based programs for the seventh, eighth, and ninth place rankings.<sup>2</sup> Unlike most of the higher-ranking priorities, no significant differences were noted in frequency of nominations for maternal, infant, and child health either across four different

types of state and local rural health respondent groups or across the four geographic regions of the country.<sup>29</sup>

## PREVALENCE AND DISPARITIES IN RURAL AREAS

### Disparities in Infant Mortality

The infant mortality rate is an indicator of a population's health, reflecting the well being of infants, children and pregnant women and the general state of maternal health, prenatal care, and public health practices.<sup>1</sup> Among industrialized nations, the United States ranked 26<sup>th</sup> in infant mortality in 1996.<sup>9</sup> The national infant mortality rate for the year 2000 was 6.9 infant deaths per 1,000 live births, down slightly from the 1999 rate of 7.1<sup>30</sup> but still well above the national target of 4.5.<sup>1</sup>

Twice as many infant deaths occur during the neonatal period compared to the postneonatal period (4.6 versus 2.3 per 1,000 live births in 2000).<sup>30</sup> Neonatal deaths commonly result from congenital anomalies, prematurity, or complications of pregnancy and delivery; in contrast, postnatal deaths are less often the result of genetic or pregnancy-related causes and more often the result of infectious disease and injuries.<sup>11, 31</sup>

National infant death rates by area of residence show rates to vary across urban and rural regions.<sup>3</sup>

According to national data from 1996 through 1998,<sup>3</sup> infant mortality rates for nonmetropolitan counties appear similar to metropolitan counties, with the exception of fringe counties of large metropolitan areas. The rates

for these "suburban" counties are 20 percent lower (6.1 deaths per 1,000 live births) than other levels of urbanization (7.5 per 1,000 live births for other metropolitan

counties and 7.7 per 1,000 live births for nonmetropolitan counties).

The rate for the nonmetropolitan South is exceeded only by the infant mortality rate for large central metropolitan counties in the Midwest (9.6 per 1,000 live births).<sup>29</sup>

When evaluated for regional variations, infant mortality rates are highest in the South, followed by the Midwest, Northeast, and West, respectively. Rates in the Northeast and Midwest regions are highest in central metropolitan counties, while nonmetropolitan counties have the highest rates in the South and West regions. Nonmetropolitan counties in the South exhibit higher infant mortality rates (8.7 per 1,000 live births) than nonmetro areas in all other geographic regions. When compared to metropolitan rates, the rate for the nonmetropolitan South is exceeded only by the infant mortality rate for large central metropolitan counties in the Midwest (9.6 per 1,000 live births).<sup>29</sup>

A study based on 1985 and 1987 national data reports higher rates of postneonatal mortality among nonmetropolitan county residents.<sup>32</sup> Controlling for other risk factors such as race, maternal age, parity, marital status, maternal education, and prenatal care, rural residence is independently associated with increased rates of postneonatal mortality but not with rates of neonatal mortality.

In addition to national infant mortality estimates, a number of state-based studies have examined the association between infant death and rural residence.

In an Illinois study,<sup>4</sup> researchers found that rural residents have a slightly higher, though not statistically significant, rate of neonatal mortality (6.9 per 1,000 births) compared to the rest of the state (6.7 per 1,000 births). The most rural counties with populations less than 2,500, however, have a rate of neonatal death that far exceeds all other areas (11.3 per 1,000 births). Postneonatal deaths are also higher in rural counties (3.7 per 1,000 births) than in the rest of the state (2.6 per 1,000). Using records from 1988, the neonatal mortality rate for all rural counties dropped and became lower than the rate for the state (4.8 versus 5.9, respectively). However, the neonatal death rate in the most rural counties (7.6 per 1,000) continued to exceed that of all nonmetropolitan counties (4.8) or the rest of the state (5.9). Postneonatal mortality rates remained higher among rural women (3.5 versus 2.8) but not statistically different.

