Child Participation in WIC: Medicaid Costs and Use of Health Care Services

Paul A. Buescher, PhD, Stephanie J. Horton, MS, Barbara L. Devaney, PhD, Sarah J. Roholt, MS, RD, Alice J. Lenihan, RD, MPH, J. Timothy Whitmire, PhD, and Jonathan B. Kotch, MD, MPH

Objectives. We used data from birth certificates, Medicaid, and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) to examine the relationship of child participation in WIC to Medicaid costs and use of health care services in North Carolina.

Methods. We linked Medicaid enrollment, Medicaid paid claims, and WIC participation files to birth certificates for children born in North Carolina in 1992. We used multiple regression analysis to estimate the effects of WIC participation on the use of health care services and Medicaid costs.

Results. Medicaid-enrolled children participating in the WIC program showed greater use of all types of health care services compared with Medicaid-enrolled children who were not WIC participants.

Conclusions. The health care needs of low-income children who participate in WIC may be better met than those of low-income children not participating in WIC. (*Am J Public Health.* 2003;93:145–150)

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is a broad-based food and nutrition assistance program for low-income pregnant, breastfeeding, and postpartum women; infants; and children up to 5 years of age. WIC is designed to help these groups meet their special nutritional needs during the critical growth and development periods of pregnancy, infancy, and early childhood. WIC provides 3 main benefits: (1) supplemental foods, (2) nutrition education, and (3) referrals to health and social services.

WIC is one of the fastest-growing food and nutrition assistance programs. In fiscal year 1980, WIC served 1.9 million women and children at a cost of $725 million. Today, WIC annually serves 7.4 million women and children at a cost of $5 billion. In recent years, WIC has come under intense scrutiny for its rapid expansion and increased coverage of children. Little is known about the effects of WIC on child health outcomes.[1,2]

A number of studies have found that WIC participation during pregnancy is associated with improved birth outcomes and reductions in maternal and newborn health care costs after birth.[3–7] In contrast to the large body of literature examining the effects of WIC participation during pregnancy, fewer studies have focused on the effects of WIC participation on children. Based on data collected during the early 1980s, the National WIC Evaluation found significant effects of WIC participation on children's intake of iron, vitamin C, thiamin, niacin, and vitamin B_6, but did not find an effect on the use of preventive care.[8]

An important component of the WIC program is referrals to health care providers. WIC staff advise clients about the types of health care available, the locations of health care facilities, how they can receive and pay for health care, and why health care is beneficial. Many WIC clinics are located at or adjacent to public health clinics. Thus, WIC is expected to be associated with increased use of preventive care and, ultimately, improved health status of children.

This study provides important and timely evidence on the use of health care by low-income children enrolled in Medicaid and on the role that WIC can play in promoting appropriate health care utilization. Using linked birth certificate, Medicaid, and WIC data files for the state of North Carolina, we examined the relationship between child participation in WIC and the use of preventive health care services, Medicaid costs for children, and the diagnosis and treatment of common childhood illnesses.

METHODS

Linking of Records

We selected Medicaid enrollment records for children who were born in 1992 and who had been enrolled in Medicaid at any time before turning 5 years old. For each child, a Medicaid enrollment history was created indicating Medicaid enrollment (yes/no) for each of the 60 months from birth to age 5. This Medicaid enrollment information was then matched to 1992 North Carolina birth certificates. Among children who had been enrolled in Medicaid for all of their first 12 months of life, 98.5% of the Medicaid enrollment records matched to a 1992 North Carolina birth certificate. The overall matching rate was 77%. The lower overall matching rate was due, in part, to children born in another state who were enrolled in North Carolina.

We matched identification numbers from Medicaid enrollment records to the Medicaid paid claims history files to extract records of all services received by each child from birth to age 5. We summarized these records to produce a variety of cost and health service use measures for each year of life. We compared the beginning date of service on each Medicaid claim with the child's date of birth on the birth certificate to determine the year of life to which the claim should be assigned. We examined the following categories of health care services: inpatient, outpatient, physician visit, prescription drug, emergency room, well-child, Early Periodic Screening, Diagnosis, and Treatment (EPSDT—a complete well-child visit paid through Medicaid), dental services, and services for otitis media, upper respiratory infections, lower respiratory infections, asthma, gastroenteritis, allergies, and iron deficiency anemia. Using primary diagnosis only, we defined the categories for childhood illnesses. A list of the diagnostic, procedural, and other codes

used to define these measures is available from the authors.

