

Influences on the Receipt of Well-child Visits in the First Two Years of Life

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Abstract. Objective. To determine demographic and health care system factors associated with children receiving an adequate number of well-child visits (WCVs).

Methods. Information on 4385 children and their families was obtained via birth certificates, parent interviews, chart review of outpatient sites of care, and insurance records.

Results. Only 77% of children received at least five WCVs by age 2. In regression analysis, the factors most strongly associated with children's total number of WCVs were delay in the initiation of prenatal care (odds ratio = 0.6) and receipt of all outpatient care in private physician offices (odds ratio = 4.2 to 5.6). Having an adequate number of WCVs was associated with being up to date for immunizations.

Conclusions. Children of mothers who delay prenatal care are at high risk for not receiving adequate numbers of WCVs. Recognition of this marker can allow for targeted interventions that aim to ensure that children receive appropriate preventive care. *Pediatrics* 1999; 103:864–869; *child health services, health services utilization, preventive care.*

ABBREVIATIONS. WCV, well-child visit; AAP, American Academy of Pediatrics; CHIP, [State] Child Health Insurance Program.

The majority of preventive health care for children younger than 2 years of age is administered at well-child visits (WCVs). WCVs provide opportunities for developmental assessment, anthropomorphic measurement, anticipatory guidance, screening tests, and vaccine administration. The American Academy of Pediatrics' (AAP) recommended schedule of WCVs calls for nine WCVs during the first 2 years of a child's life.¹ A footnote to this recommendation encourages physicians to tailor the number and frequency of visits to the needs of each individual family, but, at a minimum, physicians are expected to perform WCVs at the time of recommended immunizations. Failure of children to receive WCVs impedes the ability of

health care providers to recognize potential problems, address parental concerns, provide injury prevention counseling, give nutritional guidance, and administer vaccines.

Previous studies have explored factors associated with children obtaining well-child care.^{2–4} These reports were either small in scope or relied on visit data that were not gathered from children's medical records. None of the studies included verified data on children's insurance coverage for WCVs. To attempt a more comprehensive analysis of children's receipt of well-child care, we studied a large, population-based sample of children, with verified insurance information and primary medical record data. Our objective was to determine the demographic and health care system factors associated with children receiving an adequate number of WCVs. This analysis was part of a larger study examining the influence of insurance coverage on the age-appropriate receipt of immunizations.

METHODS

Sample Selection

In the summer of 1996, the North Carolina Office of Vital Records provided birth certificate information for a random sample of two cohorts: children born in North Carolina in January or February 1994 ($n = 2196$) and children born in January or February 1995 ($n = 2189$). Research staff then used a variety of sources (eg, commercial databases, directory assistance, US Postal Service records) to locate addresses and telephone numbers for parents of these children.

Data Collection

Phase 1: Parent Interviews

Parent telephone interviews were conducted from July through December 1996. Parents were mailed an introductory letter explaining the study and how their child was selected for participation. Trained interviewers then called parents to obtain consent to participate and complete the interview. Interviewers asked to speak with the parent who usually took the child to the doctor. In a few instances in which parents were unavailable, grandmothers completed the telephone interview. A written version of the interview form was received from 143 families with no telephone, with an unlisted telephone number, or who so requested. Spanish-speaking interviewers completed interviews on request.

Parents gave specific information about all sites where children had received medical care since birth and the type of care delivered at each site. Interviewers also asked about the child's health insurance history from birth to present, including the name of the insurance carrier(s), parental employer(s), group or subscriber numbers, and coverage dates. Several family demographic questions were asked, including ages of siblings, number of adults living in the home, and household income. Other

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demographic information was obtained from birth certificate files.

Phase 2: Medical Record Review

To obtain specific information on children's medical history, chart abstractions were conducted from February through June 1997 in each practice and health department where parents reported their children received outpatient primary care services. Specialty clinics and emergency departments were excluded from chart abstractions. Trained, certified medical record abstracters performed the chart abstractions, which included 1) dates of all vaccines administered in the practice; 2) dates and types of all office visits (categorized as well-child care, acute care, follow-up, or other); 3) dates and types of visits to other provider sites during which vaccines were administered, based on copies of records; and 4) information regarding patient transfer to other practices and names of the patient's other providers. Other sites of care obtained via chart abstraction were compared with parent-reported sites; additional chart abstractions were performed if a site was missing from parental report, which occurred infrequently.