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In Alabama, rural residents with normal birth weight infants have higher rates of postneonatal mortality than urban residents. The differential in postneonatal mortality rates between blacks and whites is also greater for rural residents. Among rural residents, the postneonatal mortality rate for blacks is 2.5 times higher than rural whites, while urban blacks have rates 2.1 times higher than urban whites.<sup>5</sup>

A Washington state study<sup>6</sup> reports that rural residents who delivered infants in urban facilities between 1984-1988 had higher rates of neonatal mortality (10.2 per 1,000 births) than rural women delivering in rural facilities (3.7 per 1,000 births) or urban women delivering in urban facilities (5.2 per 1,000 births). In this study, rural and urban designations are based on the distance to hospitals officially designated as rural or urban. The higher rates of adverse pregnancy outcomes among rural residents delivering in urban hospitals may be evidence that high-risk pregnancies are appropriately referred to regional facilities with the appropriate resources. However, this finding may also be a reflection of poor access to local care.

A Florida study documents that the rates of infant mortality in rural residents (9.3 per 1,000) compare unfavorably to rates for urban residents (7.5 per 1,000 births).<sup>7</sup> The authors conclude that rural residence influences infant death indirectly through its association with other risk factors such as poverty, race/ethnicity, age, education, and availability and access to medical resources.

In a study of access to care in a rural area in Indiana, availability of obstetrical services in nonmetropolitan counties is negatively correlated with infant mortality ( $r=-0.38$ ,  $p=0.02$ ).<sup>17</sup> Furthermore, 14 percent ( $R^2=14.44$ ) of the variability in infant mortality in nonmetropolitan counties is explained by physician availability. Thus, lack of access to local care may explain some portion of disparate infant mortality rates in rural communities.

As a whole, a number of state-based studies have found increased rates of infant mortality among rural residents. When other known social and biological

risk factors are taken into account, there is evidence that rural residence may have an indirect effect on infant mortality rather than a direct association. Thus, disparities in infant mortality by area of residence may result from the disproportionate distribution of poverty, race/ethnicity, age, education, and availability and access to medical resources.

### **Disparities in Adverse Pregnancy Outcomes**

Total fetal mortality rates in 1990 were reported to be slightly lower for metropolitan (6.8 per 1,000 live births and fetal deaths) than nonmetropolitan (7.1 per 1,000 live births and fetal deaths) populations.<sup>33</sup> Rates were inversely associated with the mother's educational attainment, revealing an increase to 8.4 fetal deaths per 1,000 live births for mothers with less than 12 years of schooling.

Fetal death ratios in 1992 were approximately 4 percent higher in nonmetropolitan areas (7.6 per 1,000 live births) than in metropolitan areas (7.3 per 1,000).<sup>34</sup> Higher fetal death ratios were consistently observed in nonmetropolitan areas across racially defined groups; however, fetal death ratios were approximately two times higher among blacks than whites.<sup>34</sup> Reports of pregnancy outcomes, such as low birth weight and premature birth, have had mixed results when rates are compared for rural and urban populations.

A study of Iowa women, who delivered live-born infants by cesarean section, found rural residents to have poorer birth outcomes than women residing in urban counties.<sup>8</sup> These rural residents had lower birth weights, shorter gestations, lower Apgar scores, longer hospital stays, higher costs, and greater distances to travel for delivery than urban women or women living in rural areas adjacent to urban areas.<sup>8</sup>

In Illinois, low birth weight and fetal death rates were found to be slightly higher in rural counties compared to the rest of the state, but these differences were not statistically different (low birth weight, 6 percent versus 5 percent; fetal death rate, 6.7 versus 6.3).<sup>4</sup>

A Wisconsin study<sup>35</sup> found that although rural women are more likely to have inadequate prenatal care, rates of low birth weight outcomes do not differ between urban and rural residents. However, urban women have higher rates of very low birth weight outcomes (< 1000 grams) than their rural counterparts (10.8 per 1,000 compared to 7.6 per 1,000). Furthermore, low prenatal care utilization is positively associated with low birth weight in urban counties, but this association was not observed in rural counties.

A comparison of birth outcomes for women attending public health department prenatal clinics found rural women deliver infants with lower average birth weights despite entering prenatal care earlier than urban women.<sup>36</sup> However, rural residence does not significantly predict infant birth weight patterns when adjusting for race, education, total prenatal visits, weeks gestation at first prenatal visit, and prepregnancy weight/weight gain.

