

An Evaluation of the Kessner Adequacy of Prenatal Care Index and a Proposed Adequacy of Prenatal Care Utilization Index

ABSTRACT

Objectives. The assessment of the adequacy of prenatal care utilization is heavily shaped by the way in which utilization is measured. Although it is widely used, the current major index of utilization, the Kessner/Institute of Medicine Index, has not been subjected to systematic examination. This paper provides such an examination.

Methods. Data from the 1980 National Natality Survey are used to disaggregate the components of the Kessner Index for detailed analysis. An alternative two-part index, the Adequacy of Prenatal Care Utilization Index, is proposed that combines independent assessments of the timing of prenatal care initiation and the frequency of visits received after initiation.

Results. The Kessner Index is seriously flawed. It is heavily weighted toward timing of prenatal care initiation, does not distinguish timing of initiation from poor subsequent utilization, inaccurately measures utilization for full- or post-term pregnancies, and lacks sufficient documentation for consistent computer programming.

Conclusions. The Adequacy of Prenatal Care Utilization Index offers a more accurate and comprehensive set of measures of prenatal care utilization than the Kessner Index. (*Am J Public Health*. 1994;84:1414-1420)

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Introduction

Accurate assessment of prenatal care utilization is the critical first step in the development of public health programs to improve prenatal care accessibility and ultimately to improve birth outcomes. The assessment of the adequacy of prenatal care utilization is heavily shaped by the way in which utilization is measured.

Currently, there are two widely used measures of adequacy of prenatal care utilization: the trimester of prenatal care initiation and the Kessner/Institute of Medicine (IOM) Adequacy of Prenatal Care Index.¹ Trimester of initiation will not be examined here because it provides no information about prenatal care utilization after initiation; it has been critically examined elsewhere.^{2,3} The Kessner Index—the principal adequacy of prenatal care utilization index in use in the United States today—includes information about both the timing of prenatal care initiation and prenatal care visits after initiation. It was published in 1973 as part of an IOM-supported study of infant mortality in New York City.¹ The Kessner Index combines two continuous numeric measures (month prenatal care begins and number of visits, adjusting for length of gestation) and rigidly links them into a very easy to understand index with three levels of adequacy (Adequate, Intermediate, and Inadequate). To be rated Adequate on the Kessner Index, one must start prenatal care in the first trimester and have nine prenatal care visits for a normal-length pregnancy.

Table 1 presents the Kessner Index algorithm as initially published. In this original description, public or private obstetric service was a third factor, but this factor has been dropped by all subsequent researchers because the type of service is not noted on the standard US

birth certificate and because researchers disagree with the index's assumption that care from public services can never be adequate.⁴⁻⁷ Although Kessner et al. called their index the "Adequacy of Prenatal Care Index," their measure indicates nothing about the content or clinical adequacy of prenatal care; it is a utilization index only.

The Kessner Index has been widely adopted for public health research, planning, and resource allocation. However, it appears that the index was not subjected to close scrutiny prior to its widespread adoption. The accuracy of the Kessner Index is critical because any limitations may distort our perceptions about prenatal care adequacy in the United States and may incorrectly influence programmatic efforts to improve prenatal care utilization. The Kessner Index has also been widely used to assess the association between prenatal care and birth outcomes.⁴⁻⁷ The limited positive associations noted may be more a reflection of the internal characteristics of the Kessner Index than of the true strength of that relationship.

The ability to measure prenatal care utilization after initiation remains underdeveloped. The Kessner Index does not separately isolate utilization after enrollment, nor does any other prenatal care index. Yet a distinction between initiation

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and utilization once in care may have differential implications for birth outcomes and for prenatal care program practices.

In this paper I examine the characteristics and limitations of the Kessner Adequacy of Prenatal Care Index and propose an alternative, the two-factor Adequacy of Prenatal Care Utilization Index.

