

### III. DESCRIPTION OF THE DATA AND THE CHARACTERISTICS OF WIC PARTICIPANTS AND NONPARTICIPANTS

One of the key analytic challenges in assessing the savings in Medicaid costs from prenatal WIC participation was to construct an analysis database that contained information on Medicaid costs from birth to 60 days after birth and on WIC participation. This chapter provides an overview of the data used to examine the relationship between Medicaid costs and prenatal WIC participation. The first section describes the WIC/Medicaid database, and the second section provides descriptive profiles of WIC participants and nonparticipants in each of the five study states.

#### A. OVERVIEW OF THE WIC/MEDICAID DATABASE

The database designed for this study serves four major purposes: (1) to identify the newborns of mothers who receive Medicaid, and women with Medicaid claims for labor and delivery in a specified time period, (2) to provide information on Medicaid costs from birth to 60 days after birth, (3) to determine whether the mother participated in the WIC program while she was pregnant, and (4) to provide descriptive information on the characteristics of WIC participants and nonparticipants. The data sources include the Medicaid paid claims and eligibility files, the WIC program files, and the Vital Records files. Each of these is discussed in turn, followed by a brief discussion of how the data were combined for analytical purposes.<sup>1</sup>

#### Medicaid Data

Medicaid eligibility and paid claims files served two purposes: (1) to identify Medicaid-covered births, and (2) to provide data on Medicaid costs for the analysis. The analysis sample includes all Medicaid-covered births that occurred in 1987 in Florida, Minnesota, North Carolina and South Carolina, and those in the first six months of 1988 in Texas. Women and newborns who participate in health maintenance organizations (HMOs) were not included in the analysis,<sup>2</sup> since Medicaid

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<sup>1</sup>Volume 2 of this report will contain a more detailed description of the state data systems used to construct the database.

<sup>2</sup>The exclusion of HMO enrollees from the study affects only the analysis for Florida and Minnesota, since no HMO participation by Medicaid recipients occurs in North Carolina, South Carolina, or Texas. The percentage of all Medicaid recipients enrolled in prepaid health plans in 1987 was approximately 5 percent in Florida and 9 percent in Minnesota.

pays a flat monthly capitation fee to HMOs that covers all acute-care services for enrollees, rather than a fee based on individual services rendered. Thus, while WIC participation may influence the cost of providing birth-related care to an HMO enrollee, it will not have any short-term effect on the cost of such care to Medicaid. Therefore, prenatal WIC participation will not affect Medicaid costs for HMO enrollees.

The choice of 1987 as the study period represents a balance between the competing objectives of (1) selecting the most recent year possible in order to observe a period when at least some of the recently enacted Medicaid expansions were in effect and (2) selecting a period of time by which all Medicaid claims for the study subjects were fully processed and finalized in time to construct the data file and perform the analysis for this study, which was mid-1989. The year 1987 was selected as a study period that would maximize the availability of a complete claims history for each birth in the study sample.

Texas is the sole exception to using calendar year 1987. In Texas, the study is based on all Medicaid births that occurred during the period from January 1988 through June 1988, since the data necessary to identify WIC prenatal participants were not available for births in an earlier period. While the risk of missing Medicaid claims that were not finalized by the date on which the extract was created is somewhat greater, Texas appears to process most claims relatively promptly. Furthermore, because the Texas Medicaid program paid for just 30 days of inpatient services during that period, the risk of missing long-term hospitalizations by using the later period is much lower in Texas than it would be in many other states.

As mandated, the Medicaid costs examined in this study include reimbursements from birth to 60 days after birth. Although constructed for the database, prenatal Medicaid costs were not included in the analysis summarized in this report. In addition, because of the widespread use of global billing by physicians for comprehensive prenatal care and delivery services combined, all physician claims for prenatal care and delivery were included in the prenatal period. For services that started within the 60-day period after birth but extended beyond the 60-day period, the

Medicaid reimbursements were prorated according to the proportion of the service period that occurred within the 60-day postpartum period.<sup>3</sup>

### WIC Data

Data from the states' WIC data systems were used to determine whether a mother identified by the Medicaid files was receiving WIC benefits while she was pregnant. In this study, a woman was considered a prenatal WIC participant if she redeemed any food instrument during the nine months prior to birth or, for states that did not provide redemption data, if she had a WIC certification date sometime during the nine months prior to birth. Alternative definitions of prenatal WIC participation that account for the point in a woman's pregnancy at which she was certified for the WIC program were also considered, and results based on these alternative definitions will be discussed in Volume 2 of this report.

The cost of providing the WIC food packages to pregnant women was also derived from the WIC files. WIC program costs are equal to the cost of the food packages provided to each participant plus an estimate of the administrative and nutrition education expenses per participant. However, the type of data on food package costs varied across the states. Florida, Minnesota, and North Carolina provided data on the actual value of food instruments redeemed during pregnancy for each of the prenatal WIC participants. In these three states, the estimate of the food supplement for each prenatal WIC participant was obtained from summing the values of the redeemed food instruments from the pregnancy certification date to six weeks after the birth of the child.

South Carolina provided data only on the number of food instruments issued during pregnancy and up to 6 weeks postpartum, and Texas provided data only on the date of certification for each pregnant women, from which the months of prenatal WIC participation was estimated. Thus, for both South Carolina and Texas, the cost of the WIC food supplements was estimated on the basis of the months of participation during pregnancy multiplied by (1) the average value of the monthly food package (available from state data) and (2) the average proportion of food instruments that are redeemed (from state data).

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<sup>3</sup>Volume 2 of this report will present findings from an analysis in which the total reimbursements for Medicaid claims that extend beyond the 60-day period after birth are included in the Medicaid cost variable, rather than being prorated.

The estimate of total WIC costs per prenatal WIC participant entailed adding an adjustment for administrative and nutrition education expenses to the costs of the WIC food supplements. This adjustment was obtained from state data on total WIC food costs and total administrative and nutrition education costs. The ratio of administrative and nutrition education expenses to total WIC food costs was multiplied by the average food supplement cost per prenatal participant to calculate estimated administrative and nutrition education expenses per participant. Total WIC costs per prenatal WIC participant were the sum of the food package costs and administrative and nutrition education expenses.<sup>4</sup>

### Vital Records

Vital Records data files provided information on the characteristics of Medicaid mothers and newborns. These data files are maintained at the state level by Bureaus of Vital Records, which are responsible for overseeing the collection of information on births, deaths, marriages, and divorces. The following data were available from the Vital Records files:

- Data on the sex, number, duration of gestation, and birthweight of newborns
- Data on the age, race, ethnicity, education, and marital status of mothers
- Data on the number of previous live births, number of previous pregnancy terminations, and indicators of prenatal care

### Combining Measures of Medicaid Costs, WIC Participation and Costs, and Maternal and Newborn Characteristics

To conduct the analysis of the Medicaid cost savings due to WIC participation, the data on Medicaid costs, WIC participation and costs, the characteristics of Medicaid mothers, and birth outcomes were combined for each Medicaid-covered birth. Specifically, for each Medicaid birth in the study period, the analysis file contained the following information: the Medicaid costs of the newborn, the Medicaid costs of the mother, the birth outcomes (birthweight and gestational age) of the newborn, the demographic and prenatal care characteristics of mothers, whether the

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<sup>4</sup>The measure of WIC costs includes federal costs only and does not include any in-kind or other subsidies to the WIC program provided by the states.

mother participated in the WIC program during pregnancy, and either the months of participation or the value of redeemed food instruments.<sup>5</sup>

This brief description of combining the data on Medicaid costs, WIC participation and costs, and maternal and newborn characteristics camouflages the actual complexity of the file construction process. Variations in the data systems across the states and the sheer volume of records that were processed (for example, millions of Medicaid claims) represent one level of complexity. In addition, the identifying information on individuals from the various state data files made it difficult to determine unambiguously whether, for example, a person on the Medicaid file was the same individual as the one who appeared on the Vital Records file. Due to the lack of unambiguous identifying data, multiple iterations of the file construction process were necessary.

The ability to combine the measures of Medicaid costs, WIC participation, and mother and newborn characteristics for each birth depended on both the effectiveness of the linking algorithms and a number of other factors. In particular, valid circumstances exist under which some data were missing yet the Medicaid birth was still retained for the study. Most notably, data on WIC costs were not available for those Medicaid births to women who were not WIC participants. Newborn Medicaid costs were missing if the newborn did not have its Medicaid eligibility established separately from the mother. The mother's Medicaid costs were missing if only the newborn was Medicaid-eligible.

However, some incomplete records were dropped from the analysis sample. Out-of-state births and adoptions may mean that birth certificates were not available, and data entry errors may have resulted in unmatched Medicaid births. In general, Medicaid records that were not linked to the vital records birth file were omitted from the analysis due to the absence of important maternal information and newborn characteristics from the birth certificates. Descriptive analyses of the Medicaid births that could not be linked successfully to the Vital Records files were conducted, and the findings did not indicate any systematic difference in average Medicaid costs between analysis file observations (those linked to the Vital Records birth file) and those observations excluded from the final analysis file.

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<sup>5</sup>Volume 2 of this report will describe in detail the process by which the Medicaid, WIC, and Vital Records data were linked.

Table III.1 presents some summary data on the number of Medicaid mothers and newborns in each of the five study states. Florida and Texas had the largest number of Medicaid mothers and newborns, while Minnesota and South Carolina had the smallest.<sup>6</sup> With the exception of South Carolina, the Medicaid mothers who were included in the final analysis ranged from nearly 94 percent to 97 percent of all Medicaid mothers, while the Medicaid newborns included in the final analysis were between 97 and 98 percent of all Medicaid newborns. The percentages for South Carolina were lower than for the other states for two reasons: (1) birth certificates for out-of-state residents who gave birth in South Carolina were not available, so that Medicaid births to out-of-state residents could not be matched to a birth record; and (2) less identifying information from the Medicaid files was available in South Carolina relative to the other four states.

Overall, the WIC/Medicaid analysis database includes nearly 105,000 Medicaid births.<sup>7</sup> The proportion of these births occurring to WIC participants varied considerably across the study states, ranging from nearly one-half of the Medicaid births in Texas to almost three-quarters of the Medicaid births in South Carolina. (See Table III.2.) Average Medicaid costs from birth to 60 days after birth for newborns were available only for North Carolina and Texas, and were similar in

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<sup>6</sup>The number of Medicaid mothers and newborns from Florida was greater than from Texas because the study period in Texas was only six months. On an annual basis, Texas had the greatest number of Medicaid births of the study states.