We examined 4 age groups based on completed years of age: 1-year-olds (12 to 23 months old), 2-year-olds (24 to 35 months old), 3-year-olds (36 to 47 months old), and 4-year-olds (48 to 59 months old). We matched WIC certification records and food redemption files to the birth/Medicaid file to identify children who participated in WIC; we then constructed a cumulative measure of child WIC participation. We defined 4 levels of WIC participation based on the percentage of months from age 1 through the particular year of age in which food vouchers were redeemed: high (>66%), medium (34%–66%), low (<34%), and none. We considered this cumulative measure to be a better gauge of child WIC participation than just WIC participation in the current year of life.

Variables used to link the various data files included name, date of birth, sex, county of residence, and social security number (where available). We conducted several deterministic matching steps. Records unmatched at each step were passed to subsequent steps, in which the matching criteria were successively relaxed.

Exclusions

We excluded from the analysis file infant deaths, multiple births, and children who were ever institutionalized (not including hospitalizations). These exclusions represented approximately 7% of the total linked records. The resulting file contained linked birth/Medicaid/WIC records for 49 795 children born in 1992. From this file, children were excluded from the analyses for any year of life in which they participated in the Child Service Coordination program. This program provides tracking and case management services for children with medical, developmental, or social risk factors. Children in this program have medical costs significantly higher than average. These exclusions averaged about 5% of the children at each year of age.

For each age 1 through 4, we examined children who were continuously enrolled in Medicaid by level of WIC participation. Children who were not continuously enrolled in Medicaid for a year were excluded from the analyses, because complete cost and service information for them would not be available from the Medicaid paid claims data. Children who were enrolled in a Medicaid health maintenance organization after 1996, for whom we did not have complete encounter and cost data, were excluded from the 3- and 4-year-old age groups. This comprised about 7% of the children who were continuously enrolled in Medicaid.

Analysis

Through multiple regression analyses, we used WIC participation and other control variables to predict Medicaid costs and use of services for each year of life. Because some of the Medicaid cost variables included a large number of zero values, we used a Tobit model to estimate the Medicaid cost equations. Tobit is an estimation procedure that accounts for censored values of the dependent variable. We transformed the estimated Tobit coefficients to produce estimates of the differences in Medicaid costs between the WIC and non-WIC subgroups. We used logistic regression to estimate the odds of having a well-child visit, being hospitalized, having an emergency room visit, or being diagnosed and treated for a common childhood illness (dichotomous dependent variables), controlling for selected characteristics of the mother and child.

We estimated the effects of high, medium, and low WIC participation, using no WIC participation as the reference category. We used the following dichotomous control variables in the regression models: minority race, mother unmarried, mother less than age 18, mother's education greater than 12 years, EPSDT received in a public health department, mother smoked during pregnancy, low birthweight (<2500 grams), and previous prenatal and infant WIC participation.

Measures of most of these control variables came from the birth certificate. Whether EPSDT was received in a public health department was used as a control variable be-

TABLE 1—Percentage of Medicaid-Enrolled Children With Selected Characteristics, by WIC Participation and Age

	Completed Year of Age							
	1		2		3		4	
Control Variables, %	No WIC (n = 5285)	WIC (n = 15 992)	No WIC (n = 3901)	WIC (n = 14 849)	No WIC (n = 2944)	WIC (n = 13 987)	No WIC (n = 2547)	WIC (n = 13 778)
Minority race	54.3	59.6	58.1	61.6	55.7	60.9	54.5	61.7
Mother's education < 12 years	42.5	41.5	42.5	42.3	43.3	44.0	44.2	45.3
Low birthweight	7.7	7.6	8.0	8.2	9.4	8.7	9.5	9.2
Mother's age < 18 years	12.3	12.5	11.4	13.1	11.6	13.5	12.4	14.2
EPSDT received in a public health department	23.0	36.7	7.8	16.1	6.0	15.2	8.4	18.0
Mother smoked during pregnancy	28.9	24.2	29.1	25.0	31.7	25.5	32.1	25.9
Mother unmarried	67.4	64.7	68.8	65.7	65.8	65.8	64.0	66.0
Prenatal and infant WIC participation	51.7	79.4	51.0	77.5	50.0	76.4	49.0	75.8

Note. Children were enrolled in Medicaid for the full year. Most of the control variables are from the birth certificate. EPSDT = Early Periodic Screening, Diagnosis, and Treatment; WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

cause Medicaid reimbursements in North Carolina sometimes differ for public and private providers. Also, WIC clinics are often located in public health departments, near well-child care and other clinical services. Therefore, controlling for source of EPSDT helped to adjust for any association between WIC participation and use of health care due to convenience of location. Previous WIC participation was used as a control variable to isolate the effect of WIC participation after the first birthday from the effects of previous WIC participation.

