Surveys of Food Intakes by Individuals were not specifically designed to study perinatal outcomes, we cannot evaluate the potentially negative impact of low energy intake on maternal weight gain, birthweight, and lactation performance. It is likely that, as has been noted for self-reported diets, our participants were underreporting their intakes of energy.[9,10] It is also possible that their energy requirements were lower than the Recommended Dietary Allowance as a result of lower than average energy expenditure. The postpartum intakes of many nonlactating mothers did not return to prepregnancy levels, which may be a risk factor for retention of pregnancy weight gain.

These findings are provocative and indicate a need for additional study of nationally representative samples to determine whether the maternal energy intakes observed here are associated with adverse effects on pregnancy outcome, lactational

performance, and maintenance of desirable body weight. □

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The Quality of the New Birth Certificate Data: A Validation Study in North Carolina

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Introduction

In addition to its basic legal and administrative uses, the revised birth certificate, implemented in most states in 1988 and 1989, is an important new tool for planning and evaluating maternal and child health programs.[1,2] Many new items were added and some questions revised to elicit more complete and accurate information on demographic, behavioral, and medical factors influencing fertility and pregnancy outcomes. In light of the extensive use of birth certificate data, it is important to evaluate the quality of the new information. The North Carolina Vital Records Section and the State Center for Health and Environmental Statistics undertook a followback study to assess the accuracy of the information recorded on a sample of December 1989 birth certificates. The new birth certificate was implemented in North Carolina in 1988, so there was a period of adjustment to the new certificate of almost

2 years before the sample data were collected. This report describes the extent of agreement between data recorded on the sampled birth certificates and information found in the corresponding maternal hospital medical records.

Methods

This study examined December 1989 births in the 79 nonmilitary hospitals having 250 or more births during the year. A stratified, clustered sample design was used, with each birth certificate having an equal

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A B S T R A C T

A random sample of 395 December 1989 North Carolina birth certificates and the corresponding maternal hospital medical records were examined to validate selected items. Reporting was very accurate for birthweight, Apgar score, and method of delivery; fair to good for tobacco use, prenatal care, weight gain during pregnancy, obstetrical procedures, and events of labor and delivery; and poor for medical history and alcohol use. This study suggests that many of the new birth certificate items will support valid aggregate analyses for maternal and child health research and evaluation. (*Am J Public Health.* 1993;83: 1163–1165)

TABLE 1—Percentages of Exact Agreement between Birth Certificates and Corresponding Medical Records for Selected Items: 1989 North Carolina Birth Certificates

	n	Agreement, %	95% Confidence Interval
Birthweight	393	100.0	...
Apgar score	392	100.0	...
Month prenatal care began	379	78.9	73.4, 84.4
No. of prenatal visits	312	82.1	76.0, 88.2
Weight gain during pregnancy	330	82.8	78.1, 87.5
Method of delivery	395	91.9	87.9, 95.9

Note. Records were excluded in instances in which the birth certificate could not be verified.

TABLE 2—Percentages of Exact Agreement between Birth Certificates and Corresponding Medical Records, Excluding Cases in Which Negative Responses Were Indicated in Both Sources: 1989 North Carolina Birth Certificates

	n	Agreement, %	95% Confidence Interval
Tobacco use during pregnancy	89	84.4	74.1, 94.7
Alcohol use during pregnancy	20	56.2	35.0, 77.4
Medical history	140	58.5	44.2, 72.8
Obstetrical procedures	383	68.8	58.3, 79.3
Events of labor and delivery	197	62.5	52.1, 72.9

Note. Records were excluded in instances in which the birth certificate could not be verified.

probability of selection into the sample. Overall, 395 birth records from 42 hospitals were included.

A poststratification process was used to weight the sample to the statewide distribution of births by hospital size, resulting in more accurate estimates of the population parameters. Thus, the percentages shown in Tables 1 and 2 are weighted. To account for the stratified, clustered sample design, standard errors for computing the confidence intervals of the sample estimates were calculated with the SUDAAN program developed at the Research Triangle Institute.[3]

To determine whether the sample of 395 certificates was representative of all 1989 North Carolina birth certificates, values from the sample for selected items were compared with the 1989 state total. Agreement was very close, generally within one percentage point. For example, of the sample certificates and the 1989 certificates, respectively, 20% and 21% reported tobacco use during pregnancy, 23% and 22% reported one or more medical risk factors, 93% and 92% reported one or more obstetric procedures, and 37% and 37% reported one or more events of labor and delivery.

Information on the birth certificates selected in the sample was compared with information in the corresponding maternal hospital medical records to assess accuracy. A copy of the lower sections of the birth certificate used in December 1989 is shown in the Appendix. Most of the new check-box groups included at the bottom of the certificate and selected other items were assessed for accuracy. Because of the small sample size, only agreement across all of the items in each check-box group could be assessed; the accuracy of specific conditions was not evaluated. The basic assumption was that the information included in the medical record was correct. Records in which the birth certificate could not be verified were excluded from the analysis. The check boxes for conditions of the newborn and congenital anomalies were not evaluated since only the mothers' hospital records were reviewed.