<sup>7</sup>Medicaid births include all birth events. Birth events are defined as one of the following three possibilities: (1) a Medicaid mother/newborn pair matched to a newborn birth certificate; (2) a Medicaid newborn (no Medicaid mother identified) matched to a newborn birth certificate; and (3) a Medicaid mother (no Medicaid newborn identified) matched to a newborn birth certificate.

TABLE III.1

NUMBER OF MEDICAID MOTHERS AND NEWBORNS

	Florida	Minnesota	North Carolina	South Carolina	Texas
All Medicaid Mothers	32,967	10,842	19,721	11,671	24,475
Medicaid Mothers Included in the Analysis <sup>a</sup>	32,033	10,450	18,501	10,462	23,534
Percent of All Medicaid Mothers	97.1 %	96.4 %	93.8 %	89.6 %	96.2 %
All Medicaid Newborns	26,662	10,313	18,450	12,781	25,767
Medicaid Newborns Included in the Analysis <sup>a</sup>	25,873	10,153	18,091	11,358	25,097
Percent of All Medicaid Newborns	97.0 %	98.5 %	98.1 %	88.9 %	97.4 %

SOURCE: WIC/Medicaid database for Florida, Minnesota, North Carolina, South Carolina, and Texas.

<sup>a</sup>Observations included in the analysis are those Medicaid mothers or newborns that were matched with a Vital Records birth certificate.

TABLE III.2

DESCRIPTIVE DATA ON MEDICAID BIRTHS: NUMBER OF BIRTHS,  
AVERAGE MEDICAID COSTS, AND BIRTHWEIGHT

	Florida	Minnesota	North Carolina	South Carolina	Texas
Medicaid Births To WIC Participants	35,558	11,592	20,441	11,641	25,472
To Nonparticipants	20,476	7,977	14,039	8,543	12,180
Percent WIC Participants	15,082 57.6 %	3,615 68.8 %	6,402 68.7 %	3,098 73.4 %	13,292 47.8 %
Average Medicaid Costs <sup>a</sup> Newborns Newborns and Mothers	n.a. \$2,569	n.a. \$3,822	\$1,733 \$2,743	n.a. \$2,433 <sup>b</sup>	\$1,867 \$3,248
Average Birthweight (grams) Percent Low Birthweight <sup>c</sup>	3,181 11.7 %	3,295 8.6 %	3,143 12.8 %	3,103 12.9 %	3,191 10.7 %

SOURCE: WIC/Medicaid database for Florida, Minnesota, North Carolina, South Carolina, and Texas.

NOTE: Medicaid births include all Medicaid mothers and newborns that were matched with a Vital Records birth certificate.

<sup>a</sup>Includes Medicaid costs from birth to 60 days after birth. Births with costs ≤ \$200 are excluded.

<sup>b</sup>Includes hospital costs only.

<sup>c</sup>Birthweight of less than 2,500 grams (5.5 pounds).



magnitude (\$1,733 and \$1,867, respectively).<sup>8</sup> In contrast, the average Medicaid costs for mothers and newborns showed greater variation across the states, ranging from a low of \$2,433 in South Carolina (hospital costs only) to \$3,822 in Minnesota. Birth outcome data indicate that the average birthweight of Medicaid newborns in the study states was around seven pounds (3,180 grams), and approximately 11.5 percent of the Medicaid newborns were low birthweight (a birthweight of less than 2,500 grams, or 5.5 pounds). The average birthweight of Medicaid newborns ranged from 3,103 grams (6.83 pounds) in South Carolina to 3,295 grams (7.25 pounds) in Minnesota. The percentage of low birthweight newborns was highest in North Carolina and South Carolina (12.8 and 12.9 percent, respectively) and lowest in Minnesota (8.6 percent).

For the purposes of this study, it is important to realize that the study population consisted of a very low-income group of women and that the socioeconomic characteristics of the study populations in five states were not comparable during the study period. At the two extremes, Minnesota was covering pregnant women whose incomes were up to 88 percent of the poverty level (\$7,969 for a family of three), whereas Texas was covering only pregnant women whose incomes were up to 33 percent of the poverty level (\$2,988 for a family of three). In Florida, North Carolina, and South Carolina, income eligibility changed from below 50 percent of the poverty level in the first quarters of the study year to 100 percent of the poverty level in the last quarter of the year. However, because eligibility expansions typically require a considerable start-up period, the full impact of this change may not have been felt until 1988. Thus, the Medicaid mothers and newborns in this study were very poor with incomes well below the WIC income eligibility limit of 185 percent of poverty. The differences in Medicaid income eligibility across the states during the study period may have a significant effect on the study findings and must be considered when the implications of the analysis

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<sup>8</sup>North Carolina and Texas were the only two study states in which newborns automatically received their own Medicaid number, and claims for all newborns appeared under their own number. In the remaining study states, claims for normal healthy newborns often appeared under the claims for the mother, and it was not possible to distinguish the newborn's Medicaid costs from the mother's Medicaid costs. In addition, in South Carolina, it was not possible to separate physician claims for the prenatal period from claims for the 60-day postpartum period; thus, only hospital costs are considered in South Carolina.

findings are assessed within the context of current income eligibility standards.

## B. THE CHARACTERISTICS OF WIC PARTICIPANT AND NONPARTICIPANT MEDICAID MOTHERS

The major analytic challenge to this study was to develop an accurate measure of the Medicaid costs that would have been incurred by WIC participants had they not participated in the WIC program. To meet this challenge, the data described above were used to compare the Medicaid costs of WIC participants with those of nonparticipants. However, WIC participants may differ from nonparticipants in terms of other factors that may also influence Medicaid costs, and it is necessary to identify and adjust for these differences in order to obtain an accurate estimate of the effects of prenatal WIC participation. This section presents descriptive data on the available demographic and prenatal care characteristics of Medicaid-eligible WIC participants and nonparticipants.

### Demographic Characteristics

The age distribution of Medicaid-eligible WIC participants and nonparticipants in the five study states did not differ greatly. As shown in Table III.3, mean age of the women in the study varied from 22 in North Carolina and South Carolina to 24 in Minnesota, with approximately two-thirds or more of the women in all states between the ages of 20 and 34. Minnesota had the smallest proportion of women under 18 (8 percent of both Medicaid-eligible WIC participants and nonparticipants), while other states had higher proportions of these younger women (between 10 and 15 percent).

The racial composition of Medicaid-eligible WIC participants and nonparticipants varied somewhat within states, perhaps reflecting differences in WIC outreach or racial/cultural preferences for the use of health care and publicly funded health-care programs. White women consistently comprised a smaller proportion of WIC participants than nonparticipants. This difference was particularly pronounced in North Carolina and Texas. In North Carolina, white women comprised 40 percent of nonparticipants but only 35 percent of WIC participants, while in Texas white women comprised 28 percent of nonparticipants and 17 percent of WIC participants. Even in Minnesota, in which the majority of both WIC participants and nonparticipants were white, 80 percent of nonparticipants and 74 percent of WIC participants were white.

TABLE III.3

DEMOGRAPHIC CHARACTERISTICS OF MEDICAID MOTHERS

	Florida		Minnesota		North Carolina		South Carolina		Texas	
	WIC Partici- pants	Non- Partici- pants	WIC Partici- pants	Non- Partici- pants	WIC Partici- pants	Non- Partici- pants	WIC Partici- pants	Non- Partici- pants	WIC Partici- pants	Non- Partici- pants
Mean Age (years)	22.9	23.1	23.6	23.3	22.1	22.5	22.2	22.5	22.9	22.7
Age										
Less than 18	13.3 %	10.2 %	7.7 %	7.5 %	15.1 %	11.4 %	13.2 %	13.0 %	12.0 %	10.4 %
18 to 19	16.8	16.7	16.7	17.6	19.4	18.5	20.4	18.2	17.9	20.0
20 to 34	66.6	70.0	71.4	71.0	63.4	67.4	64.2	66.1	66.4	66.1
35 or older	3.4	3.0	4.2	3.9	2.1	2.7	2.3	2.7	3.8	3.5
Race <sup>a</sup>										
White	42.9 %	44.5 %	74.0 %	80.2 %	35.3 %	40.3 %	25.3 %	27.5 %	17.1 %	28.3 %
Black	47.9	45.0	9.5	9.1	64.7	59.7	74.7	72.5	27.0	28.5
Hispanic	8.5	9.9	-	-	-	-	-	-	52.1	37.1
Native American	-	-	7.1	7.0	-	-	-	-	-	-
Asian	-	-	9.0	3.0	-	-	-	-	-	-
Unknown	.7	.7	.4	.7	-	-	-	-	3.9	6.1
Marital Status										
Married	34.5 %	35.8 %	54.7 %	62.9 %	32.1 %	31.4 %	29.7 %	30.6 %	50.4 %	44.9 %
Unmarried	65.5	64.2	45.3	37.1	67.8	68.6	70.3	69.4	49.6	55.1
Mean Years of Education	11.0	11.2	11.4	11.8	11.1	11.3	11.1	11.2	n.a.	n.a.
Education										
Less than 9 years	8.6 %	7.2 %	4.8 %	2.6 %	7.4 %	5.6 %	7.6 %	6.5 %	n.a.	n.a.
9-11 years	39.5	37.8	27.6	25.1	39.4	37.2	38.2	38.4	n.a.	n.a.
12 years	41.3	41.9	43.1	44.4	42.5	43.2	44.0	42.2	n.a.	n.a.
13 or more years	10.3	12.5	14.3	17.4	10.4	13.8	9.8	12.1	n.a.	n.a.
Unknown	.4	.6	10.3	10.5	.2	.2	.4	.9	n.a.	n.a.
Number of Medicaid Births	20,476	15,082	7,977	3,615	14,039	6,402	8,543	3,098	12,180	13,292
Percent of Total	57.6	42.4	68.8	31.2	68.7	31.3	73.4	26.6	47.8	52.2

SOURCE: WIC/Medicaid database for Florida, Minnesota, North Carolina, South Carolina and Texas.