Database

The database for this paper is the National Center for Health Statistics' 1980 National Natality Survey, a representative sample of US births in 1980.⁸ This survey uses a follow-back methodology involving the collection of data from four sources: maternal retrospective information, physician and hospital records, radiologic records, and birth and death certificates. Data are available on 9941 live births, oversampled (4:1) for low-birth-weight infants. Responses were weighted by a poststratification ratio estimate procedure to be representative of the 1980 US birth cohort. Prenatal care information is absent for 15% of the births. All missing data were imputed via a categorical matrix hot-deck methodology. Details of the survey and study population are described elsewhere.⁹

All data used in this paper are derived from the birth certificate data source only. The birth certificate data were chosen because they are readily available to the public health community, they are the principal database for the assessment of a community's prenatal care utilization adequacy, and they are available for all married and unmarried women in the 1980 National Natality Survey.

Kessner Index Assessment

The Kessner Index is a seriously flawed index of adequacy of prenatal care utilization. Four features merit attention.

First, the Kessner Index is principally a measure of the timing of initiation of prenatal care. The Kessner Index algorithm requires that to be rated Adequate, prenatal care must begin in the first trimester; to be rated Intermediate, care must begin in the second trimester; and to be rated Inadequate, care must begin in the third trimester or not at all. The additional factor in the Kessner Index, the number of prenatal care visits, can only lower the rating category. This rarely happens. Table 2 shows that the trimester of care overwhelmingly (for 86.2% of

TABLE 1—Three-Factor Health Services Index Controlled for Gestation and Based on Number of Prenatal Visits, Interval to First Prenatal Visit, and Type of Hospital Service

Medical Care Index	Gestation (Weeks)	Number of Prenatal Visits
Adequate ^a	13 or less	1 or more or not stated
	14–17	2 or more
	18–21	3 or more
	22–25	4 or more
	26–29	5 or more
	30–31	6 or more
	32–33	7 or more
	34–35	8 or more
Inadequate ^b	36 or more	9 or more
	14–21 ^c	0 or not stated
	22–29	1 or less or not stated
	30–31	2 or less or not stated
Intermediate	32–33	3 or less or not stated
	34 or more	4 or less or not stated
	All combinations other than specified above	

^aIn addition to the specific number of visits indicated for adequate care, the interval to the first prenatal visit had to be 13 weeks or less (first trimester), and the delivery must have taken place on a private obstetrical service.

^bIn addition to the specific number of visits indicated for inadequate care, all women who started their prenatal care during the third trimester (28 weeks or later) were considered inadequate.

^cFor this gestation group, care was considered inadequate if the time of the first visit was not stated. Source: Reprinted with permission from *Infant Death: An Analysis by Maternal Risk and Health Care* (Table 2-3, p 59). Copyright ©1973, National Academy of Sciences. Courtesy of the National Academy Press, Washington, DC.

TABLE 2—Ratings Assigned to Births According to the Kessner Adequacy of Prenatal Care Index, by the Trimester of Initiation of Prenatal Care

Trimester of Initiation of Care	Kessner Index Rating			% of Total Births
	Inadequate, %	Intermediate, %	Adequate, %	
1	1.4	10.6	65.9	77.9
2	1.8	15.7	...	17.5
3 or no care	4.6	4.6
% of total births	7.7	26.3	65.9	

Note. Percentages are those of all US births. Concordance of trimester and index rating = 86.2%. Percentages may not add to 100 because of rounding.

Source. Percentages are based on an analysis of birth certificate data from the 1980 National Natality Survey.⁸

women) predicts the Kessner Index rating. Only 13.8% of women have their ratings reduced owing to insufficient visits.

Second, the Kessner Index does not distinguish inadequacy of care due to late initiation from inadequacy of care due to insufficient number of visits. Table 3 shows that these two implicit subscales have distinctive distributions. Overall, 24.7% of US women would be classified differently if the two were measured separately. More striking, 61.1% of women starting prenatal care in the second trimester (rated Intermediate by the Kess-

ner Index) and 45.6% of women starting prenatal care in the last trimester or not at all (rated Inadequate by the Kessner Index) would be classified differently based on an index with two distinctive factors.