Crude analyses of metropolitan and nonmetropolitan differences show slightly lower percentages of low birth weight, very low birth weight, and neonatal death rates among nonmetropolitan residents but

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higher rates of postneonatal deaths. The differences in low and very low birth weight persist among blacks and American Indians when the data are stratified by race, but rural whites have higher rates of low birth weight than urban whites. When other risk factors such as race, maternal age, parity, marital status, maternal education, and prenatal care are controlled in the analysis, neonatal mortality and low birth weight no longer differ by metro-nonmetro residence. However, rural residence is independently associated with postneonatal mortality rates.

## Disparities in Prenatal Care

Among several national and state-based studies of prenatal care utilization, the majority of studies report less adequate prenatal care among rural women than among urban women. There is a plethora of evidence from studies using data from the late 1980s that prenatal care among rural residents

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compares unfavorably with care received by urban populations. The few reports from 1990s' data suggest that prenatal care remains inadequate in both urban and rural locations but may be most lacking in urban areas. Thus, prenatal care for rural women may be approaching rates for urban women, but care in both groups remains inadequate and below the national goal of 90 percent initiating care in the first trimester.<sup>1</sup>

Analysis of the National Linked Birth Death Data Set for the 1985-1987 study period reveals that non-metropolitan residents in the United States are more likely than their urban counterparts to delay prenatal care until the third trimester.<sup>32</sup> This result persists after controlling for other risk factors such as race, maternal age, parity, marital status, and maternal education.

Using the Adequacy of Prenatal Care Utilization Index<sup>37</sup> to combine information on timing and amount of care, disparities by residence become apparent. Significantly more nonmetropolitan women (16.8 percent) receive inadequate prenatal care compared to metropolitan women (12.5 percent). When evaluated by race/ethnicity, the disadvantage among nonmetropolitan residents persists for each racial/ethnic group; however, the difference by residence is greatest among Hispanic women (19 percent metro and 32 percent nonmetro), notable among whites (8 percent metro and 13 percent nonmetro), and alarmingly high for both

groups of African Americans (25 percent metro and 29 percent nonmetro). When comparing the proportion of women with adequate prenatal care, there is no difference by residence, with roughly one-third of all women classified as receiving adequate care.

A number of state-based studies conducted in Washington, Illinois, Wisconsin, and Virginia found comparable trends in inadequate prenatal care among rural women.<sup>4, 6, 35, 36</sup>

Analysis of the 1988 National Maternal and Infant Health Survey shows that U.S. women residing in nonmetropolitan areas were more likely to receive inadequate prenatal care than metropolitan residents, irrespective of race/ethnicity or socioeconomic status.<sup>15</sup> However, differences by race/ethnicity are also observed. When comparing white, black, and Hispanic women by residence, Hispanics who live in nonmetropolitan areas are the most likely to receive inadequate care.<sup>15</sup> The probability of inadequate care is highest for high-risk Hispanic women living in rural areas. The high-risk profile includes those who are poor, have no insurance, have an unwanted pregnancy, live alone and unmarried, are young, have low educational attainment, have no previous pregnancies, use a public provider, drive an hour or more to provider, and do not take prenatal classes. Inadequate prenatal care is defined, according to the Kotelchuck Adequacy of Prenatal Care Index, as entry later than the fourth month of pregnancy or receiving less than 50 percent of the expected number of visits.<sup>37</sup>

In contrast, a study of Hispanic women in San Diego County, California, found rural women to enter prenatal care earlier than urban women. Those delivering in urban county hospitals in 1991-1992 were twice as likely to delay prenatal care beyond 24 weeks gestation than women who delivered in rural hospitals, independent of other factors such as income, education, marital status, language, pregnancy wantedness, and total number of barriers to care.<sup>38</sup> The most frequent barriers to prenatal care were the same for urban and rural women: lack of money, distance to care, lack of transportation, and depression.