We examined several multistage models, using instrumental variables as a means of controlling for selection bias. However, because most of the available predictor variables came from birth certificates, we were not able to find good predictors of child WIC participation that were not also associated with the outcome measures. Therefore, the results presented below do not include adjustments for possible selection bias.

RESULTS

Table 1 shows the numbers of children who were continuously enrolled in Medicaid for each age group, by WIC participation. The children who were continuously enrolled in Medicaid during each year of life represent approximately half of the total children enrolled in Medicaid for 1 or more months during the year. Children participating in WIC were generally very similar to nonparticipating children in minority status, incidence of low birthweight, and maternal age, education, smoking during pregnancy, and marital status. WIC participants were more likely than nonparticipants to have received EPSDT services at a health department and to have had previous prenatal and infant WIC participation. These variables in Table 1 were used as the control variables in the logistic and Tobit regressions.

Table 2 presents results on the use of Medicaid preventive care. The percentage of children receiving the recommended number of EPSDT visits was low, especially for those aged 2 and 3 years, of whom only about half had the recommended 1 visit. In general, the findings showed that the higher the participation in WIC, the greater the odds of receiving any well-child care and the recommended number of EPSDT visits. Also, children on WIC had significantly higher Medicaid expenditures for EPSDT and all well-child care; the higher the level of WIC participation, the higher the Medicaid expenditures for preventive care.

Table 3 shows the estimated differences in Medicaid costs associated with the 3 levels of WIC participation for total, physician, outpatient, prescription drug, and dental costs, separately by year of age. Child WIC participation was associated with increased total Medicaid expenditures. Compared with children not on WIC, children with high WIC participation had adjusted annual Medicaid expenditures that were $163 higher for 1-year-olds, $197 higher for 2-year-olds, $204 higher for 3-year-olds, and $345 higher for 4-year-olds. These are substantial differences, given that the total annual Medicaid expenditure per child in these age groups is approximately $825. In general, children with medium and low WIC participation also had significantly higher total Medicaid expenditures than did WIC nonparticipants. For the other Medicaid cost variables in Table 3, Medicaid expenditures generally increased as WIC participation increased.

TABLE 2—Use of Preventive Care by Children Enrolled in Medicaid: Estimated Effects of Child WIC Participation

	Completed Year of Age			
	1	2	3	4
Any well-child care				
% with any well-child visit	76.9	52.3	52.8	71.1
Odds ratios from logistic regression[a]				
Low WIC participation	1.22**	1.05	1.08	1.18**
Medium WIC participation	1.48**	1.27**	1.24**	1.38**
High WIC participation	2.12**	1.57**	1.74**	1.89**
Recommended EPSDT visits[b]				
% receiving recommended EPSDT visits	66.3	46.4	48.0	63.2
Odds ratios from logistic regression[a]				
Low WIC participation	1.17**	1.03	1.11*	1.13*
Medium WIC participation	1.39**	1.25**	1.31**	1.31**
High WIC participation	1.78**	1.65**	1.82**	1.70**
EPSDT Medicaid costs				
Average EPSDT Medicaid costs	$73.50	$42.05	$43.63	$67.77
Estimated difference in Medicaid costs, $[c]				
Low WIC participation	3	-3	-2	3*
Medium WIC participation	6**	8**	2	6**
High WIC participation	16**	11**	10**	11**
All well-child Medicaid costs				
Average well-child Medicaid costs	$77.54	$43.44	$44.48	$68.44
Estimated difference in Medicaid costs, $[c]				
Low WIC participation	3	-2	-2	3*
Medium WIC participation	5**	7*	2	6**
High WIC participation	16**	10**	10**	11**

Note. Each cell represents a separate regression model. Control variables are shown in Table 1. EPSDT = Early Periodic Screening, Diagnosis, and Treatment; WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.
[a]Odds ratios are significantly different from 1.0 at the .05 (*) or .01 (**) level. Reference group is children with no WIC participation.
[b]One full EPSDT visit per year.
[c]Estimated differences from the no-WIC group are based on Tobit regression coefficients and are significant at the .05 (*) or .01 (**) level.
*$P < .05$; **$P < .01$. All P values are 2-tailed.

