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A BRIEF ORIGINAL CONTRIBUTION

Accuracy of Birth Certificate Data Regarding the Amount, Timing, and Adequacy of Prenatal Care Using Prenatal Clinic Medical Records as Referents

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This study compared birth certificate data on the amount, timing, and adequacy of prenatal care with the same data abstracted from the prenatal clinic records of 2,032 women who attended a health department prenatal clinic in northeast Georgia from 1980 to 1988. Overall accuracy was poor. Only 14.3% ($n = 291$) of the records completely agreed on the total number of visits, while approximately 36% ($n = 738$) and 53% ($n = 1,081$) agreed within one visit and two visits, respectively. Complete agreement for month and trimester prenatal care began was 31.1% ($n = 632$) and 50.6% ($n = 1,202$), respectively. Because of the small geographic region included in the current study, the generalizability of these findings to other populations may be limited. *Am J Epidemiol* 1997;145:68–71.

birth certificates; prenatal care; quality of care; sensitivity and specificity (epidemiology)

Information regarding the amount and timing of prenatal care has been part of the US Standard Certificate of Live Birth since 1968 (1). Data from these vital records are used for program planning and development as well as to evaluate the role of prenatal care in determining birth outcomes. The accuracy of these data varies greatly. Reported concurrence between birth certificate data and other sources ranges from 15.6 percent to 82.1 percent for the total number of prenatal visits and from 30.9 percent to 78.9 percent for the month prenatal care began (2–5).

One potential methodological problem with previous validation studies is that use as referents of self-administered questionnaires to mothers and/or physicians, or abstracted hospital medical records, may not be the best standards for comparison. Questionnaires, in addition to potential non-response bias, often rely on recall of prenatal events several months after childbirth. Hospital records may be inaccurate when the prenatal care record is not contained within the hospital medical record. In those cases, the information for the hospital record may also have been provided

retrospectively from either the maternal or physician source. Prenatal care clinic records may be a more accurate referent, because that information is collected and recorded in a prospective manner throughout the pregnancy. Accordingly, the purpose of this study was to evaluate the accuracy of the amount, timing, and adequacy of prenatal care on birth certificates using prenatal clinic medical records as the standard for comparison.

MATERIALS AND METHODS

The study population consisted of all women who received prenatal care from certified nurse midwives practicing in one county health department clinic in northeast Georgia ($n = 2,572$) from 1980 to 1988. Services were limited to low income women who resided in that county and who were at low medical risk for poor birth outcomes. Women who received care from additional sources at any point during their pregnancy were excluded ($n = 372$). These included women who transferred to or from the clinic, who were lost to follow-up, or who were referred to physicians for further evaluation. Clinic prenatal care records were matched to the computerized birth tapes using a multi-stepped matching process based on mother's maiden name, first name, date of birth, and infant's date of birth. A total of 93 percent ($n = 2,046$) of the clinic records matched the birth tapes. Records that did not match were excluded from the analysis.

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Birth certificates with incomplete prenatal care information ($n = 14$) were also excluded, leaving a total of 2,032 matched records.

All subjects were part of a retrospective study to examine birth outcomes of women who attended the health department clinic during the 9-year time period. As part of that larger study, selected behavioral and medical characteristics were abstracted from the prenatal clinic records. Variables relevant to the current investigation included gestational age at first visit and number of prenatal visits. The appointment date and gestational age at each visit were recorded on a pre-printed flow sheet placed at the beginning of the clinic record. Total number of visits was established by counting each visit, while month prenatal care began was determined by dividing the gestational age at the first visit by 4.33 (6). Each clinic visit was recorded on the flow sheet. Phone visits were documented in the clinic notes but not included on the flow sheet. Data were abstracted by five persons trained and standardized in the abstracting procedure using a structured abstract form. For women with multiple pregnancies during the 9-year time period, records from each pregnancy were abstracted. Throughout the data collection period, selected information, including the total number of visits, was rechecked by one of the authors (KC) or another supervisory person. At the completion of data collection, approximately 10 percent of the charts were re-abstracted, at which time only four records (1.9 percent) were found to have errors in the total number of visits.