A total of 643 sites of medical care participated in the chart abstraction (500 private practices, 24 community health centers, 16 hospital-affiliated clinics, and 103 local health departments). Only 24 private practices refused to consent to chart abstraction, and 3 solo physicians had retired by the time of the study.

Phase 3: Insurance Status Verification

The final aspect of data collection verified children's health insurance history and identified whether insurance benefits covered immunizations and WCVs. Research staff contacted insurance companies and employers identified in the parent interviews to verify coverage for individual children. More than 150 insurance companies and more than 200 employers provided historical information on children's dates of enrollment and benefit coverage for immunizations and WCVs. Information on Medicaid enrollment was provided by the North Carolina Division of Medical Assistance. For each child, a chronology of insurance coverage was constructed to reflect the child's insurance status from birth to 2 years of age. Children were classified as having full private coverage for immunizations and WCVs; partial private coverage for a portion of immunizations and/or WCVs; underinsured covering neither immunizations nor WCVs; Medicaid; or uninsured.

Data Analysis

Initial analysis of data involved demographic assessment of the sample. Next the research team determined the minimum number of WCVs a child would need by specific ages to be considered as having received an adequate (not necessarily ideal) number of WCVs. This determination was linked closely to the number of WCVs required to administer the recommended schedule of immunizations. Therefore, we set the minimum number of WCVs required for adequate care at three visits by 7 months, four visits by 13 months, and five visits by 24 months. In contrast, the number of WCVs recommended by the AAP is four visits by 7 months, six visits by 13 months, and nine

visits by 24 months (see reference 9). As such, these data represent a "best case scenario" for receipt of WCVs.

χ^2 Analysis was used to examine the association of adequate numbers of WCVs at each age with demographic and health care system factors, including maternal age, race, education, and marital status; household income; site of outpatient care; and maternal initiation of prenatal care. Finally, a logistic regression model was constructed to explore the independent association of each of these variables with WCV adequacy. For regression analysis, a conservative significance level of $P < .01$ was used, given the large sample size.

This study was approved by the Committee for the Protection of Human Subjects at the University of North Carolina at Chapel Hill.

RESULTS

Of the original sample of 4385 children, 507 were declared ineligible because they had either moved from the state ($n = 298$), obtained medical care at military bases sites or at sites outside of North Carolina ($n = 202$), were adopted or placed in the custody of the courts ($n = 6$), or had incomplete birth certificate information ($n = 1$). Of the remaining 3878 children, 2767 (71%) completed parent interviews (1241 children in the 1994 cohort and 1526 in the 1995 cohort).

Of the 2767 children with complete parent interviews, 2447 (88%) had complete chart abstraction information from all sites of care, and 2695 (97%) had complete insurance information. Demographic analysis revealed that mothers of nonparticipants were more likely to be black, single, and less educated than mothers of participant or ineligible children.

Overall, 82% of children had received an adequate number of WCVs (ie, at least three WCVs) by age 7 months. At 13 months of age, 80% had received an adequate number of WCVs (at least four), and 77% had received an adequate number (at least five) at 24 months of age. Using the AAP criteria for recommended numbers of WCVs, these percentages fall to 63% at 7 months of age, 46% at 13 months of age, and 16% at 24 months of age.

Table 1 demonstrates the association between adequate numbers of WCVs and site of care. At each of the three sentinel ages, children who received primary care only in private practices were more likely to have adequate numbers of WCVs than were children who received some or all care in public sites. There also was a strong association

TABLE 1. Adequate Number of WCVs* By Site of Care and Insurance Status

	% Receiving Adequate Number of WCVs		
	7 Mo	13 Mo	24 Mo
Site of outpatient care†			
Health department only ($n = 161$)	63	63	63
Private practice(s) only ($n = 1333$)	93	92	90
Combination private/public sites ($n = 943$)	70	66	58
Insurance status†			
Full private ($n = 461$)	93	93	92
Partial private ($n = 201$)	92	88	84
Underinsured ($n = 197$)	85	79	73
Medicaid ($n = 751$)	76	76	75
Uninsured ($n = 662$)	76	75	69

* Adequate defined as three WCVs by 7 months, four WCVs by 13 months, and five WCVs by 24 months of age.