<sup>a</sup>Racial breakdowns of samples differed across states. In North Carolina and South Carolina, a very small number of women classified neither as white nor black are included with the black women. In Texas, "white" means "white, nonspanish," "black" means "black, nonspanish" and "Hispanic" is predominantly Mexican.

The racial composition of the Medicaid populations varied considerably across the study states. Minnesota had the greatest proportion of white women and roughly equal proportions of black, Native American, and Asian women (though 9 percent of WIC participants were Asian, compared with 3 percent nonparticipants). Texas contained a smaller proportion of white women and a higher proportion of Hispanic women (primarily Mexican), particularly among WIC participants (52 percent of participants versus 37 percent of nonparticipants were Hispanic). In Texas, black women comprised just over a quarter of WIC participants and nonparticipants: 27 percent and 29 percent, respectively. In Florida, equal proportions of WIC participants and nonparticipants were either white or black (approximately 45 percent) and the remaining 10 percent of each group were Hispanic. North Carolina and South Carolina were predominantly black. In North Carolina, 65 percent of the WIC participants were black, compared with 60 percent of nonparticipants, while in South Carolina 75 percent of WIC participants were black, compared with 73 percent of nonparticipants.

Some differences in the marital status of WIC participants and nonparticipants were also observed in Minnesota and Texas, but not in Florida, North Carolina, or South Carolina. In Minnesota, 55 percent of WIC participants and 63 percent of nonparticipants were married, while in Texas 50 percent of WIC participants and 45 percent of nonparticipants were married. However, in Florida, North Carolina, and South Carolina, approximately one-third of both WIC participants and nonparticipants were married.

In the four states for which information on the educational level of the mother was available from birth certificates (every state but Texas), the average number of years of school completed was 11. However, in each state, a larger proportion of WIC participants than nonparticipants had not reached high school, and a smaller proportion of WIC participants than nonparticipants had an education beyond high school.

### Prenatal Care Characteristics

In contrast to fairly minor differences in demographic characteristics, differences in the adequacy of prenatal care for WIC program participants and nonparticipants are more striking.<sup>9</sup> In all five states, Medicaid mothers who did not participate in the WIC program were approximately two to three times as likely to have received inadequate prenatal care as WIC participants. (See Table III.4.) Overall, 9.6 percent of the WIC participants in the five study states received inadequate levels of prenatal care, in contrast to 22.4 percent of nonparticipants. WIC participants in all five states also had, on average, one to two more prenatal visits than nonparticipants. The number of prenatal care visits ranged from 8.9 to 11.2 for WIC participants as compared with from 7.1 to 9.2 for nonparticipants. WIC participants were also more likely to have had any prenatal care than nonparticipants. These findings are not surprising since access to prenatal care for low-income women and WIC program participation are linked in many states. However, this finding has important implications for the analysis of Medicaid cost savings since it is important to distinguish between the effects of WIC participations and the effects of the adequacy of prenatal care on Medicaid costs.

Large differences in the adequacy of prenatal care are also observed across the study states. Medicaid births to WIC participants receiving inadequate care ranged from roughly 5 percent in North Carolina to 14 percent in Texas, and births to nonparticipants receiving inadequate care ranged from nearly 15 percent in Minnesota to 28 percent in South Carolina. Both North Carolina and Minnesota had relatively high proportions of Medicaid mothers receiving adequate prenatal care and low

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<sup>9</sup>The adequacy of prenatal care was measured with a modified Kessner Index used by the National Center for Health Statistics. The Kessner Index combines information on the timing of entry into prenatal care with the number of visits recorded and the length of the pregnancy gestation. Thus, for example, for a full-term pregnancy, adequate prenatal care is defined as nine or more visits, with the first visit occurring during the first trimester of pregnancy, and inadequate care is defined as four or fewer visits. Intermediate care for a full-term pregnancy encompasses all levels of prenatal care in between the two extremes. Adequate prenatal care for preterm births (births of less than 37 weeks of gestational age) requires a decreasing number of visits as the length of the gestation decreases.

TABLE III.4

PRENATAL CARE CHARACTERISTICS OF MEDICAID MOTHERS

	Florida		Minnesota		North Carolina		South Carolina		Texas	
	WIC Partici- pants	Non- Partici- pants	WIC Partici- pants	Non- Partici- pants	WIC Partici- pants	Non- Partici- pants	WIC Partici- pants	Non- Partici- pants	WIC Partici- pants	Non- Partici- pants
<b>Kesner Index<sup>a</sup></b>										
Adequate	40.1 %	32.5 %	42.9 %	36.1 %	51.9 %	40.3 %	33.7 %	25.4 %	34.8 %	26.9 %
Intermediate	47.9	41.2	35.5	32.8	41.0	38.7	51.0	44.2	42.8	40.5
Inadequate	9.1	22.6	7.8	14.6	4.9	18.2	13.6	28.0	14.2	25.0
Unknown	3.0	3.7	13.8	16.6	2.1	2.8	1.6	2.4	8.1	7.7
<b>Mean Number of Prenatal Visits</b>	10.3	8.3	9.8	8.7	11.2	9.2	8.9	7.1	9.1	7.7
<b>Prenatal Visits</b>										
No visits	1.7 %	11.1 %	.9 %	4.3 %	0.5 %	8.4 %	1.3 %	10.2 %	3.2 %	9.3 %
1-2 visits	2.5	5.4	1.9	4.2	1.4	5.6	4.0	8.4	4.2	7.1
3-6 visits	14.7	17.4	14.3	16.1	11.1	15.3	22.6	26.5	20.8	24.1
7-10 visits	39.7	36.3	33.1	30.0	27.6	24.9	37.7	30.5	35.5	30.8
11-12 visits	15.5	12.1	19.6	16.7	26.8	22.3	17.0	12.0	14.5	11.7
13 visits or more	24.9	16.6	17.2	13.1	32.4	23.1	16.3	10.9	18.0	13.3
Unknown	1.0	1.2	13.0	15.6	0.2	0.4	1.1	1.6	4.4	3.8
<b>Number of Medicaid Births</b>	20,476	15,082	7,977	3,615	14,039	6,402	8,543	3,098	12,180	13,292
<b>Percent of Total</b>	57.6	42.4	68.8	31.2	68.7	31.3	73.4	26.6	47.8	52.2

SOURCE: WIC/Medicaid database for Florida, Minnesota, North Carolina, South Carolina and Texas.

<sup>a</sup>The Kesner Index, as modified by the National Center for Health Statistics, combines information on the timing of entry into prenatal care with the number of visits recorded and the length of the pregnancy gestation. Thus, for example, for a full-term pregnancy, adequate prenatal care is defined as nine or more visits, with the first visit occurring during the first trimester of pregnancy, and inadequate care is defined as four or fewer visits. Intermediate care for a full-term pregnancy encompasses all levels of prenatal care in between the two extremes. Adequate prenatal care for preterm births (births of less than 37 weeks of gestational age) requires a decreasing number of visits as the length of gestation decreases.

proportions receiving inadequate care, while the opposite is true for South Carolina and Texas.<sup>10</sup>

### C. SUMMARY

The data used for the analysis of the savings in Medicaid costs from birth to 60 days after birth resulting from prenatal WIC participation includes almost 105,000 Medicaid births, representing all Medicaid-covered births in 1987 in Florida, Minnesota, North Carolina, and South Carolina and in the first six months of 1988 in Texas. The percentage of these births that were to women who participated in the WIC program during pregnancy ranged from 47.8 percent in Texas to 73.4 percent in South Carolina, with intermediate values for Florida, Minnesota, and North Carolina.

The demographic characteristics of Medicaid mothers varied considerably across the five study states, but the differences between WIC participants and nonparticipants in any particular state were less marked. The most striking differences arise between Minnesota and the other four states; Minnesota contained a significantly lower percentage of young teenage Medicaid mothers and much higher percentages of married and white Medicaid mothers than the other four states. Texas and Florida were the only two study states with significant Hispanic populations, but the proportion of Hispanic mothers in Texas was much greater than in Florida. Within any particular state, Medicaid-eligible WIC participants and nonparticipants generally had similar age, educational, and marital-status characteristics (with some small exceptions), but racial and ethnic differences occurred in Minnesota and Texas. In Minnesota, Medicaid-eligible WIC participants included a greater proportion of Asians than did nonparticipants. In Texas, Medicaid-eligible WIC participants were considerably more likely to be Hispanic than were nonparticipants.

In all five states, Medicaid-eligible WIC participants were noticeably more likely than nonparticipants to have received adequate prenatal care and less likely to have received inadequate prenatal care. This finding has important implications for analyzing the relationship between Medicaid costs and prenatal WIC participation. That is, since both the adequacy of

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<sup>10</sup>Due to the relatively high proportion of Medicaid mothers in Minnesota for whom the adequacy of prenatal care was unknown, the Minnesota data should be interpreted carefully.

prenatal care and prenatal WIC participation may influence Medicaid costs, it is critical to be able to isolate the savings in Medicaid costs due to prenatal WIC participation from the savings attributable to the adequacy of prenatal care.



#### IV. THE EFFECTS OF PRENATAL WIC PARTICIPATION ON MEDICAID COSTS AND BIRTH OUTCOMES

This chapter provides estimates of the effects of prenatal WIC participation on the savings in Medicaid costs from birth to 60 days after birth and on birth outcome measures. It begins with a brief discussion of the methodology and continues with a discussion of the main results of the analysis. Based on the Medicaid cost savings associated with prenatal WIC participation and data on WIC costs, benefit-cost ratios are presented to show the estimated savings in Medicaid costs per dollar spent on the prenatal component of the WIC program.

The results of the analysis show considerable Medicaid cost savings for prenatal WIC participants. For newborns and mothers, the estimated savings in Medicaid reimbursements from birth to 60 days after birth range from \$277 in Minnesota to \$598 in North Carolina. The associated benefit-cost ratios range from 1.77 in Florida to 3.13 in North Carolina, indicating that for every dollar spent on the prenatal WIC program, the associated savings in Medicaid costs for newborns and mothers during the first 60 days after birth are between \$1.77 (Florida) and \$3.13 (North Carolina). For newborns only, the estimated savings in Medicaid costs from birth through 60 days are \$744 in North Carolina and \$573 in Texas, with associated benefit-cost ratios of 3.90 and 2.84, respectively.