Third, the Kessner Index is unable to adequately characterize prenatal care utilization for normal-gestation and postmaturity births. For all normal-length pregnancies (more than 36 weeks' gestation), the Kessner Index requires only nine visits for care to be Adequate. Yet up to 36 weeks' gestation, the Kessner Index adjusts the

TABLE 3—Ratings Assigned to Births According to the Number of Visits Component of the Kessner Adequacy of Prenatal Care Index, by the Trimester of Initiation of Prenatal Care

Trimester of Initiation of Care	Number of Visits			% of Total Births
	Inadequate (<5), %	Intermediate (5-8), %	Adequate (≥9), %	
1	1.4	10.6	65.9	77.9
2	1.8	6.9	8.9	17.5
3 or no care	2.5	1.3	0.8	4.6
% of total births	5.7	18.8	75.5	

Note. Percentages are those of all US births. Concordance of trimester and number of visits = 75.3%. Percentages may not add to 100 because of rounding.

Source. Percentages are based on an analysis of birth certificate data from the 1980 National Natality Survey.⁸

TABLE 4—Ratings Assigned to Births According to the Kessner Adequacy of Prenatal Care Index, Original and Extrapolated beyond Nine Prenatal Care Visits

Rating	Original Kessner	Extrapolated Kessner ^a
Adequate, %	65.9	29.2
Intermediate, %	26.3	54.5
Inadequate, %	7.7	16.3

Note. Percentages are those of all US births; they may not add to 100 because of rounding.

Source. Percentages are based on an analysis of birth certificate data from the 1980 National Natality Survey.⁸

^aRatings are based on trimester prenatal care began plus proportion of total visits recommended by American College of Obstetricians and Gynecologists received (all recommended visits received for a rating of Adequate and fewer than half the recommended visits received for a rating of Inadequate).

TABLE 5—Ratings Assigned to Births According to the Kessner Adequacy of Prenatal Care Index, Original and Extrapolated beyond Nine Prenatal Care Visits, by Week of Gestation at Delivery

Week of Gestation at Delivery	Adequate		Intermediate		Inadequate	
	Kessner, %	Extrapolated, %	Kessner, %	Extrapolated, %	Kessner, %	Extrapolated, %
35	57.7	57.7	27.8	27.8	14.5	14.5
36	53.5	53.5	33.1	29.7	13.4	16.8
37	55.7	47.2	31.7	36.6	12.6	16.7
38	61.3	39.8	29.9	44.4	8.8	15.8
39	69.5	38.9	24.6	49.2	5.9	11.9
40	67.0	21.8	26.0	61.5	7.0	16.7
41	73.3	18.5	20.4	68.8	6.4	12.8
42	69.9	13.1	24.6	65.7	5.5	21.1
43	66.8	8.9	23.0	70.4	10.1	20.7
44	66.5	5.5	28.0	68.5	6.6	26.0
45	58.7	3.5	37.4	66.6	3.9	29.9
% of total births	65.9	29.2	26.3	54.5	7.7	16.3

Note. Percentages are those of all US births; they may not add to 100 because of rounding.

Source. Percentages are based on an analysis of birth certificate data from the 1980 National Natality Survey.⁸

required number of visits according to the well-established American College of Obstetricians and Gynecologists (ACOG) recommendations (one visit per month through 28 weeks' gestation, one visit every 2 weeks through 36 weeks' gestation, and one visit per week thereafter).¹⁰ No discussion of the rationale for stopping at nine visits is presented.

It would appear that the index stops at nine visits because only one digit was allocated to record the number of prenatal care visits on the 1968 New York City computerized birth certificate file used in the Kessner et al. analyses.¹ According to ACOG, nine visits corresponds to the recommended number of visits at 36 weeks' gestation; hence the index's adjustments for gestational age stop at that point. Thus, the Kessner Index is constructed on the basis of an outdated computer data storage limitation. Full-term births can, therefore, be rated as having Adequate prenatal care even if they have had fewer than the ACOG-recommended number of visits. The longer the pregnancy, the smaller the percentage of recommended visits needed for care to be rated Adequate. Only premature births (36 weeks' gestation and less) are assessed fully against the ACOG standards.