In the comparisons in which a majority of the births did not have a risk factor or adverse condition, there was a high percentage agreement between medical records and birth certificates simply because both sources indicated "none" in many cases. The percentage agreement was strongly influenced by the prevalence of the condition. Therefore, agreement was assessed after excluding records in which both the birth certificate and the medical

record indicated "no" or "none" in regard to the following items: tobacco use, alcohol use, medical history, obstetric procedures, and events of labor and/or delivery. (The resulting subsample sizes are shown in Table 2.)

Results

Table 1 shows the percentages of exact agreement between birth certificates and medical records for items in which each birth certificate should report a value. Birthweight, Apgar score, and method of delivery appear to be very accurately reported on the birth certificates. If one keeps in mind that *exact* agreement between the medical record and birth certificate is being measured, reporting for month prenatal care began, number of prenatal care visits, and weight gain during pregnancy could be considered fair to good. Grouping the data improves accuracy. For 92% of the birth certificates, the trimester in which prenatal care began agreed with that indicated in the medical record. In most cases of disagreement on the number of prenatal care visits, the number of visits recorded on the birth certificate was higher, perhaps as a result of information supplied by the mother. In most cases of disagreement regarding method of delivery, forceps was recorded in the medical record but vaginal delivery was the only method recorded on the birth certificate.

Table 2 shows the percentages of exact agreement between birth certificates and maternal medical records, excluding records in which the birth certificate indicated "no" or "none" in regard to certain items and the medical record agreed. Reporting on the birth certificate could be considered fair to good for tobacco use, obstetrical procedures, and events of labor and delivery and poor for medical history and alcohol use. In most cases in which there was disagreement on obstetrical procedures, the medical record included procedures not listed on the birth certificate. For events of labor and delivery and medical history, the most common discrepancy was that the medical record showed one or more conditions present and the birth certificate listed "none." The results for alcohol use are based on very small numbers and should be regarded with caution. Available evidence indicates that use of alcohol is underreported in both medical records and birth certificates. Even if all of the unverifiable records were true cases of alcohol use, the prevalence rate in the sample of 395 would be approximately 9%. Only about 3% of all 1989 North Carolina birth

certificates indicated alcohol use during pregnancy. Other studies suggest that 20% to 25% of pregnant women use alcohol at some time during pregnancy.[4,5]

Discussion

For the prenatal care indicators, the level of validation shown in Table 1 is considerably higher than that found in national studies in which birth certificates were compared with other sources of information.[6,7] A study of birth certificate quality conducted in Pennsylvania found higher rates of agreement for many of the items examined than did the present study.[8] However, that study did not exclude records with "none" recorded; therefore, much of the agreement for some items fell within that category. To facilitate comparisons with other studies, we recalculated the percentages of agreement shown in Table 2, including all records except those in which the birth certificate could not be verified. The levels of agreement were 96.6% for tobacco use, 98.1% for alcohol use, 85.8% for medical history, 70.2% for obstetric procedures, and 81.0% for events of labor and delivery.

The accuracy of specific conditions within the groups of items was not assessed in this study because of the small sample size and the way in which the data were collected and coded. Only agreement across all items in each group could be assessed. A recent study in North Carolina showed that the percentage of birth certificates indicating the presence of diabetes was almost identical to the percentage found in records of deliveries from hospital discharge data for the same period (about 3%).[9] A study in Missouri compared rates of a wide range of specific conditions listed on birth certificates with rates from computerized hospital discharge records and found that the overall agreement was quite good for some conditions and not very good for others.[10] However, the hospital discharge data did not always show the higher incidence, and questions have been raised about the completeness of computerized hospital discharge data relative to medical records.[11] One advantage of the present study is that direct comparisons were made between each birth certificate and its corresponding medical record rather than an aggregate comparison between the data sources.

Among December 1989 births in North Carolina, the level of agreement between birth certificates and medical records was fairly good for many of the items examined. Grouping birth certificate items into larger categories (e.g., the trimester, rather than the exact month, in which prenatal care began) will improve their accuracy. Overall, this study suggests that many of the items inlcuded on the new birth certificates will support valid aggregate analyses for maternal and child health research and evaluation. □

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APPENDIX—North Carolina Certificate of Live Birth, Lower Sections

INFORMATION FOR MEDICAL AND HEALTH USE ONLY

[Birth certificate form with sections including: FATHER and MOTHER education and Hispanic origin fields; MOTHER MARRIED, PLURALITY, BIRTH WEIGHT, APGAR SCORE; PREGNANCY HISTORY; prenatal care dates; MEDICAL HISTORY FOR THIS PREGNANCY; OTHER HISTORY FOR THIS PREGNANCY (Tobacco use during pregnancy Yes/No, Alcohol use during pregnancy Yes/No); OBSTETRIC PROCEDURES; EVENTS OF LABOR AND/OR DELIVERY; METHOD OF DELIVERY; CONDITIONS OF THE NEWBORN; CONGENITAL ANOMALIES OF CHILD]