The Changing Pattern of Prenatal Care Utilization in the United States, 1981-1995, Using Different Prenatal Care Indices

Michael D. Kogan, PhD; Joyce A. Martin, MPH; Greg R. Alexander, MPH, ScD; Milton Kotelchuck, PhD; Stephanie J. Ventura, AM; Fredric D. Frigoletto, MD

Context.—Two measures traditionally used to examine adequacy of prenatal care indicate that prenatal care utilization remained unchanged through the 1980s and only began to rise slightly in the 1990s. In recent years, new measures have been developed that include a category for women who receive more than the recommended amount of care (intensive utilization).

Objective.—To compare the older and newer indices in the monitoring of prenatal care trends in the United States from 1981 to 1995, for the overall population and for selected subpopulations. Second, to examine factors associated with receiving intensive utilization.

Design.—Cross-sectional and trend analysis of national birth records.

Setting.—The United States.

Subjects.—All live births between 1981 and 1995 (N=54 million).

Main Outcome Measures.—Trends in prenatal care utilization, according to 4 indices (the older indices: the Institute of Medicine Index and the trimester that care began, and the newer indices: the R-GINDEX and the Adequacy of Prenatal Care Utilization Index). Multiple logistic regression was used to assess the risk of intensive prenatal care use in 1981 and 1995.

Results.—The newer indices showed a steadily increasing trend toward more prenatal care use throughout the study period (R-GINDEX, intensive or adequate use, 32.7% in 1981 to 47.1% in 1995; the Adequacy of Prenatal Care Utilization Index, intensive use, 18.4% in 1981 to 28.8% in 1995), especially for intensive utilization. Women having a multiple birth were much more likely to have had intensive utilization in 1995 compared with 1981 (R-GINDEX, 22.8% vs 8.5%). Teenagers were more likely to begin care later than adults, but similar proportions of teens and adults had intensive utilization. Intensive use among low-risk women also increased steadily each year. Factors associated with a greater likelihood of receiving intensive use in 1981 and 1995 were having a multiple birth, primiparity, being married, and maternal age of 35 years or older.

Conclusions.—The proportion of women who began care early and received at least the recommended number of visits increased between 1981 and 1995. This change was undetected by more traditional prenatal care indices. These increases have cost and practice implications and suggest a paradox since previous studies have shown that rates of preterm delivery and low birth weight did not improve during this time.

JAMA. 1998;279:1623-1628

For editorial comment see p 1661.

Accurate measurement of prenatal care utilization is critical in assessing the need for health services, monitoring health care utilization trends, and understanding the relationship between prenatal care services and pregnancy outcomes. This is particularly true for the 1980s and 1990s, when myriad changes occurred in the practice, organization, and reimbursement of prenatal care. Diagnostic and treatment procedures, such as ultrasound and amniocentesis, became more prevalent. Medicaid expansions increased eligibility for prenatal care and reimbursed a wider array of prenatal services, while enrolling more women into managed care. Further, in 1989, the US Public Health Service's Expert Panel on the Content of Prenatal Care recommended fewer, but more comprehensive, prenatal visits for low-risk women. Yet, despite these developments, the 2 measures that have traditionally been used for monitoring na-
tional trends in prenatal care utilization and examining the impact of health services on pregnancy outcomes, ie, the trimester that care began and the Institute of Medicine (IOM) Index (also called the Keessner Index).²⁶ indicated that prenatal care utilization remained unchanged through the 1980s and only began to rise slightly in the 1990s.²¹-²⁵

Both the trimester that care began and the IOM Index have been criticized as painting an incomplete or inaccurate picture of prenatal care utilization.²⁶²⁷ The trimester that care began does not take into account subsequent prenatal care visits. For example, a woman who began care in the first trimester but had no more visits and a woman who began care in the first trimester and had 13 regularly spaced visits would be similarly classified.²⁶ The IOM Index misclassifies prenatal care utilization adequacy among women who had a pregnancy of more than 36 weeks' gestation.²⁶ For these women, it requires only 9 visits to be “adequate,” while the American College of Obstetricians and Gynecologists (ACOG) recommends more than 9 visits.²⁸

In recent years, 2 other indices have been developed to correct for some of the shortcomings of the IOM Index.²⁹-³²,³⁷ These indices, the R-GINDEX and the Adequacy of Prenatal Care Utilization (APNCU) Index, are both based on the full ACOG recommendations and include “no prenatal care” and “intensive utilization” categories.²⁶²⁷ Research has indicated that women who receive more than the recommended amount of care (intensive use) are a distinct group and should be studied independently.²⁹-³²

While several studies have compared the newer indices with the older indices, none is national in scope,²⁷³⁰,³¹ nor have they examined how these indices compare in monitoring changes over time. While national trends in prenatal care utilization are believed to have been relatively stable for many years, these trends may reflect the limited sensitivity of the trimester and IOM Index measures and not reflect actual prenatal care utilization itself.