If one extrapolates the original Kessner Index algorithm beyond the nine visits, using the ACOG standards (e.g., 10 visits by 37 weeks, 11 visits by 38 weeks, etc.), a major redistribution of prenatal care utilization adequacy would occur (Table 4). There would be more than twice the number of women with Inadequate care, a major increase and shift to Intermediate care, and many fewer women with Adequate prenatal care. Indeed, 44% of all women would now be classified as having less adequate prenatal care than previously classified. If one examines the extrapolation stratified by weeks' gestation at delivery, as in Table 5, one sees that this miscategorization increases as gestational age advances.

Finally, the lack of adequate initial documentation for the Kessner Index has led to nonstandardized definitions and discrepancies in its calculations. The algorithm presented in Table 1 appears to be the sole documentation for the Kessner Index. This is clearly inadequate. In particular, there is insufficient description of how to treat records with missing gestational age, missing visits, missing initiation date, etc.¹¹ The result is that each public health entity has had to program the index itself, with resultant inconsistencies. For example, many states

have added an "unknown" category if number of prenatal care visits or timing of first visit is unknown, while others still follow the original recommendations and record such births as having received "inadequate" care. Some states impute missing gestational age on the basis of birthweight, whereas others (e.g., New York) disregard all such records or disregard only those that cannot be rated as "inadequate" (L. Dellehunt, written communication, September 29, 1986). The state of Missouri and others have further simplified the definition of the Adequate rating of the Kessner Index to eight visits for full-term birth and five visits for premature births (J. W. Stockbauer, written communication, September 26, 1986). Thus, the Kessner Index ratings may not be comparable across sites.

Adequacy of Prenatal Care Utilization Index

The weaknesses of the Kessner Index led the author to try to develop an alternative prenatal care utilization algorithm, based on birth certificate data. The proposed Adequacy of Prenatal Care Utilization (APNCU) Index attempts to characterize prenatal care utilization on two independent and distinctive dimensions: Adequacy of Initiation of Prenatal Care and Adequacy of Received Services (once prenatal care has begun). This two-factor index does not assess the quality of the prenatal care that is delivered, but simply its utilization.

The initial dimension, Adequacy of Initiation of Prenatal Care, characterizes the adequacy of the timing of initiation of care. The month prenatal care begins, which is recorded on the birth certificate, corresponds directly to the adequacy of timing of initiation of prenatal care. The underlying assumption is that the earlier the initiation, the more adequate the prenatal care. The month in which care is initiated is grouped not by trimester, but into four slightly different adequacy groupings: months 1 and 2, months 3 and 4, months 5 and 6, and months 7 through 9. The second trimester was felt to cover too broad a time period to be useful as a single initiation date category. No prenatal care, which can be isolated in this index, is grouped in the late or inadequate care category for this dimension.

The second dimension, Adequacy of Received Services, characterizes the adequacy of the prenatal care visits received during the time the woman is actually in prenatal care (i.e., from initiation until

the delivery). The expected number of visits is based on the ACOG prenatal care visitation standards for uncomplicated pregnancies,¹² adjusted for the gestational age at initiation of care and for the gestational age at delivery. The measure for Adequacy of Received Services is the ratio of the actual number of visits to the expected number of visits.