The savings in Medicaid costs due to prenatal WIC participation are supported by the findings from the analysis of birth outcomes. Increased newborn birthweight is associated with prenatal WIC participation by Medicaid recipients in all five states, with estimates ranging from an increase in birthweight of 51 grams in Minnesota to 117 grams in North Carolina. The probabilities of having a low-birthweight newborn or a preterm birth are also lower for Medicaid-eligible WIC participants than for nonparticipants.

##### A. METHODOLOGY

Data from the constructed WIC/Medicaid databases in Florida, Minnesota, North Carolina, South Carolina, and Texas were used to assess the savings in Medicaid costs from birth to 60 days after birth and to examine differences in birth outcomes due to prenatal participation in the WIC program. These databases include all Medicaid-covered births in 1987 (the first six months of 1988 in Texas) and contain information on Medicaid costs, WIC participation and costs, birthweight and other measures of pregnancy outcomes, the adequacy of prenatal care, and

maternal demographic characteristics, such as age, race, education, marital status, and number of previous live births and pregnancy terminations.

The basic analytic approach for measuring the savings in Medicaid costs and differences in birth outcomes attributable to the WIC program was to compare the Medicaid costs and birth outcomes of WIC participants with the Medicaid costs and birth outcomes of a comparison group. The comparison group used in this study consists of a group of Medicaid mothers, and their newborns, who did not participate in the WIC program during their pregnancy (nonparticipants).<sup>1</sup> Such a comparison group was critical for providing information on what the Medicaid costs and birth outcomes for WIC participants would have been had the WIC program not existed.

One potential problem with this comparison-group approach is that both the observed and the unobserved characteristics of WIC participants may differ from those of comparison women who do not participate in the WIC program. Thus, the key analytic issue in assessing the savings in Medicaid costs is how to isolate the effects of prenatal WIC participation on Medicaid costs from the effects of other characteristics.

The methodological approach of this study was to use multiple regression analysis to control for the measured differences between WIC participants and nonparticipants. Regression analysis provided estimates of the effects of the WIC program that are independent of other measured characteristics that also affect savings in Medicaid costs for mothers and newborns. For example, if Medicaid reimbursements from birth to 60 days after birth were lower for women who received adequate prenatal care, and if WIC participants were more likely than nonparticipants to receive adequate prenatal care, then a simple comparison of Medicaid

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<sup>1</sup>This approach was used by Wayne Schramm at the Missouri Center for Health Statistics to estimate the effects of prenatal participation in the WIC program on Medicaid costs in Missouri (Schramm, 1985, 1986, and 1989). Schramm estimated benefit-cost ratios for prenatal WIC participation in the state of Missouri at three points in time--1980, 1982, and 1985-86. In all three studies, the results indicated that significant savings in Medicaid costs were associated with prenatal WIC participation, although all the estimated benefit-cost ratios were less than 1.0, suggesting that the estimated savings in Medicaid costs in Missouri were less than the costs of providing prenatal WIC benefits.

reimbursements for WIC participants with those for nonparticipants would overstate the true effect of WIC participation, since some of the difference can be attributed to the adequacy of prenatal care. However, multiple regression analysis provides estimates of the relationship between Medicaid reimbursements and WIC participation that isolate the effects of WIC participation from the effects of adequate prenatal care.<sup>2</sup> The fact that multiple regression analysis can adjust for measured differences in individual characteristics, thereby more closely identifying the actual effects of prenatal WIC participation, makes it a powerful analysis tool.

However, estimating the effects of the WIC program can be complicated considerably if unobserved or unmeasured differences between WIC participants and nonparticipants also influence pregnancy outcomes and Medicaid costs. For example, relative to other eligible women who do not participate in the WIC program, WIC participants may have a better understanding of the availability of and types of benefits provided by the social service delivery system. Such differences might lead to favorable pregnancy outcomes, and thus to lower Medicaid costs, even in the absence of the WIC program. Because this type of difference is largely unmeasured, particularly with the type of data available for this study, it is very difficult to isolate the effects of WIC participation from those of pre-existing differences on Medicaid costs. This issue will be discussed in detail in Volume 2 of this report.

The statistical analysis of the savings in Medicaid costs focused on maternal and newborn reimbursements from birth to 60 days after birth. In addition to prenatal WIC participation, the following characteristics were assumed to be important predictors of Medicaid cost savings: the sex of the newborn, multiple births, mother's age, mother's race/ethnicity, the adequacy of prenatal care, marital status, the number of previous live births, the number of previous pregnancy terminations, mother's

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<sup>2</sup>This is true only if prenatal participation and the adequacy of prenatal care are not perfectly correlated. If prenatal WIC participants and women who receive adequate prenatal care are the exact same group of women, then perfect multicollinearity exists and multiple regression analysis is not able to separate the effects of the adequacy of prenatal care and prenatal WIC participation. In this study, although prenatal adequacy and prenatal WIC participation are correlated, the correlation is not perfect (the correlation coefficients range from .13 to .16) and perfect or severe multicollinearity is not a problem.

education, and whether the county of residence is urban or rural. Descriptive data on most of these characteristics were presented and discussed earlier in Chapter III.

## B. THE RESULTS OF THE ANALYSIS OF MEDICAID COSTS FROM BIRTH TO 60 DAYS AFTER BIRTH

The principal finding from the analysis of Medicaid costs is that prenatal WIC participation is associated with substantial savings in Medicaid costs during the first 60 days after birth. In all five states, average predicted Medicaid costs from birth to 60 days after birth for women who did not participate in the WIC program exceeded predicted Medicaid costs for women who did participate, as shown in Figures IV.1 and IV.2.<sup>3</sup> The difference between the predicted Medicaid costs with and without the WIC program are the regression estimates of the Medicaid cost savings, which are presented in Table IV.1.<sup>4</sup> Prenatal participation in the WIC program is associated with reductions in Medicaid costs for mothers and newborns combined that ranged from \$277 in Minnesota to \$598 in North Carolina, with intermediate values of \$347, \$493, and \$565 for Florida, Texas, and South Carolina (hospital costs only), respectively.

In North Carolina and Texas (the only two states in which maternal and newborn Medicaid costs could be separated), the estimated savings in newborn Medicaid costs due to prenatal WIC participation were even greater than the estimated savings in combined maternal and newborn Medicaid costs. Specifically, estimated savings in newborn Medicaid costs from birth through 60 days were \$744 in North Carolina and \$573 in

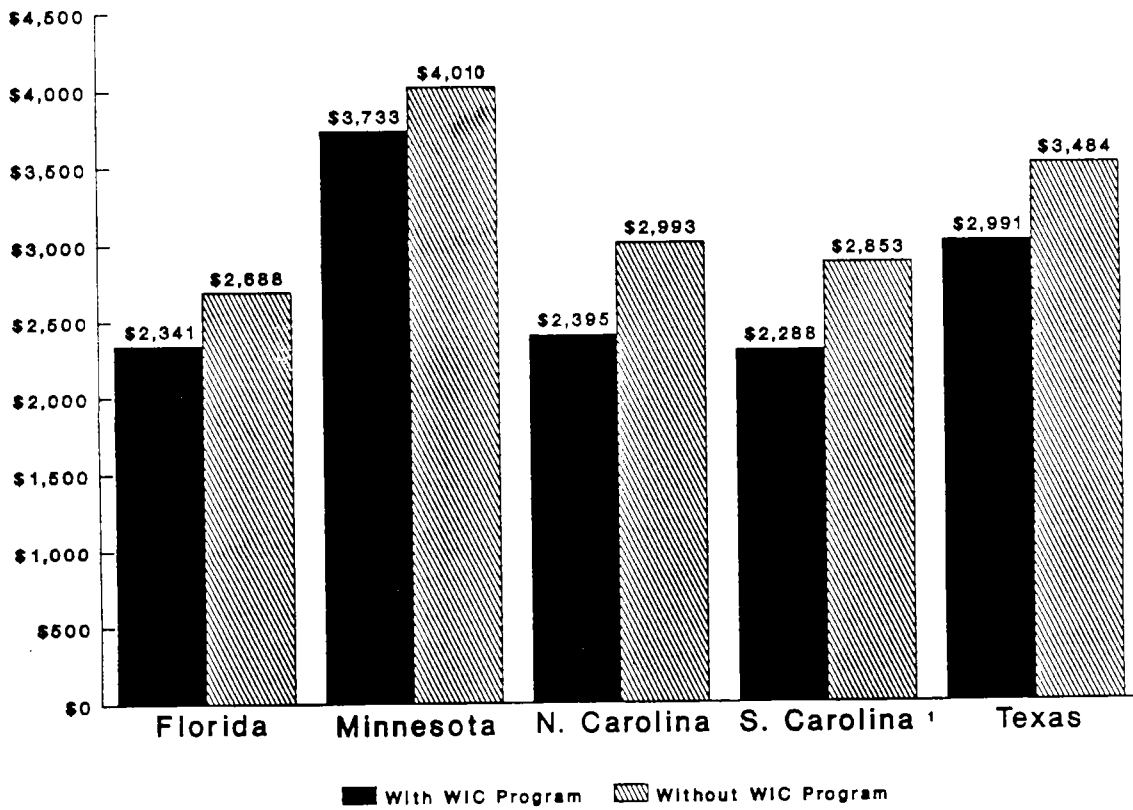
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<sup>3</sup>Predicted Medicaid costs are the regression-adjusted mean values of Medicaid costs under two scenarios: (1) all births were to WIC participants; and (2) all births were to nonparticipants.

<sup>4</sup>Complete sets of regression estimates of the determinants of Medicaid costs, including the effects of the individual characteristics described above, are presented in Appendix Tables A.1 through A.5. With the exception of the estimates for Minnesota, all the estimates presented in Table IV.1 differ statistically from zero at the .01 level of significance (two-tailed test), and the estimate for Minnesota differs statistically from zero at the .07 level of significance (two-tailed test) and is statistically greater than zero at the .03 level of significance (one-tailed test).