TABLE 3—Regression Analysis for Selected Categories of Medicaid Costs: Estimated Differences Associated With Child WIC Participation

	Completed Year of Age			
	1	2	3	4
Total Medicaid costs, $				
Low WIC participation	62	68	95*	175**
Medium WIC participation	87**	100*	108*	224**
High WIC participation	163**	197**	204**	345**
Physician costs, $				
Low WIC participation	16	29*	40	120*
Medium WIC participation	41**	59**	77**	163**
High WIC participation	80**	103**	120**	214**
Outpatient costs, $				
Low WIC participation	36**	28**	29**	24**
Medium WIC participation	32**	28**	30**	21*
High WIC participation	36**	31**	43**	34**
Prescription drug costs, $				
Low WIC participation	4	23	9	10
Medium WIC participation	19**	41*	15**	25*
High WIC participation	36**	90**	36**	56**
Dental costs, $				
Low WIC participation	−1	2	4	11*
Medium WIC participation	−1	7*	6	21**
High WIC participation	2*	11**	20**	30**

Note. Estimated differences are based on Tobit regression coefficients for each WIC group compared to the no-WIC group after adjustment for all other risk factors in the regression model (see Table 1) and are significant at the .05 (*) or .01 (**) level. WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.
*$P < .05$; **$P < .01$. All P values are 2-tailed.

Table 4 indicates that, for each of the 4 years of life, children who participated in WIC generally were significantly more likely than nonparticipating children to have been hospitalized and to have had an emergency room visit during the year. In addition, children participating in WIC were significantly more likely to have been diagnosed and treated for a common childhood illness, with those participating in WIC at the high level most likely to have been diagnosed and treated.

The prevalence of diagnosis and treatment of common childhood illnesses among children on Medicaid generally decreased with age. Among the 1-year-olds, approximately 61% were diagnosed and treated 1 or more times during the year for otitis media, 52% for an upper respiratory infection, 26% for a lower respiratory infection, 7% for asthma, 7% for gastroenteritis, 13% for an allergy, and 1% for iron deficiency anemia. Other studies show comparable prevalence rates of asthma among US children (4%–7%)[9] and of otitis media among 2-year-olds (68%).[10]

DISCUSSION

We used linked Medicaid enrollment files, Medicaid paid claims files, birth certificates, and WIC food redemption records to analyze preventive care use, health care expenditures, and diagnosis and treatment of common childhood illnesses for child WIC participants and low-income nonparticipants.

The results were striking: Not only was child WIC participation associated with increased use of preventive care, but it also was associated with increased use of almost all kinds of health care (including emergency room and inpatient care) and increased diagnosis and treatment of common childhood illnesses, including otitis media, gastroenteritis, upper and lower respiratory infections, and asthma. Medicaid costs were higher for all categories of health services for the children participating in WIC.

The bottom line is that children enrolled in Medicaid who participate in WIC are linked to the health care system and are much more likely to receive both preventive and curative care, whereas Medicaid-enrolled children who do not participate in WIC simply are not as connected to the health care system. Because we would not expect WIC children to be more likely to be diagnosed with common childhood illnesses, concerns arise about likely undiagnosed and untreated health conditions among low-income children enrolled in Medicaid who do not participate in WIC.

This association between participation in WIC and higher use of health services persists after control for other factors that affect service use and cost, such as low birthweight and mother's race, education, age, marital status, and smoking during pregnancy. Household income was not available as a control variable, although the study sample consisted only of children enrolled in Medicaid, which is a low-income sample. For children born in 1992, the family income threshold for Medicaid eligibility at ages 1 through 4 was less than 133% of the federal poverty level. Thus, differences in family income within the study population were also controlled to some extent. In addition, use of mother's education and marital status as control variables partially adjusted for differences in socioeconomic status.

The finding of higher use of well-child services among children on WIC is important, given that the overall use of preventive services among children on Medicaid is low. Among all of the children in our study, only about half received *any* EPSDT care in each year. These findings are in contrast to those of the National WIC Evaluation, based on an older data set, which did not indicate more frequent use of preventive health services among preschool children on WIC.[8] The study findings also suggest that greater use of well-child and other diagnostic services by child WIC participants may increase the diagnosis and treatment of common childhood illnesses, which in turn leads to an overall higher use of health care services.