The expected number of visits for each pregnancy can be calculated easily (by computer or by hand) by noting the number of ACOG-recommended prenatal care visits for a pregnancy of a given gestation and then adjusting or reducing that number based on the gestational age at initiation of care (missed visits are assumed not to be made up). Essentially, this procedure measures a segment of a fixed recommended prenatal care utilization metric, but in contrast to the Kessner Index, it is adjusted at two places: when the woman begins prenatal care and when she delivers. For example, for a 40-week pregnancy, ACOG recommends 14 visits; if care began in month 4 (three missed visits), then the expected number of visits would be 11. The number of actual or observed visits can be directly recorded from the birth certificate (or any other prenatal care data source). The ratio of observed to expected visits is then grouped into four categories: Inadequate (less than 50% of expected visits), Intermediate (50%–79%), Adequate (80%–109%), and Adequate Plus ($\geq 110\%$). A similar ratio concept is implicit in the existing Kessner Index, wherein inadequate visits equal approximately 50% of adequate visits. These four percentage categories allow for a slightly broader range of numbers of visits to be rated as Adequate care (80%–109%) and provide, for the first time, a measurement of prenatal care utilization that exceeds ACOG standards. This dimension of Adequacy of Received Services is independent of the previously described dimension of Adequacy of Initiation of Prenatal Care.

The two dimensions can be combined into a single summary prenatal care utilization index. Inadequate utilization is defined as either late initiation (after the 4th month of pregnancy) or less than 50% of recommended visits. All other categories require initiation of care by the 4th month of pregnancy and then are coded according to the extent of received services (e.g., to be rated Adequate Plus requires initiation of care between 1 and 4 months and more than 110% of the expected ACOG-recommended visits,

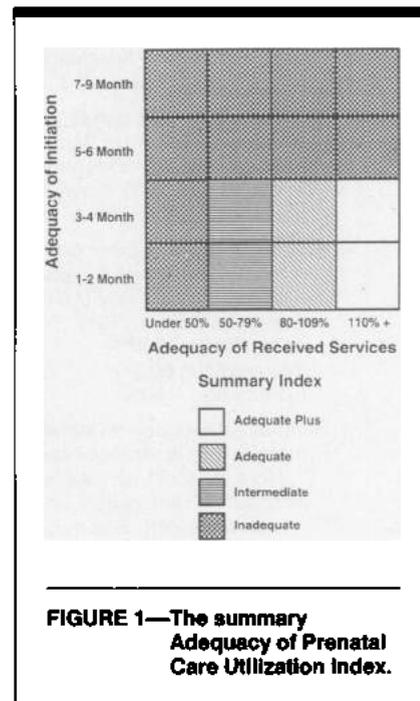


FIGURE 1—The summary Adequacy of Prenatal Care Utilization Index.

etc.). Figure 1 portrays the construction of the summary APNCU Index.

A descriptive outline of the proposed index and its two factors is presented in Table 6. (A more detailed description of the APNCU Index and its coding assumptions and a SAS Program for its computation are available from the author.)

Table 7 presents a comparison of the APNCU and Kessner Index ratings. Only 71.5% of women in the United States would be rated the same on the two indexes (assuming the APNCU's "Adequate and Adequate Plus" equal Kessner's "Adequate"), with 21.1% achieving a poorer rating and 7.4% an improved rating. Women whose care was rated Intermediate on the Kessner Index would be the most likely to be recategorized: 34% would now be rated Inadequate and 28% rated Adequate or Adequate Plus.

In a related paper in this issue of the Journal I apply the APNCU Index to the 1980 National Natality Survey data to assess the adequacy of prenatal care utilization in the United States and its association with low birthweight.¹³

Discussion

The assessment of the adequacy of prenatal care utilization is heavily shaped by the way in which utilization is measured. One of the major strategic and programmatic thrusts to reduce infant mortality in this era is to increase early initiation of prenatal care. *Healthy People*

TABLE 6—Outline of the Adequacy of Prenatal Care Utilization Index

- I. Month prenatal care began (Adequacy of Initiation of Prenatal Care)
 - Adequate Plus: 1st or 2nd month
 - Adequate: 3rd or 4th month
 - Intermediate: 5th or 6th month
 - Inadequate: 7th month or later, or no prenatal care
- II. Proportion of the number of visits recommended by the American College of Obstetricians and Gynecologists received from the time prenatal care began until delivery (Adequacy of Received Services)
 - Adequate Plus: $\geq 110\%$
 - Adequate: 80–109%
 - Intermediate: 50–79%
 - Inadequate: $< 50\%$
- III. Summary Adequacy of Prenatal Care Utilization Index
 - Adequate Plus: Prenatal care begun by the 4th month and 110% or more of recommended visits received
 - Adequate: Prenatal care begun by the 4th month and 80%–109% of recommended visits received
 - Intermediate: Prenatal care begun by the 4th month and 50%–79% of recommended visits received
 - Inadequate: Prenatal care begun after the 4th month or less than 50% of recommended visits received