**FIGURE IV.1**  
**PREDICTED MEDICAID COSTS FROM**  
**BIRTH TO 60 DAYS AFTER BIRTH,**  
**NEWBORNS AND MOTHERS**

Predicted Medicaid Costs



1. Medicaid costs refer to hospital costs only

**FIGURE IV.2**  
**PREDICTED MEDICAID COSTS**  
**FROM BIRTH TO 60 DAYS AFTER BIRTH,**  
**NEWBORNS**

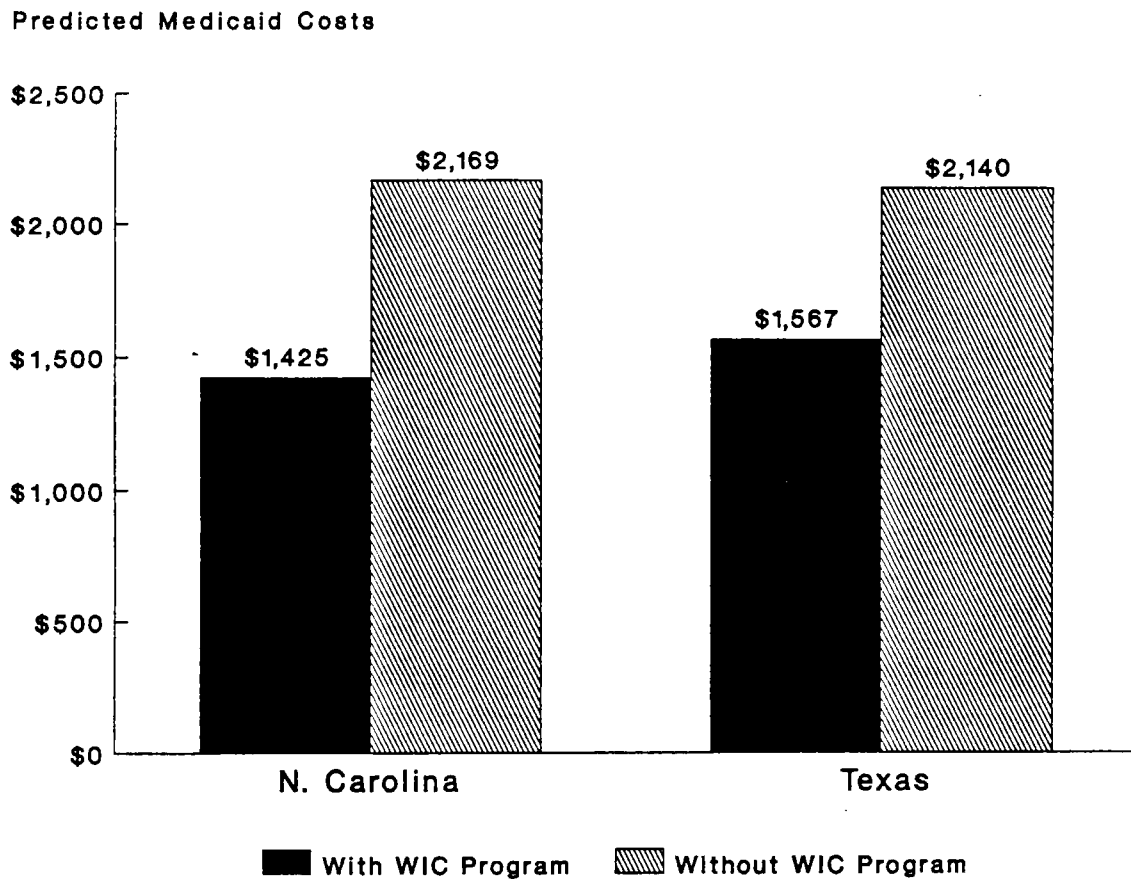


TABLE IV.1

SAVINGS IN MEDICAID COSTS FROM BIRTH TO 60 DAYS AFTER BIRTH ASSOCIATED WITH PRENATAL PARTICIPATION IN THE WIC PROGRAM

	Average Medicaid Costs		Estimated Savings in Medicaid Costs <sup>a</sup>
	With WIC Program	Without WIC Program	
<b>Florida</b>			
Newborns and Mothers	\$2,341	\$2,688	\$347
<b>Minnesota</b>			
Newborns and Mothers	\$3,733	\$4,010	\$277
<b>North Carolina</b>			
Newborns	\$1,425	\$2,169	\$744
Newborns and Mothers	\$2,395	\$2,993	\$598
<b>South Carolina<sup>b</sup></b>			
Newborns and Mothers	\$2,288	\$2,853	\$565
<b>Texas</b>			
Newborns	\$1,567	\$2,140	\$573
Newborns and Mothers	\$2,991	\$3,484	\$493

SOURCE: WIC/Medicaid database for Florida, Minnesota, North Carolina, South Carolina, and Texas.

NOTE: Medicaid costs are from birth to 60 days after birth. Complete sets of regression estimates are presented in Appendix A and in Volume 2 of this report.

<sup>a</sup>All estimated savings in Medicaid costs are statistically significant at the .01 level (two-tailed test), except in Minnesota where the estimate is statistically significant at the .07 level (two-tailed test) and at the .03 level (one-tailed test).

<sup>b</sup>Medicaid costs refer to hospital costs only.

Texas. This finding reflects two phenomena: (1) high health care costs after birth are usually associated with high-cost newborns rather than mothers; and (2) some very high-cost newborns, whose mothers were not Medicaid-eligible during pregnancy, become eligible for Medicaid due to their high costs.

The benefit-cost ratios presented in Table IV.2 show the estimated savings in Medicaid costs per dollar of WIC program costs--the cost of the WIC supplemental food benefits plus an adjustment for administrative and nutrition education expenses. (See Chapter III for a discussion of WIC program costs.) All benefit-cost estimates are greater than one, suggesting that the WIC program is cost-effective, with the benefits of prenatal WIC participation (that is, savings in Medicaid costs from birth to 60 days after birth) exceeding the costs of providing benefits. For newborns and mothers, these estimates vary across states, ranging from 1.77 in Florida to 3.13 in North Carolina, with values of 1.83 for Minnesota and 2.44 for both South Carolina and Texas. For newborns only, the benefit-cost estimates are 3.90 in North Carolina and 2.84 in Texas. Thus, for every dollar spent on the prenatal WIC program, the associated savings in Medicaid costs during the first 60 days after birth range from \$1.77 to \$3.13 for newborns and mothers and from \$2.84 to \$3.90 for newborns only.<sup>5</sup>

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<sup>5</sup>These benefit-cost ratios are larger than those obtained by Schramm for the state of Missouri (1985, 1986, and 1989). Among others, one important difference between this study and the studies by Schramm is the definition of Medicaid costs from birth to 60 days after birth. The definition in this study includes reimbursements for all Medicaid claims with a start date of service at or before 60 days after birth, and claims that extend beyond the 60-day postpartum period are prorated according to the proportion of the claim period that falls within the 60-day postpartum period. The definition used in the Schramm studies includes reimbursements for all Medicaid claims with an end date of service at or before the cutoff date (30 days in 1980, and 45 days in 1982 and 1985-86). Thus, the definition of Medicaid costs in this study is more inclusive and includes higher-cost births, particularly those with claims that extend beyond the postpartum period. Yet a third definition of Medicaid costs from birth through 60 days, and one that will be discussed in Volume 2, includes all costs (i.e., no prorating) for claims with a start date of service within 60 days of birth. Thus, the definition used for the analysis results presented in this volume is in the middle between the more inclusive and less exclusive of the possible definitions of Medicaid costs from birth through 60 days.



TABLE IV.2  
ESTIMATED BENEFIT-COST RATIOS

	Estimated Savings in Medicaid Costs <sup>a,b</sup>	Estimated Prenatal WIC Costs per Participant	Estimated Benefit-Cost Ratios <sup>b</sup>
<b>Florida</b>			
Newborns and Mothers	\$347	\$196	1.77
<b>Minnesota</b>			
Newborns and Mothers	\$277	\$151	1.83
<b>North Carolina</b>			
Newborns	\$744	\$191	3.90
Newborns and Mothers	\$598	\$191	3.13
<b>South Carolina<sup>c</sup></b>			
Newborns and Mothers	\$565	\$232	2.44
<b>Texas</b>			
Newborns	\$573	\$202	2.84
Newborns and Mothers	\$493	\$202	2.44

SOURCE: WIC/Medicaid database for Florida, Minnesota, North Carolina, South Carolina, and Texas.

<sup>a</sup>Medicaid costs are from birth to 60 days after birth.

<sup>b</sup>All estimates are statistically significant at the .01 level (two-tailed test), except in Minnesota where the estimate is statistically significant at the .07 level (two-tailed test) and at the .03 level (one-tailed test).

<sup>c</sup>Medicaid costs refer to hospital costs only.

Two points must be considered when these results are interpreted. First, the estimated savings in Medicaid costs from birth to 60 days after birth that are associated with prenatal WIC participation are independent of the effects of prenatal care on Medicaid costs. Table IV.3 presents estimates of the separate effects of prenatal WIC participation and the adequacy of prenatal care on the savings in Medicaid costs from birth to 60 days after birth. These estimates indicate that considerable Medicaid cost savings during the 60-day postpartum period were associated with adequate or intermediate levels of prenatal care, ranging from \$267 for newborns and mothers in Florida to \$1,005 for newborns and mothers in Minnesota. Thus, for Medicaid-eligible women who both participate in the WIC program during pregnancy and receive adequate or intermediate levels of prenatal care, the associated savings in Medicaid costs are substantial.

The second important point is that the estimated savings in Medicaid costs associated with prenatal WIC participation are not independent of any unmeasured or unobserved differences between WIC participants and nonparticipants that may also influence birth outcomes and Medicaid costs. WIC participants are a self-selected group of women who may choose to participate in the WIC program for underlying reasons that may independently lead to lower Medicaid costs. For example, some pregnant women may not participate in the WIC program because they lack access to public health programs, which, may affect pregnancy outcomes. Thus, the estimated savings in Medicaid costs related to WIC participation may overestimate the true savings, since, relative to nonparticipants, WIC participants would have lower Medicaid costs even in the absence of the WIC program.<sup>6</sup> The problem introduced by self-selection is rendered less severe by the fact that (1) the adequacy of prenatal care is also likely to be related to any such underlying differences between WIC participants and nonparticipants, and (2) the analysis was able to adjust the estimated savings in Medicaid costs associated with prenatal participation for the adequacy of care. However, the potential implications of the self-selection issue should be kept in mind when the study results are interpreted and generalized.