TABLE 4—Adjusted Odds of Being Hospitalized, Having an Emergency Room Visit, and Being Diagnosed and Treated for Selected Childhood Illnesses for Children Who Participated in WIC

	Completed Year of Age			
	1	2	3	4
Hospitalization				
Low WIC participation	0.97	1.17	1.28	1.33
Medium WIC participation	1.12	1.04	1.18	1.66*
High WIC participation	1.05	1.28*	1.32	1.89**
Emergency room visit				
Low WIC participation	1.25**	1.19**	1.23**	1.17**
Medium WIC participation	1.22**	1.18**	1.24**	1.21**
High WIC participation	1.16**	1.17**	1.30**	1.20**
Diagnosis and treatment of a common childhood illness				
Otitis media				
Low WIC participation	1.09	1.10*	1.15*	1.05
Medium WIC participation	1.27**	1.24**	1.21**	1.25**
High WIC participation	1.34**	1.45**	1.55**	1.44**
Upper respiratory infection				
Low WIC participation	1.12*	1.12*	1.04	1.23**
Medium WIC participation	1.20**	1.23**	1.24**	1.37**
High WIC participation	1.44**	1.46**	1.53**	1.71**
Lower respiratory infection				
Low WIC participation	1.03	1.08	1.14	1.14
Medium WIC participation	1.27**	1.27**	1.16*	1.28**
High WIC participation	1.28**	1.33**	1.36**	1.43**
Asthma				
Low WIC participation	1.08	1.45**	1.10	0.98
Medium WIC participation	1.17	1.37**	1.15	1.05
High WIC participation	1.22**	1.62**	1.31**	1.19
Gastroenteritis				
Low WIC participation	1.15	1.18	1.04	1.23
Medium WIC participation	1.40**	1.25	1.23	1.25
High WIC participation	1.52**	1.51**	1.39*	1.65**
Allergy				
Low WIC participation	0.93	1.05	1.05	1.13
Medium WIC participation	1.09	1.14	1.03	1.21
High WIC participation	1.23**	1.32**	1.14	1.30*
Iron deficiency anemia				
Low WIC participation	1.17	1.25	0.93	1.95
Medium WIC participation	1.72*	1.49	0.60	1.89
High WIC participation	2.12**	2.15**	1.43	2.31*

Note. Results are based on logistic regression. The reference category for odds ratios is no WIC participation. Odds ratios are significantly different from 1.0 at the .05 (*) or .01 (**) level. WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.
*P < .05; **P < .01. All P values are 2-tailed.

These findings are consistent with the goals of the WIC program, one of which is to serve as an adjunct to good health and to counsel WIC participants on the importance of preventive health care. Children participating in WIC should have stronger links to the health care system, resulting in higher overall use of health care services.

Children on Medicaid are a relatively high-risk population in need of more health care services than the general population.[11] The association of WIC with higher use of services may mean that the health care needs of low-income children on Medicaid who participate in WIC are being better met than those of their non-WIC-participating peers. The findings for dental services support this conclusion. The percentage of children with any dental visit within a year was low: 5% for age 1, 10% for age 2, 24% for age 3, and 39% for age 4 years. WIC participation was associated with increased Medicaid costs for dental services. Also, across the 4 age groups, the adjusted odds of having 1 or more dental claims during the year was 1.3 to 1.5 times greater for Medicaid-enrolled children with high WIC participation than for those not participating in WIC (P<.01). Other studies have suggested that dental care is a serious unmet need among children in poverty.[12–14] However, the data used in this study do not allow determination of an adequate or appropriate level of health care use, so we can only infer that there are unmet health care needs in this population of low-income children.

There may be alternative explanations for the finding that children on WIC use health services at a higher level. Perhaps children who use more health services are more likely to be referred to the WIC program. The data in this study do not demonstrate the direction of causation, and the effect may run in both directions. The regression models do control for source of EPSDT (public health department vs other) to help adjust for any association between WIC participation and use of health care that is attributable to physical proximity of WIC clinics to well-child and other clinical services in health departments.

Another issue is that children with health problems either may be selected into WIC after infancy or may be more likely to remain on WIC as they get older, resulting in higher Medicaid costs for child WIC participants. Good measures of health status for these children after infancy are not available from the study data set.