The most current comparison of urban and rural prenatal care comes from the 1995 National Survey of Family Growth. This survey indicates that more nonmetropolitan than suburban women receive delayed or no prenatal care.<sup>16</sup> However, urban central city residents have the highest percentage of prenatal care delayed beyond the first trimester. More suburban residents initiate prenatal care early, followed by nonmetropolitan residents and central city residents.

### Disparities in Obstetrical Care

Pregnant women residing in rural areas with fewer available obstetric services in their communities frequently opt to deliver outside their communities.<sup>18</sup> Seeking services outside the community is considered an indicator of inadequate access to care. Rural women seeking obstetrical services outside their local community hospital experience more complications during delivery and higher rates of preterm birth compared to rural mothers who deliver at local facilities.<sup>18</sup> The infants treated in facilities outside the community also have longer and more expensive stays.

According to data from the 1995 National Survey of Family Growth, fewer nonmetropolitan mothers have insurance to cover all expenses associated with

labor and delivery.<sup>16</sup> Thus, a higher percentage of nonmetropolitan residents pay out-of-pocket expenses for all or part of their labor and delivery charges.<sup>16</sup>

Another study examines whether use of high-technology services differs for urban or rural women in the U.S.<sup>39</sup> Among women with high-risk pregnancies, including those with preterm births or who receive a high-risk medical diagnosis, urban women are two to three times more likely to deliver

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at facilities with high technology capabilities compared to rural women.<sup>39</sup>

## IMPACT OF THE CONDITION ON MORBIDITY AND MORTALITY

### Adverse Pregnancy Outcomes

There were over four million births in the United States in the year 2000, and the crude birth rate was 14.8 per 1,000 population.<sup>40</sup> Adverse pregnancy outcomes such as fetal death, low birth weight, and preterm birth, however, were a major source of perinatal morbidity and mortality. The leading causes of infant mortality in 2000 included congenital malformations, low birth weight and preterm birth, and sudden infant death syndrome (SIDS), accounting for 20.7, 15.4 and 7.7 percent, respectively, of all infant deaths.<sup>30</sup> After the first month of life, the leading cause of infant death is SIDS, representing approximately one-third of postneonatal deaths in 1997.<sup>30</sup>

Low birth weight and premature birth are major sources of infant morbidity and mortality. Preterm birth accounts for the majority of neonatal deaths not associated with birth defects.<sup>1</sup> Long-term impairments associated with low birth weight and preterm birth include cerebral palsy, autism, mental retardation, vision and hearing difficulties, learning disabilities, and delayed development.<sup>10</sup>

Respiratory distress is the most common cause of death among low birth weight infants.<sup>11</sup> The introduction of surfactant in the early 1990s for the treatment of respiratory distress contributed to improved survival of premature and very low birth weight infants.<sup>41</sup> Although survival of the preterm or low birth weight infant has improved along with medical advancements, rates of long-term disabilities associated with these birth outcomes have not experienced a similar decline.

### Prenatal Care and Obstetrical Care

Lack of available local prenatal and obstetrical care in rural areas is reported to be associated with higher rates of preterm delivery, infant mortality, and

complications during delivery.<sup>17-20</sup> Overall, fewer preterm and low birth weight infants are born to women who receive early and comprehensive prenatal care.<sup>42</sup>

Hypotheses for the association between access to care and pregnancy outcome include longer travel time for routine care, which is associated with poor compliance for prenatal care due to factors such as transportation problems.<sup>43</sup> Other explanations include lack of adherence to prenatal protocols prescribed by providers in distant locations, delayed hospital arrival following onset of labor, and the stresses associated with travel and delivery in an unfamiliar setting.<sup>18</sup>

Maternal mortality can potentially be reduced through quality prenatal and obstetrical care. Maternal deaths from complications such as ectopic pregnancy, infection, and hemorrhage can be prevented. It is estimated that early diagnosis and effective treatment of pregnancy complications may prevent over half of all maternal deaths.<sup>27, 28</sup>