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<sup>6</sup>Conversely, if the WIC program were successful at reaching high-risk, low-income pregnant women, WIC participants may be more likely to have higher-cost pregnancy outcomes than nonparticipants, and the estimated savings presented in this chapter would underestimate the true savings associated with prenatal WIC participation.

TABLE IV.3

SAVINGS IN MEDICAID COSTS FROM BIRTH TO  
60 DAYS AFTER BIRTH: EFFECTS OF PRENATAL WIC  
PARTICIPATION AND THE ADEQUACY OF PRENATAL CARE

	Prenatal WIC Participation	Prenatal Care Was Intermediate or Adequate <sup>a</sup>
<b>Florida</b>		
Newborns and Mothers	\$347	\$267
<b>Minnesota</b>		
Newborns and Mothers	\$277	\$1,005
<b>North Carolina</b>		
Newborns	\$744	\$593
Newborns and Mothers	\$598	\$415
<b>South Carolina</b>		
Newborns and Mothers	\$565	\$623
<b>Texas</b>		
Newborns	\$573	\$610
Newborns and Mothers	\$493	\$362

SOURCE: WIC/Medicaid database for Florida, Minnesota, North Carolina, and Texas.

NOTE: Complete sets of regression estimates are presented in Appendix A and in Volume 2 of this report. All estimated effects of prenatal care are statistically significant at the .01 level. With the exception of Minnesota, the estimated effects of prenatal WIC participation are statistically significant at the .01 level (two-tailed test). In Minnesota, the estimated effect of prenatal WIC participation is statistically significant at the .07 level (two-tailed test) and at the .03 level (one-tailed test).

<sup>a</sup>These estimates are derived from a comparison of regression-adjusted mean values of Medicaid costs for intermediate or adequate levels of prenatal care with regression-adjusted mean values of Medicaid costs for inadequate levels of prenatal care.

Other unmeasured differences between WIC participants and nonparticipants may also influence the study findings. One issue considered in the analysis concerns the timing of enrollment in the WIC program. For the results presented in this report, a woman is considered a prenatal WIC participant if she redeemed any food instruments during the nine months prior to birth, or, for states with no redemption data, if she had a certification date for the WIC program sometime during the nine months prior to birth. Thus, WIC participants include some women who enrolled very early during pregnancy and some women who enrolled very late during pregnancy. For the very late WIC enrollees (e.g., after 36 weeks gestation) there is the potential for an overstatement of the effects of WIC participation due to the fact that Medicaid costs for these late WIC enrollees with longer gestational ages are being compared to costs for nonparticipants, some of whom had preterm births and did not have the opportunity to enroll later as prenatal WIC participants. At the opposite end of the spectrum, early WIC enrollees (e.g., enrollment in the first trimester) may well include higher risk pregnancies that have higher Medicaid costs.<sup>7</sup> Thus, for early WIC enrollees, there is the potential for an understatement of the effects of WIC participation, since Medicaid costs for the higher-risk early enrollees are also being compared to nonparticipants who, as a group, are likely to have lower-risk pregnancies. Both of these issues are discussed in the forthcoming Volume 2 of this report.

### C. THE RESULTS OF THE ANALYSIS OF BIRTH OUTCOMES

An analysis of the effects of prenatal WIC participation on birth outcomes is important for understanding the possible sources of the Medicaid cost savings discussed earlier. This section presents the results of an analysis of the effects of prenatal WIC participation on four measures of birth outcomes: birthweight, the incidence of low birthweight, gestational age, and the incidence of preterm births.

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<sup>7</sup>Although the data available for this study do not allow a thorough analysis of why this is true, discussions with state staff and analyses of early WIC enrollees suggest that they exhibit the highest risk factors for poor pregnancy outcomes. In addition, the WIC program actively targets early prenatal enrollment by high-risk women.

Prenatal WIC participation by Medicaid recipients is consistently associated with increased birthweight and a lower incidence of low birthweight (births of infants who weigh less than 2,500 grams, or 5.5 pounds), as shown in Table IV.4. The average increase in birthweight ranged from 51 grams in Minnesota to 73 and 77 grams in Florida and Texas, to 113 and 117 grams in South Carolina and North Carolina, respectively. Similarly, the reduction in the percentage of women who gave birth to low-birthweight newborns ranged from 2 percentage points in Minnesota to 5 percentage points in North Carolina and South Carolina. (From 10 to 17 percent of nonparticipating Medicaid women gave birth to low-birthweight babies.)

However, the most dramatic increase in birthweight for prenatal WIC participants relative to nonparticipants occurred with the newborns of the subsample of Medicaid women who had preterm births--births of infants whose gestational age was less than 37 weeks. The average increase in birthweight for this subsample ranged from 138 grams in Minnesota to 259 grams--approximately half a pound--in South Carolina, with intermediate increases of 150, 165, and 238 grams in Florida, Texas, and North Carolina, respectively. Thus, increases in birthweight for preterm births to Medicaid-eligible WIC participants relative to nonparticipants were on the order of 6 to 11 percent, compared with 2 to 4 percent for all births. Consequently, increases in birthweight for full-term births were relatively small--under 50 grams--in all five states.

In general, the pattern of the estimated effects of prenatal WIC participation on birthweight are consistent with the explanation that relatively heavier babies have relatively lower-cost births. The smallest effects on birthweight and Medicaid costs were observed in Minnesota, while the largest effects for birthweight and costs were observed in North Carolina and South Carolina.

Prenatal WIC participation by Medicaid recipients is also associated with a lower incidence of preterm births and a longer gestational age. The reduction in the percentage of women with preterm births ranged from 2 percentage points in Minnesota to 6 percentage points in South Carolina. Medicaid-eligible prenatal WIC participants also had longer gestations than nonparticipants, ranging from between .2 weeks and .8 weeks longer for Minnesota and North Carolina, respectively, with intermediate estimates of .4 weeks for Florida and Texas, and .6 weeks for South Carolina. These estimated gestational age effects should be interpreted

TABLE IV.4

## ESTIMATED EFFECTS OF WIC PARTICIPATION ON BIRTHWEIGHT AND GESTATIONAL AGE

	Birthweight					Gestational Age	
	All Births	Birthweight (grams) <sup>a</sup>			Incidence of Low Birthweight (%) <sup>b</sup>	Gestational Age (weeks) <sup>a</sup>	Incidence of Preterm Births (%) <sup>b, c</sup>
		Preterm Births	Full-Term Births				
<b>Florida</b>							
With WIC Program	3,225	2,602	3,313	9.5	39.6	11.8	
Without WIC Program	3,152	2,452	3,284	12.8	39.2	15.3	
Estimated Effect of WIC Participation	73	150	29	-3.3	.4	-3.5	
<b>Minnesota</b>							
With WIC Program	3,312	2,342	3,398	7.8	39.3	10.4	
Without WIC Program	3,261	2,204	3,382	10.0	39.1	12.7	
Estimated Effect of WIC Participation	51	138	16	-2.2	.2	-2.3	
<b>North Carolina</b>							
With WIC Program	3,179	2,669	3,276	11.1	39.6	13.2	
Without WIC Program	3,062	2,430	3,234	16.2	38.8	18.6	
Estimated Effect of WIC Participation	117	238	42	-5.1	.8	-5.4	
<b>South Carolina</b>							
With WIC Program	3,134	2,602	3,222	11.7	39.3	13.9	
Without WIC Program	3,021	2,343	3,192	16.8	38.7	20.2	
Estimated Effect of WIC Participation	113	259	30	-5.1	.6	-6.3	
<b>Texas</b>							
With WIC Program	3,231	2,834	3,308	8.8	39.5	11.5	
Without WIC Program	3,154	2,669	3,283	12.2	39.1	15.7	
Estimated Effect of WIC Participation	77	165	25	-3.4	.4	-4.2	

SOURCE: WIC/Medicaid database for Florida, Minnesota, North Carolina, South Carolina, and Texas.

NOTE: Complete sets of regression estimates are presented in Appendix B and in Volume 2 of this report. All estimated effects are statistically significant at the .01 level, except the effect on birthweight for full-term births in Minnesota.

<sup>a</sup>Estimated with OLS regression.<sup>b</sup>Estimated with probit analysis.<sup>c</sup>Preterm births are those with a gestational age of less than 37 weeks.

with some caution, however, given the issue discussed previously concerning early and late enrollees in the WIC program. In particular, some WIC participants enroll very late during pregnancy, and the gestational age of the newborns of these late enrollees would have been relatively high even had they not enrolled in the WIC program.





## V. GENERALIZATION OF THE STUDY FINDINGS

The results of this study indicate that prenatal participation in the WIC program by Medicaid recipients improves birth outcomes and leads to savings in Medicaid costs. However, given that the study is limited to five states and is based on 1987 birth cohorts, two important questions must still be resolved:

1. What inferences can be drawn from these state-specific results about the nation as a whole?
2. How stable are these conclusions over time?

Analyzing the reasons for the different results in the five study states can shed light on the first question. In addition to variations in the accessibility and effectiveness of the WIC program, differences in birth outcomes and health care costs are due to differences in (1) the characteristics of the Medicaid population, and (2) program policies that affect Medicaid reimbursement amounts. These same factors affect the extent to which the results of the study can be generalized. In addition, major changes in both the WIC and the Medicaid programs have occurred since 1987, and the increase of substance abuse is changing the nature of perinatal risk factors. Consequently, the same study conducted with a 1990 Medicaid birth cohort might generate different findings.

This chapter explores the generalizability of the study results. Section A summarizes the major findings presented in earlier chapters. Section B discusses the feasibility of generalizing the results for all 1987 Medicaid births, building on the insights gained from studying the reasons for different outcomes in the study states. Section C reviews the programmatic and risk-factor changes that may affect the long-term stability of the results. The conclusions of the chapter are summarized in Section D.

### A. MAJOR STUDY FINDINGS

The findings of the study in all five states indicate that prenatal participation in the WIC program by Medicaid recipients is associated with higher birthweights, longer gestational ages, and reduced maternal and newborn Medicaid costs in the 60-day postpartum period. These results occur after the effects of sociodemographic characteristics and the

adequacy of prenatal care on birth outcomes and Medicaid costs are adjusted for. However, not all the differences between participants and nonparticipants that may affect birth outcomes and costs can be assessed. In particular, the factors that affect (1) a pregnant woman's decision to seek prenatal care and/or to participate in the WIC program, and (2) her ability to obtain this care, have not been directly measured.