TABLE 7—Ratings Assigned to Births According to the Adequacy of Prenatal Care Utilization Index Compared with the Kessner Index

Kessner Index	Adequacy of Prenatal Care Utilization Index				% of Total Births
	Inadequate, %	Intermediate, %	Adequate, %	Adequate Plus, %	
Inadequate	7.7	0.0	0.0	0.0	7.7
Intermediate	8.9	10.1	5.0	2.4	26.3
Adequate	.1	12.1	38.3	15.4	65.9
% of total births	16.7	22.2	43.4	17.7	100.0

Note. Percentages are those of all US births; they may not add to 100 because of rounding.
 Source. Percentages are based on an analysis of birth certificate data from the 1980 National Natality Survey.⁶

2000's goal 14.11 is to increase first-trimester prenatal care to at least 90% of live births.¹⁴ By contrast, continuity of prenatal care once enrolled is much less emphasized. Professional and public attention has been drawn to the theme of early access to care, I believe, because we have been able to marshal clear evidence about prenatal care initiation but we lack any readily available measures of care after enrollment. Both current popular measures of prenatal care adequacy, trimester of initiation of care (by definition) and the Kessner Index (by algorithmic biases), are basically measures of initial access to care. Improving birth outcomes, however, may be dependent on other features of prenatal care (such as content, timing, and number of visits). One utilization measure may not capture all facets of prenatal care.

The Kessner Index was a major achievement in perinatal health service research, transforming two technically available but continuous and complex data items on birth certificates into a simple three-point utilization scale. Its original rationale and basic algorithm seemed clear and clinically reasonable. Unfortunately, the Kessner Index appears to be seriously flawed; it may be leading us to misperceive the nature of prenatal care utilization in the United States. Four limitations were noted in this paper.

First, the Kessner Index is overwhelmingly a measure of the initiation of prenatal care. Only 14% of women receive fewer visits than the number required for the trimester they enter care. This initiation bias may explain why those who have used both the Kessner Index and the trimester of prenatal care initia-

tion note so little difference between them in most analyses; the latter measure is therefore preferred because it does not require the often inaccurately recorded or missing gestational age variable in its calculations (J.C. Kleinman, PhD, verbal communication, November 6, 1987). Second, the Kessner Index does not distinguish between inadequacy due to late initiation and inadequacy due to an inadequate number of visits. Although the summary Kessner Index was not developed to measure these components separately, the absence of independent measures results in the loss of important information about the nature of prenatal care adequacy, especially since 24% of women would be rated differently on these two dimensions. Neither of these first two observations about the Kessner Index, though interesting, would seem to warrant its dismissal.

The limitation of the Kessner Index to nine visits is, however, critical. This limitation is totally arbitrary and not clinically derived; it is the direct result of a computer data capacity limitation of the 1968 New York City birth file. For 20 years, the US public health profession has based its major index of prenatal care adequacy on an algorithm developed to accommodate this single-digit limitation in the counting of the number of prenatal care visits.