## BARRIERS

Access to available prenatal and obstetrical care is necessary to ensure the health and well being of mother and baby. Although there has been recent progress with technological advancements in perinatal medicine, access to such services has concurrently deteriorated for rural residents. One reason for decreased access is the number of family practitioners dropping obstetrics from their practice, most often due to the high cost of medical malpractice insurance and increasing fear of litigation.<sup>44</sup> A total of 9 percent of all physicians practice medicine in rural areas.<sup>45</sup> The number of rural obstetric providers in the United States has been decreasing since the early 1980s,<sup>46, 47</sup> with a 20 percent decrease in obstetric providers between 1984 and 1989 alone.<sup>47</sup> The number of rural family

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physicians providing obstetric or neonatal care has also declined in recent decades.<sup>11</sup> In 1992, only 37 percent of rural family physicians offered obstetric services, and only 65 percent provided care for newborns.<sup>48</sup> Thus, the decline in access to maternity care is accompanied by declining access to neonatal services.

A decrease in obstetric services in rural areas has created a barrier to prenatal and obstetric care, particularly for women with high-risk pregnancies. In the 1980s, there was a transition to regionalized systems of perinatal care to provide access to tertiary care for high-risk, rural mothers and their infants. Regionalization led to marked improvements in birth weight-specific infant mortality rates among rural infants,<sup>6, 18</sup> but regional variation remains.<sup>32</sup> Furthermore, interhospital transport has been associated with excess morbidity<sup>49</sup> as well as additional expense, stress, and inconvenience.<sup>50</sup>

**Other barriers to prenatal care for women living in rural communities include less access to health insurance,<sup>21</sup> greater distance and travel time to providers,<sup>22</sup> transportation problems,<sup>11, 23, 24</sup> and child-care difficulties for larger families.<sup>23, 24</sup>**

Other barriers to prenatal care for women living in rural communities include less access to health insurance,<sup>21</sup> greater distance and travel time to providers,<sup>22</sup> transportation problems,<sup>11, 23, 24</sup> and child-care difficulties for larger families.<sup>23, 24</sup> However, a study of predictors of distance traveled for prenatal care showed that up to 50 percent of rural Alabama women bypassed the nearest rural hospital to obtain obstetrical care, with approximately one-third delivering in metropolitan hospitals.<sup>22</sup> Rural women with higher incomes and insurance coverage are more likely to travel further to seek obstetrical services from larger hospitals with neonatal intensive care units.<sup>22</sup>

## **KNOWN CAUSES OF THE CONDITION OR PROBLEM SO EFFECTIVE INTERVENTIONS OR SOLUTIONS CAN BE IDENTIFIED**

### **Fetal Mortality**

Risk factors for infant death include low birth weight, preterm birth, delayed or lack of prenatal care, mother under age 20 or over age 40, low educational attainment of mother, maternal smoking during pregnancy, and more than three previous births.<sup>12</sup> Additionally, maternal and infant morbidity and mortality more commonly result from unintended pregnancies.<sup>13, 14</sup> It is estimated that one-third to one-half of all pregnancies in the U.S. are unplanned.<sup>13, 51, 52</sup> This estimate increases to 75 percent of all pregnancies among women under 20 years of age.<sup>13</sup> Women with unintended pregnancies are more likely to engage in high-risk behaviors, such as smoking, alcohol intake, and poor nutrition,<sup>13</sup> and delay prenatal care beyond the first trimester.<sup>13</sup>

In addition to reflecting disparities by racial/ethnic composition and poverty, higher infant mortality rates among the nonmetropolitan South may result from disproportionately low maternal ages and risk behaviors, such as smoking during pregnancy. Birth rates among adolescents 15 to 19 years of age are highest among residents of nonmetropolitan counties in the South (70.4 per 1,000 female adolescents).<sup>3</sup> According to the National Center for Health Statistics, the percentage of births among teenagers (less than 20 years of age) in 1992 was higher for nonmetropolitan mothers (16 percent) than metropolitan mothers (12 percent).<sup>53</sup> The difference by geographic location is even more pronounced when examined by race. Among nonmetro blacks, 27 percent of live-born infants are born to mothers under 20 years of age. The corresponding figure for nonmetro white infants is 14 percent.