† χ^2 For each category significant at $P < .001$ for each age shown.

between children's insurance status and WCV adequacy. Children with full private insurance coverage were most likely to receive adequate numbers of WCVs throughout the first 2 years of life; rates of adequate WCVs fell as private insurance coverage included less preventive care (ie, partial, underinsured). At the lower end of the spectrum, children enrolled in Medicaid fared little better than the uninsured.

Table 2 presents the association of maternal characteristics with adequacy of WCVs at each of the sentinel ages. Children of women who began prenatal care in the first trimester were more likely to receive adequate numbers of WCVs than children born to mothers with late-initiated or no prenatal care. Children of mothers who were younger, less educated, black, and unmarried also were less likely to receive adequate numbers of WCVs at each age, as were those from low-income families or from rural counties.

The timing of the first WCV also was strongly linked to the receipt of subsequent WCVs (Table 3). The earlier children received their first WCV, the more likely they were to have adequate numbers of WCVs at subsequent ages. Specifically, children who did not have a WCV in the first 6 weeks of life were at least one third less likely than were children with an earlier WCV to have adequate numbers of WCVs.

Regression analysis found only two variables independently associated with children receiving an adequate number of WCVs at each of the sentinel

TABLE 2. Adequate Number of WCVs* by Maternal Characteristics†

	% Receiving Adequate Number of WCVs by		
	7 Mo	13 Mo	24 Mo
Initiation of prenatal care			
1st Trimester (<i>n</i> = 2041)	85	83	80
Later/none (<i>n</i> = 395)	69	68	64
Mother's age			
13–19 (<i>n</i> = 386)	75	74	72
20–24 (<i>n</i> = 132)	76	74	70
25–29 (<i>n</i> = 656)	84	86	83
≥30 (<i>n</i> = 854)	88	86	83
Mother's education			
<12 y (<i>n</i> = 486)	72	72	69
12 y (<i>n</i> = 853)	78	77	73
>12 y (<i>n</i> = 1108)	89	87	83
Mother's race			
White (<i>n</i> = 1676)	86	84	81
Black (<i>n</i> = 662)	73	71	68
Other (<i>n</i> = 109)	78	79	73
Mother's marital status			
Married (<i>n</i> = 1693)	86	84	80
Not married (<i>n</i> = 754)	73	72	70
Household income			
<\$10 000 (<i>n</i> = 371)	69	67	67
\$10 000–\$40,000 (<i>n</i> = 1100)	81	80	75
>\$40 000 (<i>n</i> = 696)	91	91	88
County of residence			
Metro (<i>n</i> = 1608)	85	84	81
Nonmetro (<i>n</i> = 839)	75	75	70

* Adequate defined as three WCVs by 7 months, four WCVs by 13 months, and five WCVs by 24 months of age.

† χ^2 For each category significant at $P < .001$ for each age shown.

TABLE 3. Timing of First WCV and Subsequent Adequacy of Number of WCVs

	% Receiving Adequate Number of WCVs by		
	7 Mo	13 Mo	24 Mo
Age at first WCV†			
0–14 d (<i>n</i> = 857)	93	90	88
15–41 d (<i>n</i> = 971)	90	87	81
≥42 d (<i>n</i> = 577)	58	62	60

* Adequate defined as three WCVs by 7 months, four WCVs by 13 months, and five WCVs by 24 months of age.

† Differences between groups significant at $P < .001$ for each age shown.

ages (7 months, 13 months, and 24 months): the initiation of prenatal care and the receipt of all primary care in private physician offices (Table 4).

Finally, there was a marked difference in children's immunization status based on their adequacy of WCVs. Those children who had not received adequate numbers of WCVs were much less likely to be up to date for immunizations at 7, 13, and 24 months of age (Table 5).

DISCUSSION

Although physician specialty societies and child health advocates stress the importance of preventive care, few studies have examined the numbers or determinants of WCVs received by children. Certainly, WCVs do not carry the same parental imperative as sick visits. Thus, parents must value preventive health services and exercise initiative for WCVs to take place.

