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Prenatal Care Utilization in Successive Births

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Abstract

Utilization of prenatal care is known to vary cross-sectionally by sociodemographic and psychosocial factors. Electronic birth certificates in New Jersey from 1996 to 2003 were probabilistically matched by mother. Using the Adequacy of Prenatal Care Utilization Index, we compare utilization in the first two births. Large proportions of women experience significant changes in utilization between their first two births, both upward and downward. Lack of private health insurance doubled the risk of inadequate utilization.

INTRODUCTION

Early prenatal care is important in providing appropriate screening, education, preventive services and treatment of maternal or fetal complications. Maximizing access to prenatal care is a key element of public health strategy to improve the early initiation and appropriate utilization of prenatal care to improve pregnancy outcomes. Utilization of prenatal care is known to vary cross-sectionally by sociodemographic characteristics, notably race/ethnicity, education, age, and marital status (1-5). Previous longitudinal research has noted persistence in the level of utilization between one birth and the next (6-7).

Contemporary policy thinking about access to health care typically focuses on gaps in health insurance, other economic and transportation barriers, and lack of information as impediments to utilizing care (3,5). While some of these factors are persistent over a woman's life, others such as familiarity with prenatal services change in regular or random patterns.

Psychosocial factors may also delay initiation of care, undermine adherence to the standard schedule of visits, or both (9). For example, women in some sociodemographic groups may be more inclined to find the organization of services to be impersonal or threatening, and the content of services to be unresponsive to their concerns and ordinary mode of life (4,5,8). Some of these attitudinal factors may have a consistent impact on prenatal care throughout the lifetimes of such women. Others may, however, be responses to experience from earlier pregnancies.

In this report we use a longitudinally linked birth certificate file for New Jersey to examine patterns of prenatal care utilization across pregnancies resulting in live births for the same woman. Using the Adequacy of Prenatal Care Utilization Index (APNCU) developed by Kotelchuck (10), we examine patterns of consistency and change in prenatal care utilization in the first two births.

DATA AND METHODS

File Linkage

New Jersey's longitudinal birth certificate file links all in-state births to individual mothers from 1996 to 2003 (out-of-state births to the same women are not included). In the process, plural births and successive births are connected (12-14). Since all records originate from an eight-year calendar period, the linked maternal sequences or "histories" are open-ended, and relatively short compared to retrospective collections of complete reproductive histories. We restrict analysis to the first two births for women whose first live birth occurred during or after 1996.

Record linkage was achieved via probabilistic matching using AutoMatch software (15,16). The data fields used in linkage were: date of birth, last name, first name, maiden name, social security number, medical record number and insurance identifier of the mother. Municipality of mother's residence, race and Hispanic origin and hospital of delivery were used for confirmation only. To minimize false matches, very selective program parameters for match sensitivity were specified. After matching, we tested several additional variables for consistency to assess the overall linkage process: self-reported parity agreed with the record sequence in 97% of histories; mother's blood type matched in 96% of successive-record comparisons.

Unlike a linkage of two files hypothetically covering the same cases, it is difficult to define for longitudinal linkage a measure of the completeness of the matching process. We define an analog "match rate" in the following way: for each birth record that represents an n^{th} -born child (not the first), we were able to link an apparently matching record for an $(n-1)^{\text{th}}$ -born child 76% of the time. That rate was 86% for mothers themselves born in New Jersey, and therefore most likely to deliver all their children in the state (17).

The linked file contains a total of 867,544 total births and 650,553 unique mothers. Of these women 183,567 (28%) had multiple births linked. Among these

maternal histories 126,448 (69%) included the first birth for that mother, and so are available for traditional prospective analysis techniques.

Variables

The New Jersey birth certificate file includes the month of the first prenatal care visit and the total numbers of visits, used to compute the Adequacy of Prenatal Care Utilization Index (10-11). The APNCU index takes account of initiation of prenatal care, and compares the number of visits reported to the number expected from the duration of gestation. Our analysis collapses the adequate and adequate-plus levels identified by Kotelchuck.

<i>Utilization Level</i>	<i>Month of pregnancy when care began</i>	<i>Visits relative to standard for gestation</i>
Inadequate	After 4 th 1 st – 4 th	Any number <50%
Intermediate	1 st – 4 th	50–80%
Adequate	1 st – 4 th	>80%

Maternal U.S./foreign nativity status was derived from the mother's reported place of birth. Race/ethnicity indicates self-reported Hispanic origin of the mother, and for non-Hispanics self-reported race of white, black, Asian/Pacific Islander, or other. Insurance status was categorized as "private insurance" if the birth certificate identified the payment source as a commercial product (e.g., PPO, POS, HMO), a commercial insurance carrier (e.g., Blue Cross) or employment related (e.g., Champus, self-administered group). Other variables used in the analysis were taken directly from the U.S. Standard Certificate of Birth.