The purpose of this study is to compare these older and newer indices in the monitoring of trends in prenatal care utilization in the United States from 1981 to 1995, both in terms of the overall population and in 3 selected subpopulations: women who had a multiple birth, teenagers (<18 years of age), and women considered at low risk based on sociodemographic characteristics.

METHODS

The data used were drawn from the National Center for Health Statistics' natality files for 1981 to 1995. More than 54 million birth records were available for analysis. The number of births annually ranged from 3,629,238 to 4,138,212. Birth records with inconsistent or missing values for the month prenatal care began, the number of prenatal visits, or the length of gestation were excluded from the analysis in the calculation of each index. Records with 1 or more missing values for gestational age, month care began, or number of visits ranged from 5.0% to 6.8% for each year.

Information on the month prenatal care began is measured from the date the last normal menses began and may be obtained from the mother, physician, or hospital record. The number of prenatal visits is defined as “visits made for medical supervision of the pregnancy by a physician or other health care provider.”³² It is obtained from the same sources and is not intended to include encounters where only screening procedures such as amniocentesis or ultrasound are performed.

Gestational age in completed weeks is computed from the interval between the first day of the last normal menstrual period and the date of birth. Records missing the date of the last normal menstrual period are imputed when there is a valid month and year. Imputation procedures have been described in detail elsewhere.³³,³⁴

In this study we examine 4 measures of prenatal care utilization over time, the trimester that care began, the IOM Index, the R-GINDEX, and the APNCU Index. The IOM Index, published in 1973, was derived in part from the prenatal care visit schedule recommended by ACOG,²⁶ although it did not accurately follow their guidelines.²⁶,²⁷ All of the prenatal care measures, except the trimester that prenatal care began are based on the month that care began, and the number of visits, adjusted for gestational age, and include the categories “adequate,” “intermediate,” “inadequate,” and “no care.” For comparability, a separate “no prenatal care” classification was added to each measure based on the categorization used in the R-GINDEX.²⁷ The trimester that care began categorizes women only according to when they began prenatal care.

The R-GINDEX and the APNCU Index both use the same ACOG criteria for recommended visits, each index categorizes utilization differently depending on when care began and, for intensive use, the threshold number of visits. Therefore, for example, “adequate” on one index is not analogous to “adequate” on another index.²⁷ Table 1 presents an example of how each index would classify the prenatal care utilization of women who give birth at 32 or 40 weeks of gestation. Detailed descriptions of these indices are available elsewhere.²²,²⁷,³²

We examined 3 groups considered to be at higher or lower risk of adverse pregnancy outcomes: women having a multiple birth, teenagers (<18 years of age), and low-risk women. A woman is classified as low risk if her birth is a singleton, she is married, is aged 18 to 34 years, is having a second or third live birth, and has at least 12 years of education. Women considered to have high parity for their ages were also excluded from the low-risk group, for example, an 18-year-old having her third birth.²² Twenty six percent of women having births in 1995 met this definition of low risk.

The race categories are based on the self-reported race of the mother and include white, African American, American Indian, and Asian or Pacific Islander. Data for Hispanic women were not identifiable for many states during the early part of the study period; therefore, only limited data for 1995 are included in this analysis. We compared women born in the United States (the 50 states and the District of Columbia) with women born elsewhere.

Analysis

We will present the trends in prenatal care utilization for the complete population of US births for each of the 4 indices and for low-risk women for the years 1981 to 1995. For women with multiple births and teenagers, we compare utilization for the years 1981 and 1995.

Findings are based on essentially the complete population of US births and are not subject to sampling error. Therefore, SEs or other sample statistics are not presented for point estimates in Tables 2 to 4 or in the Figure.³⁵

Multiple logistic regression was used to analyze the risk characteristics of those women who had intensive prenatal care utilization according to the R-GINDEX and APNCU Index in the years 1981 and...
1995. We weighted the logistic models by plurality status to account for the difference between the number of births and the number of women giving birth. The parameters in the logistic model were estimated by the maximum likelihood method. Adjusted odds ratios and 95% confidence intervals were calculated from the logistic analyses.