We determined the "adequate" number of WCVs to correspond to the minimum number of WCVs necessary at each age for children to receive all recommended immunizations. Even with these minimal criteria, one in five children did not receive adequate numbers of WCVs. Furthermore, application of the AAP's recommendations¹ significantly reduced the proportion of children with adequate numbers of WCVs, to a low of 16% at 24 months of age. Such a low rate is startling, yet its clinical implications are unclear. Other investigators have questioned the practicality of using the AAP WCV schedule recommendations in determining whether a child has received an adequate number of visits,⁵ and we could find no published evidence demonstrating differential health outcomes based on varying definitions of the recommended numbers of WCVs.

Results from this study reinforce previous findings. Perhaps most significantly, maternal patterns of seeking preventive care prenatally were associated with subsequent patterns of WCV attendance. Failure of an expectant mother to initiate prenatal care in the first trimester of her pregnancy is a significant marker for the subsequent failure of her child to receive adequate numbers of WCVs over the first 2 years of life. Along the same lines, delay in the child's initial WCV is associated with an inadequate number of WCVs at older ages. Other researchers have reached similar conclusions. Analyzing a national database, Kogan and colleagues²

TABLE 4. Predictors of the Adequacy Number of WCVs* Results of Logistic Regression†

	% Receiving Adequate Number of WCVs by		
	7 Mo OR (95% CI)	13 Mo OR (95% CI)	24 Mo OR (95% CI)
Metro county (vs nonmetro)	NS	NS	NS
Late initiation or no prenatal care (vs first trimester initiation)	0.6 (0.49, 0.86)	0.6 (0.48, 0.84)	0.6 (0.50, 0.86)
All care in private site(s) (vs combination of private/public)	4.2 (3.23, 5.48)	5.6 (4.32, 7.33)	5.2 (4.06, 6.57)
All care in health department(s) (vs combination of private/public)	NS	NS	NS
Mother's age	NS	NS	NS
Mother's race nonwhite (vs white)	NS	NS	0.7 (0.55, 0.92)
Mother's marital status	NS	NS	NS
Mother's education	NS	NS	NS
Household income	NS	NS	NS
Uninsured (vs full private insurance)	NS	NS	0.5 (0.35, 0.86)
Underinsured (vs full private insurance)	NS	NS	0.5 (0.31, 0.76)
Medicaid (vs full private insurance)	NS	NS	NS

* Adequate defined as three WCVs by 7 months, four WCVs by 13 months, and five WCVs by 24 months of age.

† Values shown only for variables significant at $P < .01$.

TABLE 5. Association of WCVs* with Immunization Rates

	Percent Up to Date for Immunizations† at		
	7 Mo	13 Mo	24 Mo
Adequate number of WCVs‡	76	96	87
Inadequate number of WCVs	35	73	67

* Adequate defined as three WCVs by 7 months, four WCVs by 13 months, and five WCVs by 24 months of age.

† Up to date defined as three DTP/3 Hib/2 OPV/2 Hep B for 7 months and for 13 months, and four DTP/3 Hib/3 OPV/3 Hep B/1 MMR for 24 months.

‡ Differences between groups significant at $P < .001$ for each age shown.

found that inadequate prenatal care was associated with a decreased number of WCVs and inadequate immunization. A smaller study of 148 infants³ also found that patterns of maternal prenatal care were associated with patterns of infant health care.

Stevens-Simon and associates⁴ linked delay in the timing of the first prenatal visit with increased risk of delay in completion of the child's primary immunization series. A study of factors associated with nonattendance at the first scheduled WCV found that >10% of new parents did not schedule timely WCVs after their infant's hospital discharge, and 20% of those who did schedule such appointments did not keep them.⁶ In our study, 24% of children did not receive a WCV in the first 6 weeks of life, and that delay was a marker for failure to obtain an adequate number of WCVs over the first 2 years of life.

Delays in prenatal care or in the initial WCV are markers that are easily recognizable and, thus, potentially amenable to intervention. Interventions designed to improve mothers' problem-solving, parenting, and other skills and capabilities^{7,8} may constitute the greatest opportunity for enhancing the receipt of well-child care among at-risk children. An unresolved issue is how to involve physician offices and public health clinics in identifying mothers in need of such interventions, without the process being—or seeming to be—punitive.

Furthermore, as more children enter into managed care environments via Medicaid, new State Child Health Insurance Programs (CHIP), or private coverage, those who are paid to "manage care" should have increased responsibility and accountability. Managed care environments are ideal for the identification of pregnant women and infants who are enrolled in specific plans, yet do not present for preventive care. As part of the fee paid for care management, plans could be required to institute outreach or reminder systems targeted to these children at risk of receiving inadequate preventive care.