Cross-tabulations of APNCU level at two successive times are referred to as *transition matrices*. The conditional probability of achieving each category given that in the previous pregnancy is called the *transition probability*. All analysis was performed using SAS (18).

Missing Data

The APNCU algorithm returns a missing value for most combinations of missing month of initiation and/or number of visits, and when only one of the two indicates that there was no prenatal care at all. APNCU was missing for the first and/or second birth in 13% of prospective histories.

Maternal education and insurance status were the most frequently missing demographic items. Maternal race, marital status and age were missing for 0.4% of cases where APNCU was known for the first two births. The final number of valid records for analysis was 107,510, 85% of all women in the prospective cohort. Table 1 presents descriptive information on all variables for the complete file of all births, and for the subset available for longitudinal analysis. Compared to *all births*, the analysis file over-represents more educated, older, married white mothers.

Table 1 — Descriptive Statistics

	All live births	Cases included in analysis
Number of records	867,544	107,510
<u>Maternal education</u>		
missing	2.3	1.5
not high school graduate	13.8	9.4
high school graduate	29.1	25.8
college	54.8	63.2
<u>Maternal age</u>		
<18 years	2.7	1.0
18-29 years	46.8	43.1
30+ years	50.5	55.9
<u>Marital status</u>		
married	70.5	80.1
unmarried	29.4	19.9
<u>Race/ethnicity</u>		
white, not Hipsanic	54.9	64.5
black, not Hipsanic	16.3	11.3
Hispanic	19.9	15.8
Asian, not Hipsanic	7.4	7.1
other/not reported	1.5	1.3
<u>Maternal place of birth</u>		
US born	75.3	80.2
foreign born	24.2	19.6
<u>APNCU</u>		
missing	6.1	--
inadequate	14.1	11.8
intermediate	17.4	19.5
adequate	62.4	68.7

Cell contents: percentage (except row with number of records)

RESULTS

Figure 1 presents the overall distribution of prenatal care utilization. Among all births in the analysis set, the proportion of mothers falling into each of the APNCU categories remained virtually unchanged from first to second birth. In all later births considered together, there is slightly higher incidence of inadequate utilization and parallel reduction in adequate utilization.

Table 2 presents the transition matrix connecting prenatal care utilization for the same mother between the first two births. It illustrates a relationship somewhere between total stability and complete independence.

Among women with adequate prenatal care utilization for the first pregnancy (third column), only 75% maintained an adequate level in the second. Almost two thirds of the remainder slid to the adjacent “intermediate” category.

Among women with intermediate or inadequate prenatal care for the first birth, large proportions attain adequate utilization in the second (46% and 52%, respectively). On the other hand, one third (33%) of women with inadequate prenatal care for the first birth also had inadequate care for the second birth.