RESULTS

A comparison of the national trends among the 4 indices produced strikingly different results (Table 2). As indicated above, the level of adequate prenatal care utilization, as measured by the IOM Index and the trimester that care began, remained essentially unchanged through the 1980s and only began to rise slightly in the 1990s.24 By contrast, the R-GINDEX and APNCU Index, which use the full ACOG recommendations, showed a steadily increasing trend toward more prenatal care utilization throughout the study period, especially intensive utilization. While the percentage of women having adequate use according to the IOM Index remained essentially unchanged between 1981 and 1989 (67.0%-67.9%), the percentage of women having either intensive or adequate use according to the R-GINDEX increased substantially, from 92.7% to 40.0% in 1989, and continued to increase to 47.1% by 1995. Moreover, the APNCU Index indicates that most of the change was toward more intensive utilization; the percentage of women having intensive use increased from 18.4% in 1981 to 28.8% in 1995, while the percentage of women with adequate use remained essentially unchanged (45.1%-43.9%). All 4 indices, however, show a relatively similar decrease in intermediate and inadequate use.

We also compared the trends in the 4 measures for the 3 risk groups. Table 3 compares the 4 prenatal care measures among singleton and multiple births in 1981 and 1995. The measures that include an intensive use category indicate a dramatic change in the care of mothers of multiples over this period. According to the R-GINDEX, while the percentage of women with intensive use who had a singleton birth increased from 3.3% to 6.3%, the percent of women who had a multiple birth receiving intensive utilization jumped from 8.5% in 1981 to 22.8% in 1995. A similar increase was noted for the APNCU Index: whereas about 47% of women with multiple births had intensive use in 1981, more than 70% received intensive utilization by 1995, compared with only a 10 percentage point increase for singleton births. By contrast, both the IOM Index and the trimester that care began indicate that women with multiple births were only slightly more likely than women with a singleton birth to either have adequate use or begin care in the first trimester in both 1981 and 1995.

Table 4 reveals a very different pattern of utilization by teenage mothers over this period, as defined by the various measures. Both the IOM Index and first trimester care use revealed large disparities of inadequate utilization between teenagers and adults in 1981 and 1995, although the difference had narrowed somewhat by 1995, due to major increases in adequate use by teenagers. On the other hand, adults were only slightly more likely to receive intensive utilization than teenagers as measured by both the R-GINDEX and the APNCU Index. All indices show an increase in either intensive or adequate utilization among low-risk women (Figure). Low-risk women were more likely to begin care earlier than the overall population; by 1995, 90.0% of low-risk women began care in the first trimester compared with 81.6% in the overall population (Table 2). A similar pattern was evident for the IOM Index. Intensive use also increased substantially for this population, with the yearly increases for the APNCU Index and R-GINDEX mirroring the trends in the overall population.

Due to the substantial rise in the percentage of women receiving intensive utilization, we examined the characteristics associated with intensive use for the R-GINDEX and APNCU Index in 1981 and 1995 (Table 5). Factors associated with more intensive utilization according to both the R-GINDEX and APNCU Index in 1981 were being a multiple birth, being primiparous, being married, being of older maternal age (>35 years), and be-
R-GINDEX, while women born outside the United States were more likely to receive intensive use on the APNCU Index). In 1981, there were no differences between US-born women and women born elsewhere according to the R-GINDEX, while women born outside the United States were more likely to receive intensive use on the APNCU Index. Although married women were still more likely to have intensive utilization, there was a decline between 1981 and 1995 (OR, 1.31 in 1981 and 1.16 in 1995 for the R-GINDEX; OR, 1.62 in 1981 and 1.27 in 1995 for the APNCU Index).

We also examined factors associated with intensive prenatal use in 1995 creating a separate category for Hispanics. This did not alter the other factors associated with intensive care. Hispanic women were less likely than non-Hispanic white women to have intensive utilization according to the APNCU Index (OR, 0.80). (Data available on request from the senior author.)

**COMMENT**

This study of all births in the United States from 1981 to 1995 revealed a major increase in prenatal care utilization, especially in intensive prenatal care use, when using the newer indices of prenatal care utilization compared with the traditional but less sensitive measures, which had not revealed this trend. The traditional measures of prenatal care (the trimester that care began and the IOM Index) suggested a basically stable pattern of early and adequate use of prenatal care from 1981 to 1995. The flaws of these 2 measures limited their sensitivity to the increasing visits. This increase in intensive utilization of prenatal care indicates a noteworthy change in prenatal care practice trends in the United States.