Full-term birthweight differences between Medicaid-eligible WIC participants and nonparticipants were observed in all states, but were much smaller in magnitude than the overall birthweight differences. The study findings suggest that prenatal WIC participation by Medicaid recipients has (1) a larger effect on the birthweights of preterm infants than on full-term infants, and (2) leads to lower prematurity rates. Medicaid costs for mothers and newborns were also lower for WIC participants than for nonparticipants, and benefit-cost ratios were greater than one in all five study states. In the two states in which mothers' and newborns' costs could be separated, the estimated cost savings for newborns alone were greater than the cost savings for mothers and newborns.

While the results from all five states led to the same overall conclusions, significant differences in the magnitude of the measured differences arose. The estimated effects of WIC participation by Medicaid recipients on birthweight and gestational age were greatest in North Carolina and South Carolina and least in Minnesota. These results are also reflected in the estimated savings in Medicaid costs, although, unlike birth outcomes, Medicaid cost savings are not directly comparable across states. In the study, costs are defined in terms of Medicaid-reimbursed amounts, which may vary dramatically across states because state program policies differ. Major differences in the estimated benefit-cost ratios also exist; the ratio is the highest in North Carolina and the lowest in Minnesota and Florida. Again, however, interstate comparisons of benefit-cost ratios should be made very cautiously, since program policies and the characteristics of the WIC and Medicaid populations affect both the measured benefits and the costs of WIC participation regardless of changes in birth outcomes.

#### B. GENERALIZING THE STUDY RESULTS FOR 1987 MEDICAID BIRTHS

Three factors contribute to the estimated differences in the impacts of the WIC program in the study states: (1) socioeconomic and demographic differences among Medicaid-eligible pregnant women; (2) differences in public prenatal care systems for low-income women; and (3) differences in Medicaid program policies that affect reimbursement amounts. These factors also affect the extent to which the study findings can be generalized to all 1987 Medicaid births. In this section, the insights from studying the possible causes of outcome differences in the five study states are used to assess the feasibility of generalizing the results of the study.

Socioeconomic  
and Demographic  
Differences

In 1987, the characteristics of the Medicaid-eligible populations differed considerably across the five study states. Medicaid-eligible pregnant women in Minnesota were predominantly white and married, were somewhat older, and appeared to be less disadvantaged than those in the other four states. In addition to maternal age, marital status, and racial/ethnic differences, the Medicaid populations in the study states were not comparable socioeconomically. In 1987, the poverty income threshold for a family of three was \$9,056; the Medicaid income eligibility thresholds ranged from 33 percent of the poverty level in Texas to 88 percent of the poverty level in Minnesota. The other three states had income eligibility thresholds between 40 and 50 percent of the poverty level. A priori, one would expect that the benefits of program participation would be greatest among the most severely disadvantaged women. This expectation is consistent with the apparently smaller program impact in Minnesota.

Socioeconomic and demographic differences among Medicaid populations affect the extent to which the study findings can be generalized. The results from the five states suggest that the effects of prenatal participation in the WIC program are more pronounced in socioeconomically disadvantaged states with relatively large black populations and in states with relatively low Medicaid income eligibility thresholds. However, the lack of a large, urban, industrial state in the study limits the conclusions that can be drawn about the impacts of the program in states with large, predominantly urban, minority populations. It is not clear whether the same benefits would be seen among inner-city minority populations.

Differences in  
Public Prenatal  
Care Systems for  
Low-Income  
Women

The use of prenatal care by low-income women often depends on the availability and accessibility of public prenatal care. The accessibility of public prenatal care may also affect participation in the WIC program. Public prenatal care providers--such as local health departments--typically also provide WIC services, thus facilitating the referral of pregnant women to WIC services. (All of the study states reported experiencing difficulties in getting private physicians to refer pregnant women to the WIC program.) Conversely, if a referral from a prenatal care provider is required for WIC participation, bottlenecks in the public prenatal care system may impede WIC participation.

As described here, the availability and accessibility of public prenatal care differed considerably across the five study states, as did the linkages between WIC services and prenatal care.

- In Florida, North Carolina, and South Carolina, local health departments are generally direct providers of prenatal care and WIC services. Both Florida and South Carolina have subsidized prenatal care available in almost every county. However, North Carolina has been facing growing problems with the withdrawal of physicians from public health clinics. In July 1988, 12 North Carolina counties had no public prenatal care available. According to state staff, constraints on public prenatal care in North Carolina meant that pregnant women experienced delays in enrolling in the WIC program.
- In contrast to the other three southern states, a mixed health-care delivery system for low-income pregnant women exists in Texas. In the more populous counties, local health departments provide prenatal care. In smaller counties, either prenatal care services are administered and funded by the State Health Department, or the State may contract with private providers in these counties. Despite these efforts, the Texas Department of Health identified 55 counties that were in need of prenatal care services, although, by 1988, the state-funded Maternal Improvement Health Insurance Act (MIHIA) program was providing prenatal care in 36 of these counties. WIC services in Texas are also available from a range of different providers, including local health departments, Community Action Program (CAP) agencies, Migrant Health Centers, nonprofit health centers, and freestanding WIC centers. As with prenatal care, however, Texas had a number of unserved counties during the study period. Thirteen percent (34 out of 254 counties) were not served by the WIC program during the study period. Texas achieved state-wide WIC services in 1990.
- The public health philosophy of Minnesota differs from that of the other four states in the study, and is not strongly oriented towards the direct provision of services. Consequently, with the exception of Migrant Health Centers and a few clinics in the Twin Cities, prenatal care and WIC services are provided separately in Minnesota; WIC services are provided largely by the public sector, and prenatal care is provided by private physicians.

Given these variations in the availability and accessibility of prenatal care, one would expect that (1) rates of inadequate prenatal care among Medicaid mothers would be higher in North Carolina and Texas, and that (2) WIC participation rates would be lower in Texas and Minnesota. However, North Carolina had the lowest overall rate of inadequate prenatal care and, at the high end of the scale, South Carolina and Texas exhibited little difference. As expected, Texas had the lowest rate of WIC participation among Medicaid mothers, but Minnesota's WIC participation rate was the second highest among the study states. These findings are difficult to interpret, given what is known about the effects of availability and accessibility on program participation. Thus, the results for the five states included in this study do not provide solid evidence on how the generalizability of the study findings is affected by the differences in the health care delivery systems for low-income women.

Differences in  
Medicaid Policies  
that Affect  
Reimbursement

In this study, maternal and newborn costs are defined as the amounts that Medicaid reimbursed for mothers and infants from birth to 60 days after birth. However, Medicaid reimbursement amounts may not reflect either (1) the real costs of care or (2) the relative costs of mothers and newborns in different states, since state Medicaid program policies have critical effects on the reimbursement amounts. Lower Medicaid-reimbursed amounts do not necessarily mean that overall costs were lower. Medicaid policies that restrict reimbursement amounts may force other indigent care programs and public hospitals to pick up the excess costs of low-income women and newborns. Unfortunately, other indigent care costs could not be included in this study. Consequently, the limitations of the cost measurement should be kept in mind when the results of the study are interpreted and generalized.

The following factors affect Medicaid reimbursement amounts for mothers and newborns in the first 60 days of life:

- **Service limits.** For cost-containment purposes, many states limit the number of inpatient hospital days and/or physician visits that will be paid by Medicaid. In 1987, both Florida and Texas had Medicaid inpatient hospital service limits that may have restricted the amount that Medicaid reimbursed for high-cost newborns. The effect of these limits would be to underestimate the costs of care and to lower the benefit-cost ratios in the two states.

- **Hospital reimbursement methods.** Medicaid programs typically use one of five basic hospital reimbursement methods: retrospective cost-based systems, diagnosis-related groups (DRGs), hospital-specific prospective flat rates, budgeted systems, or negotiated rates. Each of these systems provide different cost-containment incentives. Among the five study states, Minnesota, South Carolina, and Texas used DRGs, and Florida and North Carolina used prospective hospital-specific per-diem rates. Under a DRG system, the same amount is paid for all patients in a particular DRG, regardless of the length of stay. (However, in both South Carolina and Texas, newborn care could be reimbursed on a per-diem basis, which probably tempered the impact of DRGs.) Under hospital-specific per diem-rates, the amount reimbursed varies according to length of stay and is also affected by the historical costs of the individual hospital, since these factors are used to determine the prospective rate. The latter is an important consideration when the costs of mothers and newborns are reviewed, since Medicaid deliveries and newborn care frequently occur in relatively high-cost public and university hospitals.
  
- **Spend-down eligibility.** All states must include certain population groups in their Medicaid programs, but coverage of other groups is optional. In particular, states have the option of establishing a medically needy program. The program allows Medicaid coverage for persons in the same categories as Medicaid participants whose income is slightly above the Medicaid income-eligibility ceiling. It also allows people to become eligible for Medicaid if high medical expenses reduce their income to the Medicaid eligibility level. Spend-down eligibility is a vehicle by which high-cost newborns become eligible for Medicaid, due to their medical expenses. In states without spend-down programs, the costs for the care of these newborns may be picked up by other indigent health care programs or be absorbed by hospitals. Among the study states, South Carolina did not have a spenddown program at the time of the study, which could have reduced the apparent benefits of WIC participation in South Carolina if the spenddown eligibility category included a greater proportion of nonparticipants in the WIC program.

The large variations in cost savings among the study states partially reflect the different Medicaid eligibility and reimbursement policies and their interactive effects. Nationwide, Medicaid program policies vary greatly and profoundly affect the capacity to generalize the results of the study

for 1987 Medicaid births. Thus, for example, in 1987, 7 states and the District of Columbia reimbursed hospitals using a retrospective cost-based system, 14 states used DRGs, 21 states used hospital-specific flat rates based on historical costs, 4 states used budgeted rates, and 3 states use negotiated rates. In addition, 14 states did not have medically needy programs, and 15 states (in 1986) imposed limitations on inpatient hospital patient days (Congressional Research Service, 1988). Wide variations in the amounts paid by Medicaid for different services also occurred that were not necessarily closely related to differences in health-care costs. For example, the Medicaid reimbursement for a global fee for a delivery in 1986 ranged from \$214 in New Hampshire to \$1,508 in Massachusetts. The corresponding ratios of Medicaid-reimbursed amounts to prevailing community charges ranged from 18 percent in Florida to 74 percent in Nevada (Lewis-Idema, 1988). Given program variations that affect reimbursed amounts regardless of differences in underlying health-care costs, the concept of a single benefit-cost ratio expressing Medicaid savings as a function of WIC costs makes sense only at the state level. A range of benefit-cost ratios exists nationwide, reflecting different program policies in addition to real differences in outcomes.