Because of the nine-visit limitation, the Kessner Index incorrectly assesses prenatal care utilization adequacy for normal and post-term births, the vast majority of births in the United States. The extrapolated Kessner Index algorithm would indicate that only 29%, not 66%, of births receive "adequate" care. This is not a minor difference in our perception of the extent of prenatal care adequacy in the United States. Accurate assessment of prenatal care utilization for term infants may be particularly important, given the significant racial disparities in birth outcomes for normal-birthweight infants¹⁵ and the recent observations that there are significant Black-White differences in the utilization of prenatal care at the end of pregnancy.^{16,17} Moreover, the limitation to nine visits also biases the assessment of the relationship of prenatal care and birth outcomes. Full-term babies, which are bigger and more frequently healthy, are more readily rated as having received "adequate" care than are preterm babies, thus artificially enhancing the association of positive birth outcomes with more positive prenatal care adequacy ratings.¹⁸ This bias suggests that the

current literature using the Kessner Index may be overstating the limited but positive association previously noted.^{3,19}

Finally, the lack of documentation for the Kessner Index, not surprising in a less computer-intensive era, has resulted in different computations of the Kessner Index in different localities. Alexander et al.¹¹ have shown in great detail how different coding conventions regarding missing data can result in major differences in the measurement of prenatal care adequacy and the evaluation of perinatal care programs such as Medicaid.

The proposed APNCU Index attempts to correct these four limitations of the Kessner Index. The independent assessment of prenatal care utilization after initiation, adjusted for the full range of gestational ages, is clearly the most important new feature of the APNCU Index. It provides information and a perspective on prenatal care utilization that is not presently available to the US public health community. This is important because many maternal and child health intervention programs are targeted toward continuity of prenatal care services or enhancement of services once a woman has entered care (e.g., case management, risk screening, home visits). This new component should allow for a more direct assessment of these initiatives, independent of the timing of initiation of care. Recent Medicaid enhancements appear to have differential effects on the two different components of prenatal care utilization.^{20,21}

The establishment of an Adequate Plus category, another innovative feature of the APNCU Index, provides a means to directly estimate the number of women receiving more than the ACOG-recommended number of visits, adjusted for the timing of care initiation. It appears that it is important to isolate this fairly large group of high-risk women because they have a disproportionate number of the low-birthweight babies.¹³ Efforts to isolate this high-risk group based simply on an absolute number of visits (13+) will not be accurate, incorrectly classifying many women who start prenatal care late or who are post-term.

Though not emphasized in the data presentations in this paper, the APNCU Index does allow for the direct ascertainment of the extent of "no prenatal care" as a subcategory of Inadequate prenatal care. Several perinatal analysts have emphasized the importance of distinguishing between these two groups.^{22,23}

The proposed APNCU Index can be seen as a second-generation prenatal care adequacy index. The APNCU Index was developed in 1987 and improved through feedback from multiple early users. The current version (III) includes an Adequate Plus category in the Summary Index; distinguishes "no prenatal care" within the Inadequate care category; has further clarified the coding of "no data," "missing data," and unusual data combinations; and allows users to adapt the computer program for unusual coding conventions in their own databases. The present version is basically a very minor revision of the prior APNCU Index's algorithms.

There are limitations to this new APNCU Index. First, it does not measure the adequacy of the content of prenatal care, but merely that of the utilization of prenatal care; hence its name. Second, the APNCU Index is only as accurate as the data (birth certificate or otherwise) used to calculate it. Inaccuracies in birth certificate data have been well documented, especially for prenatal care information² and gestational age.²⁴ Third, this index has the opposite bias of the Kessner Index: the longer the pregnancy, the more opportunity to miss prenatal care visits, and hence the less likelihood of a rating of Adequate or Adequate Plus.¹⁸ This bias is not, however, built into the structure of the index; the adequacy ratings accurately reflect the increasing difficulty that women have in meeting the demanding ACOG recommendations as the pregnancy continues. Fourth, the present APNCU Index does not adjust for the risk conditions of the mother. The ACOG recommendations are for women with uncomplicated pregnancies; thus, the APNCU Index produces a slightly conservative estimate of inadequate prenatal care utilization because it underestimates the true need for prenatal care visits.

Conclusions

The proposed APNCU Index, with its two components, provides a more accurate and comprehensive set of measures of prenatal care utilization than the widely used Kessner Index. The accurate measurement of prenatal care utilization is a critical step in the development of public health programs to improve prenatal care services and ultimately to improve birth outcomes. □

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