In a retrospective observational study such as this, the finding of an association between WIC participation and higher use of health care services does not demonstrate causation. Families who are inclined to seek WIC services may also be more likely to seek other

health services. Selection bias may be influencing the findings of this study. However, the WIC and non-WIC children were generally very comparable on the demographic factors available from the birth certificate.

Finally, this study demonstrates the feasibility of linking state-level birth, Medicaid, and WIC databases as an approach to WIC program evaluation. Given the overall lack of evidence on the effects of child WIC participation, this methodology is a cost-effective and promising approach for investigating the effects of WIC participation on health outcomes. The results suggest that WIC participation promotes higher use of health care services among young children on Medicaid. ■

About the Authors

Paul A. Buescher, Stephanie J. Horton, and J. Timothy Whitmire are with the State Center for Health Statistics, North Carolina Division of Public Health, Raleigh. Barbara L. Devaney is with Mathematica Policy Research, Inc., Princeton, NJ. Sarah J. Roholt and Alice J. Lenihan are with the Women's and Children's Health Section, North Carolina Division of Public Health. Jonathan B. Kotch is with the Department of Maternal and Child Health, School of Public Health, University of North Carolina at Chapel Hill.

Requests for reprints should be sent to Paul Buescher, State Center for Health Statistics, 1908 Mail Service Center, Raleigh, NC 27699-1908 (e-mail: paul.buescher@ncmail.net).

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Contributors

All of the authors participated in the conception and design of the study and in the interpretation of the data. P.A. Buescher and B.L. Devaney wrote the first draft of the article. S.J. Horton and J.T. Whitmire carried out the data analysis and contributed to the writing of the article. S.J. Roholt, A.J. Lenihan, and J.B. Kotch contributed to the writing of the article.

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References

1. Besharov DJ, Germanis P. Is WIC as good as they say? *The Public Interest.* 1999;134:21–36.
2. Besharov DJ, Germanis P. *Rethinking WIC: An Evaluation of the Women, Infants, and Children Program.* Washington, DC: American Enterprise Institute Press; 2001.
3. Buescher PA, Larson LC, Nelson MD, Lenihan AJ. Prenatal WIC participation can reduce low birth weight and newborn medical costs: a cost-benefit analysis of WIC participation in North Carolina. *J Am Diet Assoc.* 1993;93:163–166.
4. Schramm WF. WIC prenatal participation and its relationship to newborn Medicaid costs in Missouri: a cost/benefit analysis. *Am J Public Health.* 1985;75:851–857.
5. Schramm WF. Prenatal participation in WIC related to Medicaid costs for Missouri newborns: 1982 update. *Public Health Rep.* 1986;101:607–615.
6. Devaney BL, Bilheimer L, Schore J. Medicaid costs and birth outcomes: the effects of prenatal WIC participation and prenatal care. *J Policy Analysis Manage.* 1992;11:573–592.
7. US General Accounting Office. *Early Intervention: Federal Investments Like WIC Can Produce Savings.* Washington, DC: US General Accounting Office; 1992. Publication No. GAO/HRD-92-18.
8. Rush D, Leighton J, Sloan NL, et al. Study of infants and children. *Am J Clin Nutr.* 1988;48:484–511.
9. Weitzman M, Gortmaker SL, Sobol AM, Perrin JM. Recent trends in the prevalence and severity of childhood asthma. *JAMA.* 1992;268:2673–2677.
10. Yawn BP, Yawn RA, Lydick E. The relative community burden of otitis media and varicella. *Clin Ther.* 1996;18:877–886.
11. Blendon RJ, Donelan K, Hill C, et al. Medicaid beneficiaries and health reform. *Health Aff (Millwood).* 1993;12:132–143.
12. Newacheck PW, Hughes DC, Hung YY, Wong S, Stoddard JJ. The unmet health needs of America's children. *Pediatrics.* 2000;105:989–997.
13. US General Accounting Office. *Oral Health: Dental Disease Is a Chronic Problem Among Low-Income Populations.* Washington, DC: US General Accounting Office; 2000. Publication No. GAO/HEHS-00-72.
14. Cashion SW, Vann WF Jr, Rozier RG, Venezie RD, McIver FT. Children's utilization of dental care in the NC Medicaid program. *Pediatr Dent.* 1999;21:97–103.