Statistical Brief

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Comparison of Prenatal Smoking Recorded on Birth Certificates with Responses from the Corresponding PRAMS Surveys of New Mothers in North Carolina

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Introduction

Birth certificates have been used extensively to examine risk factors for low birth weight, preterm birth, and infant mortality. Prenatal smoking has been established as a key risk factor for these adverse birth outcomes.[1,2] Birth certificate data have also been used to target demographic groups and geographic areas for prenatal smoking reduction interventions.[3] A previous study in North Carolina found that there was good agreement between tobacco use during pregnancy on a sample of 1989 birth certificates and the corresponding medical records.[4] Given the wide use of the prenatal smoking data from birth certificates, we undertook this study to further assess this smoking information.

Methods

The smoking information on birth certificates may be collected in different ways, depending on the practices of the hospital. Ideally, the prenatal medical records would be consulted to gather this information. Sometimes the mother is asked directly whether she smoked during pregnancy and this information is recorded on the birth certificate. The birth certificate asks whether the mother smoked at any time during pregnancy (yes or no), and if yes, how many cigarettes per day. Our evaluation of the smoking information considers only the yes/no question and not the quantity of smoking.

The Pregnancy Risk Assessment Monitoring System (PRAMS) is a survey of new mothers in North Carolina. Sponsored by the Centers for Disease Control and Prevention (CDC), PRAMS is currently conducted in 37 states, New York City, and the Yankton Sioux Tribe in South Dakota. In North Carolina, a random sample of live birth certificates is selected on a monthly basis for PRAMS and these mothers are contacted by mail, with telephone follow-up for those who do not respond by mail. The response rate for PRAMS is about 70 percent; approximately 1,500 interviews are completed each year. (See www.schs.state.nc.us/SCHS/prams/ for more information about North Carolina PRAMS.)

In the PRAMS survey, mothers are interviewed 3 to 5 months after the births of their babies and are asked: “In the last 3 months of your pregnancy, how many cigarettes did you smoke on an average day?” For this study, if the mother reported any response other than “none” she was considered to have smoked during pregnancy. Note that the PRAMS survey asks about smoking during the last three months of pregnancy, whereas the birth certificate asks about smoking at any time during pregnancy. So the information from the two sources is not exactly comparable.

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We compared smoking as reported by the mother in the PRAMS survey with smoking as indicated on the corresponding birth certificate. The few records where smoking status was unknown were omitted from the analysis. We looked at overall smoking rates from the two sources, by age and racial/ethnic categories. Weighted percentages were used to account for the survey sampling design and coverage. We also looked at the percentage of agreement on smoking status between the birth certificates and corresponding PRAMS surveys. Data from the 2002-2004 PRAMS surveys were combined to achieve larger numbers for the comparisons, resulting in approximately 4,600 live births for this study.

Results

Table 1 shows the overall smoking rates from the birth certificate data and from the corresponding PRAMS data, broken out by age and racial/ethnic categories.

The smoking estimates from these two sources of data are very similar. In all but one of the rows of Table 1, the estimates for PRAMS are higher than the estimates from the birth certificates. The patterns by age and race are the same for both sources of data, with smoking rates declining with mother's age; white, non-Hispanic mothers having the highest rate of smoking; and Hispanic mothers having by far the lowest rate.

Table 1: Percentages Who Smoked During Pregnancy from Birth Certificate and Corresponding PRAMS Data, by Age and Race/Ethnicity of the Mother, 2002-2004

	Birth Certificate	PRAMS
Total	12.4	13.3
Age of Mother		
Less than 18 years	19.2	22.1
18-34 years	12.5	13.2
35+ years	9.6	10.8
Race/Ethnicity		
White, non-Hispanic	15.0	16.6
African American, non-Hispanic	12.5	11.2
Other, non-Hispanic	6.6	7.9
Hispanic	2.5	3.1

Note: Records with unknown smoking or demographic information are excluded. Percentages are weighted to account for survey sampling design and coverage.

Table 2 shows the pattern of agreement between the birth certificates and PRAMS surveys, among the 4,515 live births where smoking status was known on both the birth certificate and the matching PRAMS survey. For 4,248 (or 94%) of the 4,515 live births, there was agreement on smoking status between the birth certificate and the PRAMS survey. For 101 records (2.2%), the birth certificate indicated prenatal smoking and the matching PRAMS survey did not. For 166 records (3.7%), the PRAMS survey indicated prenatal smoking and the birth certificate did not. Note that the overall percentages of mothers who smoked calculated from this table of raw numbers will not match the weighted (and more representative) percentages in Table 1.

Table 2: Agreement/Disagreement Between Smoking as Reported on the Birth Certificate and its Matching PRAMS Survey, 2002-2004

	Birth Certificate: Yes	Birth Certificate: No	Total
PRAMS: Yes	536	166	702
PRAMS: No	101	3,712	3,813
Total	637	3,878	4,515

Table 3 shows the overall percentage agreement between the birth certificates and the matching PRAMS surveys, broken out by the same demographic categories as in Table 1. It can be seen that the agreement is highest among older mothers and Hispanic mothers.

Discussion

The weighted results from the PRAMS sample are designed to be representative of all live births in North Carolina. The percentage of the live births in the 2002-2004 PRAMS sample where the birth certificate indicated prenatal smoking was 12.4 (from Table 1). The actual percentage of all 355,372 live birth certificates for 2002-2004 where prenatal smoking was indicated was 12.8.

Table 3: Percentage Agreement Between Smoking as Reported on the Birth Certificate and Matching PRAMS Surveys, by Age and Race/Ethnicity of the Mother, 2002-2004

	No. of Matching Records	Percentage Agreement
Total	4,515	94%
Age of Mother		
Less than 18 years	181	88%
18-34 years	3,768	94%
35+ years	566	96%
Race/Ethnicity		
White, non-Hispanic	2,630	94%
African American, non-Hispanic	1,201	93%
Other, non-Hispanic	197	96%
Hispanic	484	98%

Note: Records with unknown smoking or demographic information are excluded.

In the validation study of 1989 birth certificates,[4] the assumption was that the smoking information included in the medical record was correct and therefore was the standard to which the birth certificate information should be compared. In that study the "sensitivity" was 86 percent, meaning that in 86 percent of the cases where tobacco use was indicated in the medical record it was correctly identified by the birth certificate (cited in Appendix to reference #3).

In the present study, it is less clear if either data source (birth certificate or PRAMS survey) should be considered a "gold standard." Maternal smoking during pregnancy as reported in the PRAMS survey may be subject to bias because some mothers are reluctant to admit to smoking during the last three months of pregnancy. Yet the overall smoking rates from PRAMS data are slightly higher than those from the birth certificates (Table 1). Since the birth certificate asks about smoking at any time during pregnancy and PRAMS asks about smoking only during the last three months, one might expect the birth certificate smoking rate to be somewhat higher.

There is a high percentage agreement (94%) between the birth certificates and the matching PRAMS surveys in part because most women do not smoke during pregnancy and therefore both sources indicate "No" in many cases. The fact that very few Hispanic mothers in North Carolina smoke during pregnancy contributes to their very high percentage agreement (98% – from Table 3).

Despite there being a number of records where the birth certificate and the mother's response on the corresponding PRAMS survey disagree about smoking during pregnancy, the overall percentages who smoked are very similar when comparing the two data sources. Though both sources of data probably underreport the extent of prenatal smoking to a degree, the aggregate results should be useful for assessing demographic and geographic differences in smoking rates and trends over time.

References

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