Virtually all births (99 percent) occurred at one hospital. Birth certificate information regarding the prenatal care variables was gathered through maternal interview conducted by a clerk or hospital volunteer. Adequacy of care was defined in several ways: 1) beginning care in the first trimester, 2) beginning care in the first 4 months of pregnancy, 3) beginning care in third trimester, 4) having less than five prenatal visits or beginning care in the third trimester. While these definitions do not consider gestational age at birth, they provide conservative estimates of either adequate or inadequate prenatal care. Sensitivity, specificity, predictive value positive, and predictive value negative were calculated according to standard formulas (7) and used to determine the accuracy of the adequacy of care variables derived from the birth tape, using the clinic prenatal care record as referent.

RESULTS

Approximately 69 percent of the study subjects were black, 30.3 percent white, and 0.7 percent other races. Mean age was 22.3 ± 4.8 years and mean educational level 11.0 ± 1.7 years. A total of 34.8

percent of the women were unmarried and 34.4 percent were primagravidias. The overall infant mortality rate was 11.3/1,000 and the proportion of low birth weight infants was 8.5 percent. Subjects that were excluded from the analysis because they received additional care from other sources, or because their birth certificate and clinic record failed to match, did not differ with respect to race, education, age, or marital status.

Overall there was poor concordance between birth certificates and prenatal clinic records regarding the total number of visits, month prenatal care began, and trimester prenatal care began (table 1). Only 14.3 percent ($n = 291$) of the records completely agreed on the total number of visits; however, 36.3 percent ($n = 738$) of the two records were within one visit and 53.1 percent ($n = 1,081$) were within two visits. A total of 31.1 percent ($n = 632$) agreed on the exact month of the first visit, while 50.7 percent ($n = 1,031$) agreed on the trimester care began. Of the records not in complete agreement, birth certificate data consistently reported greater numbers of prenatal visits and earlier onsets of care (table 1).

When data were grouped according to adequacy of prenatal care, the accuracy of the birth certificate data did not improve. The proportion of women who received inadequate care was underestimated by approximately 10 percent on the birth certificate when compared with the prenatal clinic records (table 2). Similarly, the proportion who received care in the first trimester or in the first 4 months of pregnancy was overestimated by 35.7 and 29.4 percent, respectively. The sensitivity of the birth certificate to classify inadequate care was poor. It ranged from 22.9 percent when inadequate care was defined as beginning care in the third trimester to 24 percent when it was defined as fewer than five visits or beginning care in the third trimester. Specificity was approximately 99 percent

TABLE 1. Level of agreement in the amount and timing of prenatal care between birth certificate information and abstracted prenatal care records for 2,032 births in northeast Georgia, 1980-1988

	Complete agreement		Overestimation of care level on birth certificate*	
	No.	%	No.	%
Total no. of visits				
Overall	291	14.3	980	56.2
± 1 visits	738	36.3	755	58.3
± 2 visits	1,081	53.1	568	59.7
Month care began	632	31.1	1,202	85.8
Trimester care began	1,031	50.7	996	99.5

* Proportion of birth certificates reporting a greater number of prenatal visits or an earlier onset of prenatal care than reported in prenatal clinic records.

TABLE 2. Frequency of adequate and inadequate prenatal care according to birth certificate information and abstracted prenatal clinic records for 2,032 births in northeast Georgia, 1980-1988

	Birth certificate		Prenatal clinic records		Complete agreement	
	No.	%	No.	%	No.	%
Inadequate prenatal care						
<5 visits or first visit in third trimester	104	5.1	342	16.8	82	4.0
First visit in third trimester	82	4.0	293	14.4	67	3.3
Adequate prenatal care						
Care in first trimester	1,386	68.2	661	32.5	625	30.8
Care in first 4 months	1,666	81.9	1,066	52.5	1,053	51.8

for both definitions of inadequate prenatal care. Predictive values positive and predictive values negative were good, ranging from 78.8 to 88.4. When adequate care was considered as care begun in the first trimester, or the first 4 months of pregnancy, sensitivities and predictive values negative were excellent, ranging from 94.4 to 98.8. However, specificity and predictive values positive were low, with values ranging from 37.3 to 63.2 (table 3).