### C. LONG-TERM STABILITY OF THE RESULTS OF THE STUDY

Since the analysis period of the WIC/Medicaid study (1987), major changes have occurred in the WIC and the Medicaid programs and in the environments in which these programs are operating. Thus, at issue is the long-term stability of the study results. Specifically, if the study were repeated using 1990 Medicaid births, would the same associations between WIC participation and birth outcomes and the same range of benefit-cost ratios be observed? This question is addressed here, focusing on three specific issues: (1) changes in the WIC program; (2) changes in the Medicaid program; and (3) changes in risk factors for adverse pregnancy outcomes.

#### Changes in the WIC Program Since 1987

Significant expansions in the WIC program have occurred in all states since 1987. The Commodity Distribution Reform Act and WIC Amendments of 1987 mandated that states adopt a variety of cost-containment initiatives, including infant formula rebates. States were required to contract with one (or more) infant formula manufacturers and

receive rebates on retail purchases of infant formula by WIC participants. These rebates have generated considerable cost savings, which have allowed states to expand the number of program participants without increases in federal funding. Consequently, the number of pregnant women participating in the WIC program has increased almost 22 percent nationally (from 486,900 to 593,000) between 1987 and 1989. The increase in prenatal WIC participation was due both to cost containment measures and to appropriations increases during that period. The experience of any particular state is also a function of (1) the proportion of eligible pregnant women already participating, and (2) the extent of outreach and program coordination efforts.

In addition, Public Law 101-147 and the Child Nutrition and WIC Amendments of 1989 include an adjunctive income eligibility requirement. Women, infants, and children at nutritional risk who are certified for Food Stamps or Medicaid must now be deemed to meet the income eligibility criterion for the WIC program automatically. This legislation also requires certain referrals from the WIC program to Medicaid. The net effect of these legislative changes is likely to increase the proportion of Medicaid births to WIC participants.

The effect of the program expansions on birth outcomes and Medicaid costs depends on the extent to which the WIC program expansions target and reach women who are at higher-risk than those previously enrolled. Reaching higher-risk women could lead to higher rates of adverse pregnancy outcomes, and higher Medicaid costs among WIC participants than previously, since WIC participants would include a larger proportion of high-risk women. If, on the other hand, program expansions lead to a larger proportion of low-risk women among WIC participants, then rates of adverse pregnancy outcomes may decline among WIC participants. Consequently, an evaluation of the impact of the WIC expansions requires tracking the changing risk characteristics of prenatal WIC participants, to ascertain whether changes in birth outcomes and costs reflect changes in risk characteristics or changes in the effectiveness of the program.

Changes in the  
Medicaid Program  
Since 1987

Since 1987, Medicaid program eligibility has continually been expanded to pregnant women and infants, and major enhancements have been made to the program to improve both access to care and the quality of care. So profound and complex have these changes been that making simple inferences about their impact on WIC benefit-cost studies is difficult. These problems are compounded by the variation in initiatives and the



pace at which they are being introduced in different states. The changes that have occurred fall into four broad categories: (1) income eligibility expansions and initiatives to streamline eligibility determination; (2) other program enhancements to improve the quality of care for pregnant women; (3) coordination between the WIC and Medicaid programs; and (4) higher reimbursement rates for obstetrical care. Each of these issues is reviewed briefly here.

Income Eligibility Expansions and Initiatives to Streamline Eligibility Determinations. Under the Omnibus Budget Reconciliation Act of 1989, states are mandated by Congress to expand Medicaid coverage to all pregnant women, infants, and children under age six whose incomes are below 133 percent of the poverty level. States have had the option of providing Medicaid coverage to pregnant women and infants below 185 percent of poverty since 1988, and several states have expanded to this income level. In addition, states have the option of waiving the asset test for pregnant women, granting continuous eligibility for pregnant women for up to 60 days postpartum, and allowing certain primary care providers to grant short-term Medicaid presumptive eligibility to pregnant women.

These changes have had several effects. If prenatal WIC participation is more beneficial for low-income women, enrolling a higher-income group of pregnant women in the Medicaid program may have the effect of lowering the estimated benefits of WIC participation. Conversely, streamlining and simplifying Medicaid eligibility processes may enable states to enroll a new group of poor, high-risk women in the Medicaid program, those for whom the regular eligibility processes are too complex and arduous. This change could have the effect of increasing the estimated benefits of WIC participation. Third, many pregnant women in the "near-poor" income categories, who previously became Medicaid-eligible only by spending down when they or their infants incurred high costs, may now be Medicaid-eligible throughout their pregnancies. The effects of this change on the estimates of WIC benefits are uncertain.

Other Medicaid Program Enhancements for Pregnant Women. In addition to eligibility enhancements, states also have the option of initiating a variety of Medicaid program enhancements for pregnant women, including enriched prenatal care, targeted outreach, and care coordination. The intent of these initiatives is to provide high-quality prenatal care to all Medicaid-eligible pregnant women, especially those at high risk of adverse pregnancy outcomes.

Coordination between the WIC and Medicaid Programs. Of particular importance for enhancing the quality of care for low-income pregnant women is the recent Congressional mandate that requires coordination between the Medicaid and the WIC programs. The mandate requires that states notify all Medicaid beneficiaries who are pregnant, postpartum, or breastfeeding women, or children younger than five, of the availability of WIC benefits. Women, infants, and children at nutritional risk who are certified for food stamps or Medicaid must now automatically be deemed to meet the income test to qualify for the WIC program. In addition, nutrition education for pregnant women can now be reimbursed by Medicaid as part of a package of enriched prenatal care in addition to the nutrition education provided through the WIC program.<sup>1</sup>

Some of these initiatives are so recent that it is difficult to assess their implications for benefit-cost studies of the WIC program. However, it is clear that the proportion of pregnant women enrolled in the Medicaid program who are also participating in the WIC program is likely to increase in the future. Furthermore, the distinction between WIC program services and Medicaid-reimbursed services will become increasingly blurred as nutrition screening and counseling become part of the regular prenatal care package reimbursed by Medicaid.

Higher Reimbursement Rates for Obstetrical Care. In many states, Medicaid eligibility and program expansions have been accompanied by enhanced reimbursement rates for providers of obstetrical services. The purpose of the higher fees is to increase participation rates of providers and to encourage providers both to accept high-risk pregnant women and to ensure that they provide the women with the appropriate level of care. If these initiatives prove successful, prenatal care costs for Medicaid mothers should increase, but the costs associated with adverse pregnancy outcomes should decline.

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<sup>1</sup>Hill and Bennett (1990) cite the example of Utah, which has introduced a two-step benefit for Medicaid-eligible pregnant women. All Medicaid-eligible pregnant women are referred to the WIC program for initial evaluation and counseling. Women with more complex nutritional and medical needs can then receive further Medicaid-reimbursed education, counseling, and monitoring.

Changes in Risk  
Factors for  
Adverse  
Pregnancy  
Outcomes

In its landmark 1985 study Preventing Low Birthweight, the Institute of Medicine identified the principal risk factors for adverse pregnancy outcomes, which included medical risks in the current pregnancy, behavioral and environmental risks, health-care risks, demographic factors, and medical risks predating the pregnancy. The recent expansions of the WIC and the Medicaid programs are intended to address some of the specific risks included within these categories, such as poor weight gain during pregnancy, poor nutrition, and absent or inadequate prenatal care. However, many other risks remain, and some behavioral risks appear to be increasing.

In particular, the increase in alcohol and drug abuse among pregnant women--especially cocaine and crack--has become a major public health policy problem. While much of the information on this issue has been anecdotal, recent studies suggest that the number of newborns exposed to drugs is increasing dramatically and that low-birthweight rates are thus rising (Joyce, 1990; U.S. General Accounting Office, 1990; Public Health Foundation, 1990). The costs of newborn care are increasing correspondingly; the U.S. General Accounting Office (1990) has estimated that hospital charges for drug-exposed infants were up to four times greater than for infants with no evidence of drug exposure. If recent trends continue and pregnancy outcomes deteriorate, the costs of newborn care will rise.

The WIC and the Medicaid programs will play essential roles in addressing these increasing behavioral risks. WIC nutritional assessments, counseling, and education, in conjunction with enhanced Medicaid prenatal care benefits, are critically important for women who are at risk of using drugs and alcohol during pregnancy. Indeed, recent legislation has recognized the importance of the WIC program to address the need for drug-use referrals and education.

#### D. CONCLUSIONS

Wide variations in WIC and Medicaid program policies and in the sociodemographic characteristics of Medicaid mothers across the country make generalizing the WIC/Medicaid study results extremely difficult. These problems are compounded by the exclusion of other indigent care costs from the study, which means that only a partial picture of the health-care costs of low-income women and newborns is available. Nonetheless, the fact that the benefits of WIC prenatal participation by Medicaid

recipients were so clearly demonstrated in all five study states, with all their population and program differences, suggests that a nationwide study of the effects of WIC prenatal participation among all Medicaid mothers in 1987 would show (1) better birth outcomes for WIC participants, and (2) benefit-cost ratios for the WIC program that are greater than one.

In the future, a variety of forces will affect the benefits of prenatal participation by Medicaid participants in the WIC program. The Medicaid program expansions are allowing a higher-income group of pregnant women to enroll in Medicaid. Due to the increased coordination between the WIC and the Medicaid programs, more pregnant women with incomes above the poverty level, who may be at lower nutritional risk, are likely to participate in the WIC program. Conversely, aggressive outreach and improved eligibility procedures may bring a higher-risk group of pregnant women into the Medicaid and the WIC programs. The net effect of these enrollment changes on estimates of WIC benefits is uncertain. Clearly, however, the development of outreach, referral, and care coordination programs will bring more pregnant women into both the WIC and the Medicaid programs, and the service populations of the two programs will merge.