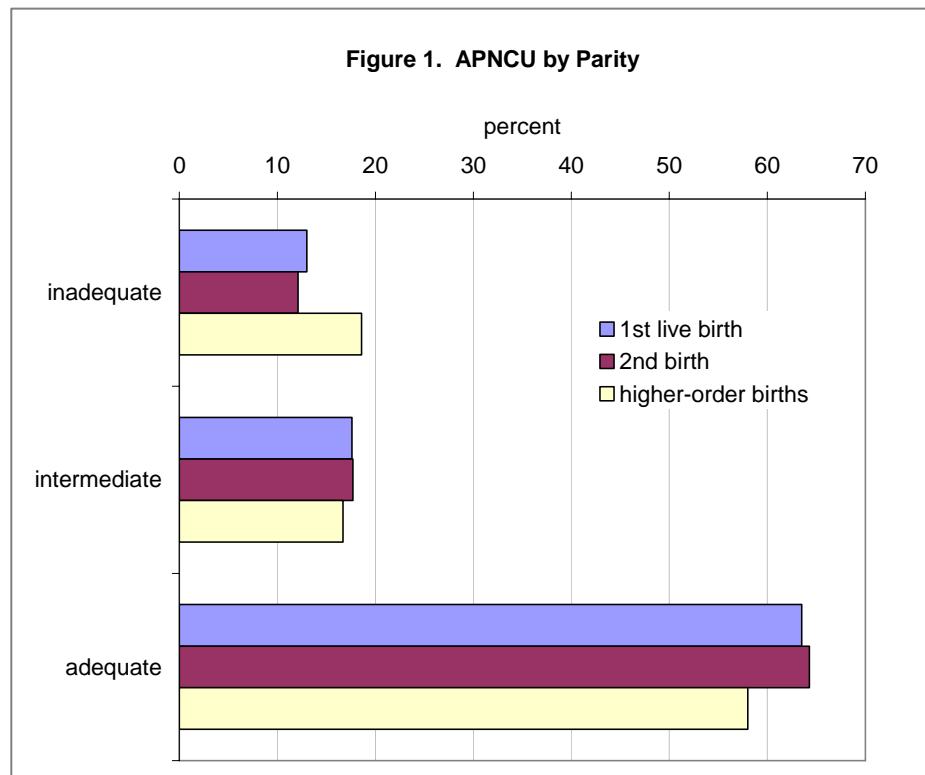


Table 2 — Transitions in Prenatal Care Utilization

APNCU, second birth	APNCU, first birth		
	inadequate	intermediate	adequate
inadequate	3,894 33.0	2,445 12.1	6,343 8.4
intermediate	2,425 20.6	5,991 29.7	12,535 16.6
adequate	5,466 46.4	11,752 58.2	56,659 75.0

N = 107,510

Cell contents: frequency, column percent

From Table 2 we can calculate that 4% of women (3,894 out of 107,510) in the cohort had inadequate prenatal care utilization in both of their first two births. A total of 14% (14,755) were below the adequate level in both.

About half of all women—53% (56,659)—maintained adequate prenatal care for both births.

Table 3 disaggregates the transition matrix according to insurance status at the second birth, when known. Both matrices exhibit a moderate dependence between the first and second births, similar to Table 2.

Among women with private insurance for their second birth, adequate prenatal care followed adequate first-birth utilization 78% of the time, and followed inadequate first-birth utilization 55% of the time. Inadequate care repeated only 23% of the time.

Among women without private insurance for their second birth, inadequate care was more persistent, repeating 51% of the time. Adequate prenatal care followed adequate first-birth utilization 56% of the time, and followed inadequate first-birth utilization only 33% of the time.

Table 3 — Transitions in Prenatal Care Utilization by Insurance Status

Private insurance, second birth

APNCU, second birth	APNCU, first birth		
	inadequate	intermediate	adequate
inadequate	1,200	1,066	2,676
	22.5	8.4	5.5
intermediate	1,225	3,920	7,863
	23.0	30.8	16.2
adequate	2,906	7,722	37,882
	54.5	60.8	78.2

N = 66,460

Cell contents: frequency, column percent

No private insurance, second birth

APNCU, second birth	APNCU, first birth		
	inadequate	intermediate	adequate
inadequate	1,892	813	2,142
	51.1	35.1	28.3
intermediate	591	518	1,216
	15.9	22.4	16.1
adequate	1,223	984	4,200
	33.0	42.5	55.6

N = 13,579

Cell contents: frequency, column percent

DISCUSSION

Analysis of transitions in prenatal care utilization yields a number of new insights. The apparent stability of aggregate utilization by number of births masks a considerable degree of variability within individual histories. While about two thirds of women achieve adequate prenatal care utilization for the first two births, barely half achieve that level in both. Similarly, the proportion of women who experience inadequate prenatal care utilization in both of the first two births is much smaller than for an individual birth.

Inadequate utilization is largely characterized by delayed initiation. While the vast majority of New Jersey's mothers without private health insurance are covered by Medicaid, their risk of delayed care is disproportionately high (20) and disproportionately persistent. Only a third of uninsured women with inadequate care for their first birth receive adequate care the next time around.

Standard prenatal care is composed of medical and obstetrical services (screening for dangerous fetal and maternal conditions, managing risk factors, etc.), childbirth and parenting education, and emotional support. Needs for these services surely differ between first and successive pregnancies. Transitions to less intensive prenatal care utilization in later pregnancies may sometimes be rational and benign. A recent review by the World Health Organization suggests that standard prenatal care may in fact be overly intensive in many low-risk circumstances (21).

Prenatal care utilization is far from a static behavior in each woman's reproductive history. Ideally, a complete longitudinal model should identify cultural predispositions, learned behaviors and independent situational factors (4,5,8). Explanatory frameworks and intervention strategies that expect women to be consistent in their preferences and utilization will overlook important opportunities for improvement.

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