Both adolescents and adults who live in the most rural counties are more likely to smoke than those living in other levels of urbanization.<sup>3</sup> According to national birth certificate data from 1996, young women age 15–19 also have the highest rates of smoking during pregnancy.<sup>54</sup> Although the rate of smoking during pregnancy dropped slightly between

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1990 and 1996, 17.2 percent of women in the 15-19 age group continued to smoke during pregnancy in 1996.<sup>54</sup>

### **Adverse Pregnancy Outcomes**

Fetal deaths are commonly associated with maternal complications including amniotic fluid levels and maternal blood disorders.<sup>55</sup> Risk factors associated with low birth weight include younger and older maternal age, high parity, low socioeconomic status, low educational attainment, inadequate prenatal care, low pregnancy weight gain, previous low birth weight infant, multiple births, smoking, alcohol intake, and illicit drug use.<sup>36, 56</sup> Less is currently known about the risk factors for preterm birth. Predictors identified to date include previous preterm delivery; multiple gestation; the use of alcohol, tobacco, and illicit drugs during pregnancy; low prepregnancy weight; low weight gain during pregnancy; vaginal infections; and domestic violence.<sup>1, 56, 57</sup>

Studies have shown that demographic composition and behavioral risk factors differ for rural and urban women in ways that influence pregnancy outcomes, such as low birth weight.<sup>36</sup> Rural women receive approximately one year less of formal education than urban women.<sup>58</sup> Poverty rates in rural areas are reportedly 30 percent higher than in urban areas.<sup>59</sup> Rural women are less likely to be married, lacking the social, emotional, and financial support that marriage may offer, which may have a link to adverse pregnancy outcomes.<sup>60</sup> A lack of social support or tangible assistance is previously shown to be associated with poor birth outcomes, particularly among those who are very young, unmarried, or have less than a high school education.<sup>61</sup>

### **Inadequate Prenatal Care**

The percentage of women delaying prenatal care or receiving no prenatal care has improved during the period of 1989-1997 from 25 to 18 percent. The top three reasons for not initiating early care include not knowing they are pregnant, inability to pay for care, and inability to obtain an earlier appointment.<sup>25</sup> Twice as many non-Hispanic blacks (28 percent) and

Hispanic women (26 percent) delay or receive no prenatal care compared to white women (12 percent).<sup>25</sup> Furthermore, over 32 percent of mothers under age 20 and 32 percent of mothers with less than a high school education receive delayed or no prenatal care.<sup>25</sup> Of note, most of the characteristics that predict prenatal care utilization such as age, race, ethnicity, marital status, income, education, and rurality are the same as those associated with adverse pregnancy outcomes, such as low birth weight.

### **PROPOSED SOLUTIONS OR INTERVENTIONS THAT ARE FEASIBLE IN RURAL COMMUNITIES**

Prenatal care is regarded as a successful approach for improving pregnancy outcomes. However, close to 20 percent of pregnant women in the United States continue to refuse or delay prenatal care.<sup>25</sup> Women who do not receive prenatal care or who delay prenatal care beyond the first trimester are at risk of severe maternal morbidity and possible mortality due to undetected complications of pregnancy.<sup>25</sup> The effectiveness of prenatal care is believed to be due to three primary components: early and continuous risk assessment, health education, and medical and psychological intervention.<sup>26</sup>

### **COMMUNITY MODELS KNOWN TO WORK**

See the Models for Practice Section in Volume 1 for a catalog of models.

### **SUMMARY AND CONCLUSIONS**

Rural mothers and their children comprise a large segment of the U.S. population. Thus, health disparities between rural and urban groups are of national concern. Increased rates of adverse pregnancy outcomes in rural areas, such as preterm birth and low birth weight have been observed, as well as higher rates of infant mortality. Access to prenatal care is critical for reducing maternal and infant morbidity and mortality, though rural women tend to receive less adequate prenatal care than their urban counterparts. Although the risk factors for these conditions tend to disproportionately affect women in rural areas, the health status of rural

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mothers and infants can be largely improved by eliminating existing barriers to high quality, comprehensive prenatal care. Improving the health of rural mothers and infants, from preconception to pregnancy to birth and beyond, advances the health of the next generation.

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