Other factors associated with inadequate number of WCVs may be less conducive to intervention. Previous reports have concluded that insurance coverage affects children's access to preventive services.^{9,10} Even among insured children, fee-for-service coverage is less likely to include WCVs than sick visits, creating a financial barrier for many families.¹¹ Short and Lefkowitz¹² determined that for low-income children who otherwise would be uninsured, a full year of Medicaid coverage increased the probability of receipt of any WCV by 17%. However, their data indicated that even if all uninsured children under 200% of the poverty line were Medicaid-eligible, these children would continue to lag behind other children in the use of preventive services. Factors other than income and insurance, such as maternal education, were more strongly associated with failure to receive recommended well-child care.

In our study, only at the 24-month assessment did a child's insurance status emerge as an independent predictor of WCV adequacy. As Medicaid eligibility becomes more restrictive in the second year of life, parents then may face greater obstacles to obtaining preventive care. Additionally, uninsured parents with financial difficulties may feel less of a need to attend WCVs in the second year of life (compared with the first year) in an otherwise healthy child. With limited resources, such families may opt for receiving immunization services

only, not coupled with a WCV.¹³ Initiatives such as the new State CHIP will help to provide better access to WCVs for certain groups of children. However, it is unclear whether CHIP will have a significant impact on actual receipt of WCVs. Previous studies have yielded mixed results on whether removing financial and other barriers to care improves utilization.^{14,15}

Our data showed a consistent association between receiving all care in private physician offices and having an adequate number of WCVs. We cannot know with certainty whether this finding results from any specific activities within the private practices, parental initiative, or unmeasured characteristics of those children who use private practices preferentially. The results also may indicate changes in venue (ie, private to public site) forced on parents by disruptions in insurance coverage.

Finally, there has been debate in the medical and public health communities regarding the degree to which vaccine administration acts as an incentive for parents to attend WCVs. Some authorities are concerned that the provision of vaccines outside the context of WCVs (eg, special vaccination clinics, mobile immunization vans) will result in children receiving fewer WCVs. However, a recent study in an inner city population demonstrated little, if any, incentive for WCV attendance associated with immunization.¹⁶ More likely, the reasons for failure to receive WCVs are much more complex than delivery of immunizations as a categorical service. In our study, the number of children with inadequate WCVs who received sufficient outside vaccine services to be up to date for immunizations was only 35% at 7 months; this rate increased to 73% at 13 months and to 67% at 24 months. Whether the availability of vaccine services separate from WCVs (eg, vaccine-only clinics) affected parents' initiative to schedule and keep well-child appointments is unclear from our data. Overall, however, children with inadequate numbers of WCVs were considerably less likely to be up to date for immunizations than were their counterparts with adequate WCVs.

Messages about the importance of immunization are pervasive in our society, with much less emphasis on WCVs. National, state, and community organizations use public service announcements, billboards, and other media to promote immunization campaigns, but there are no large-scale initiatives to improve compliance with recommended WCV schedules. Some view managed care as a means to improve access to and use of WCVs, and in at least one study, initiation of a Medicaid managed care program had this effect.¹⁷ However, although current HEDIS criteria contain measures of access, including WCVs, only one third of plans submit data on access measures.¹⁸ Until such measures receive attention and scrutiny, it is unlikely that on a broad scale, the movement of large numbers of children into

managed care plans will automatically increase their receipt of WCVs.

Limitations

The major limitation of the study is that although 71% of the random sample were contacted, respondents and nonrespondents differed. Nonrespondents were more likely to possess demographic characteristics that proved to be predictors for lower use of preventive services. Thus, these data may overrepresent the proportion of children who receive adequate numbers of WCVs and should be viewed as a best-case scenario.

RECOMMENDATIONS

We believe children's receipt of an adequate number of WCVs is important to the health of children and of the nation. WCVs give health care providers an opportunity to recognize and address potential problems and concerns. This decade, efforts to eliminate financial barriers to health care for children are underway, yet results of this analysis indicate that mitigating financial barriers alone will not ensure adequate WCVs for all children. Some children are at high risk, based on their mother's use patterns for prenatal care, of receiving inadequate preventive care. Identifying children at risk and providing earlier and more intensive intervention may improve their receipt of preventive care.

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