DISCUSSION

This study suggests that information on the amount, timing, and adequacy of prenatal care derived from birth certificate data was not a very accurate indicator of the actual level of prenatal care when compared with that recorded on prenatal care clinic records. Our findings are similar to those of Piper et al. (4), who reported exact agreement between abstracted hospital records and birth certificates for total number of visits, month care began, and trimester care began to be 27.2, 31.9, and 47.9 percent, respectively. Our findings were substantially lower and diametrically opposite to those of Buescher et al. (3), who compared birth certificate data with abstracted hospital records for 395 randomly selected births in North Carolina. They reported exact agreement for total number of visits and month care began to be 82.1 and 78.9 percent, respectively. Other investigators have validated the birth records by com-

paring them with national data sources such as the National Natality Survey and the National Survey of Family Growth. However, in these studies, no "gold standard" was declared, which makes accuracy difficult to assess (2, 5).

Some of the differences in accuracy may be due to the choice of referents. If we assume that women received all of their prenatal care at one clinic, the prenatal record of that clinic should be the more precise referent, because the information would have been recorded in a prospective manner throughout the pregnancy. In order to assure that women included in the current study received all their prenatal care at the midwifery clinic, women who transferred to or from the clinic at any point in their pregnancy, or who were lost to follow-up, were identified during the abstracting procedure and excluded from the analysis. It is possible that some women included in the current study received additional care from other sources; however, such a scenario is unlikely, because most women do not seek prenatal care from more than one source. This may be particularly true of the subjects included in the present study, because the women were of low income and were not likely to have the resources to pay for private physicians.

Variability in the way information is gathered for the birth certificate and hospital record could also affect the reported accuracy in birth records and make

TABLE 3. Sensitivity, specificity, and predictive values positive (PV+) and negative (PV-) for selected classifications of adequate and inadequate prenatal care on the 1980-1988 northeast Georgia birth certificates compared with abstracted prenatal care records

	Sensitivity	Specificity	PV+	PV-
Inadequate care				
<5 visits or first visit in third trimester	24.0	98.7	78.8	86.5
First visit in third trimester	22.9	99.1	81.7	88.4
Adequate care				
Care begun in first trimester	94.6	45.0	45.1	94.4
Care begun in first 4 months	98.8	35.5	63.2	96.6

comparisons between studies difficult. Birth certificate information was intended to be completed by the physician, other birth attendant, or hospital representative in conjunction with the parents (8). However, there is no standardized method for collecting birth certificate data, and more than 21 different data collection procedures have been identified in one state alone (9). Similarly, there may be multiple methods to ascertain prenatal care data for hospital records. For example, some hospitals may have the prenatal care records available, while other hospital records may rely strictly on maternal self-report obtained as part of the admission history. If information for the birth certificate and hospital records is gathered from the same source (i.e., maternal recall or prenatal care record), one could expect a high degree of concurrence between the two records. This would not guarantee accuracy, however. Our study suggests that maternal recall of prenatal events is poor. If information for both records were collected by maternal recall, the exact agreement could be high but the accuracy would be poor. In the two studies that used hospital records as referents, the source of the prenatal care information for either the birth certificate or the hospital record was not given (3, 4). Without such information, it is difficult to draw conclusions regarding the accuracy of the birth certificate information or to compare levels of accuracy between different studies.

There are some issues specific to this study that may affect its interpretation. We validated birth certificates on a defined population. It is possible that regional or maternal characteristics, specific to that population, may have influenced the accuracy of the birth certificate data. However, we found no improvement in the accuracy of either the amount or timing of prenatal care when the population was stratified by race, education, age, marital status, parity, or year of birth. Thus, this did not alter the accuracy of either the amount or timing of prenatal care (data not presented). Additionally, the current study examined birth certificate data for 1980–1988 while others used 1989 birth certificate data. In 1989, the recording of some ques-

tions in the birth certificate were changed from an open ended to fixed choice format to improve accuracy (10). The questions regarding the amount and timing of prenatal care were unchanged; therefore, the findings reported in this study should apply to the current Georgia birth certificate.

In summary, this study found that prenatal care data derived from vital records were not accurate when compared with prenatal clinic medical records. Although these findings cannot be generalized to larger populations, they suggest that the accuracy of birth certificate information should be validated before such information is used in program planning or research.

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