The factors that underlie the observed pattern of change in intensive use are open to speculation. During the early 1980s, perinatology (maternal-fetal medicine) developed as a specialty and several obstetric diagnostic technologies came into widespread use, eg, ultrasonography. Results from these diagnostic procedures may have led to an increase in the number of prenatal care visits and intensive utilization. Escalating litigation in the obstetric field may have resulted in more cautious practice patterns manifested by added referrals to the growing number of available technologies, although others found no increase in the use of prenatal resources for low-risk women by physicians with greater malpractice claims exposure. The ongoing expansion of Medicaid eligibility for pregnant women, which improved access to and funding for prenatal care, may have also contributed to the rising trend in intensive use in the 1990s.
The change in intensive utilization in 1995 also suggests that the Public Health Service’s recommendations for fewer visits to low-risk women have had little impact on prenatal care practices. The corresponding rise in intensive utilization among women with some college education, typically a group with fewer high-risk characteristics, further suggests that women with potentially greater resources are receiving additional visits, regardless of risk status.

Finally, the disproportionate growth in intensive utilization by women with multiple births may stem from factors that underlie the increase in multiple births in the United States, eg, increasing age of mothers and infertility interventions, and possibly a practice trend toward more aggressive management of these high-risk pregnancies.

The decline in intensive use of prenatal care by women born outside the United States is counter to the overall trend and may reflect changes in access to care. Ongoing monitoring of prenatal care use by these women is indicated, given recent provisions in the welfare legislation that may erode access to prenatal care.

However, regardless of the causes of this trend, the health care cost implications of this increase in intensive use must be explored. Although the previously presumed cost benefit of prenatal care has been recently called into question, it is unclear what cost implications this increase in intensive care entails, as cost studies on prenatal care have not specifically focused on intensive use nor have they considered the potentially distinctive needs of this population.

During this same period of increased utilization, the rates of low birth weight and preterm birth in the United States have worsened. Although these prenatal care indices are measures of the utilization, and not the content or appropriateness of care, the results suggest that simply offering more prenatal care services without careful evaluation of the clinical significance of the services provided may not lead to improved birth outcomes.

While both the R-GINDEX and the APNCU Index reveal a similar rise in the intensive use of prenatal care, the difference in the proportion of women each index places into this category is striking; eg, in 1995, the intensive use percentage was 6.7 by the R-GINDEX and 28.8 by the APNCU Index. Previous comparisons of these indices have stressed that differences in the conceptualization and coding of intensive use by these indices underlie their disparate measures. It should be noted that a generally accepted standard definition for intensive use does not exist.

The accuracy and completeness of reporting are potential limitations to the prenatal care trends noted here. Other research has indicated that reporting of gestational age on the birth certificate may not be accurate below 37 weeks, which can affect the classification of prenatal care use. We did not see any differences in trends when we examined prenatal care utilization among births less than 37 weeks (preterm) and those of 37 weeks or more. Other studies have compared the agreement between prenatal care information on birth certificates and medical records with mixed results. While some have not found a high level of agreement, others have, particularly for women having adequate utilization.

Changes in reporting areas may also have affected the results. Two states did not collect information on the number of prenatal visits during the earlier part of the study period. These states were excluded from the analysis for the years where they had missing data. For the years 1989 to 1995, we examined the trends in prenatal care use both including and excluding these states and found negligible differences. Therefore, we included all states for 1989 to 1995. Three states did not report education during earlier parts of the study period. We examined the trends in prenatal care utilization among low-risk women both including and excluding those states in the years when there was full reporting and found few differences. We also examined the risk of intensive utilization in 1995 both including and excluding the 4 states that did not collect information on either prenatal visits or education in 1981 and found no differences in the characteristics associated with intensive use (data available on request from the authors).

Moreover, although the definition of a prenatal visit has remained constant, it is possible that the increase in diagnostic procedures may have led to some of these visits being counted inappropriately as prenatal visits, and thus inaccurately inflating the number of visits for some women. However, between 1990 and 1995, levels of intensive use for the R-GINDEX and the APNCU Index increased among both women reported to have received or not received an ultrasonogram (data available from the authors).
The newer measures of prenatal care utilization indicate that there has been an increase in the number of visits that would be effective that exceed recommendations by ACOG. While there has been success in increasing prenatal care utilization to high-risk women, the benefits of increasing obstetric care to low-risk women are less immediately apparent. Given that the rates of low birth weight and preterm birth in the United States have not improved over this same period, investigations of cost-benefit should explore the varied short- and long-term outcomes that may be influenced by prenatal care use to more completely evaluate the impact of these trends.22

We would like to thank Lester R. Curtin, PhD, of the National Center for Health Statistics, Hyattsville, MD, for his biostatistical support.

References