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OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

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Pediatrics 2002;110:e73

DOI: 10.1542/peds.110.6.e73

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://www.pediatrics.org/cgi/content/full/110/6/e73>

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Factors That Influence Receipt of Recommended Preventive Pediatric Health and Dental Care

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ABSTRACT. *Objective.* This study examined the factors that affect children's receipt of recommended well-child and dental visits using nationally representative data.

Methods. We analyzed the Child Public Use File of the 1999 National Survey of America's Families, including 35 938 children who were younger than 18 years. Bivariate and multivariate analyses were conducted to examine the relationship between dependent variables, including receipt of well-child visits as recommended by the American Academy of Pediatrics' periodicity schedule and dental visits as recommended by the American Academy of Pediatric Dentistry and *Bright Futures*, and independent variables, including health status and socio-demographic and economic indicators.

Results. Overall, 23.4% of children did not receive the recommended well-child visits, whereas 46.8% did not receive the recommended number of dental visits. The factors that predict nonreceipt of care differed for well-child and dental care and with child's age. Logistic regression reveals that children who were young (<10 years old), uninsured, non-Hispanic white, had a parent who was less than college educated, or in poor health were least likely to meet the recommendations for well-child care. Children who did not meet the dental recommendation were more likely to be black, uninsured, from families with low incomes, have a parent who was less than college educated, and have postponed dental care in the last year. These risk factors increased with children's age.

Conclusions. A substantial proportion of US children do not receive preventive care according to professionally recommended standards, particularly dental care. Publicly insured children experience higher rates of recommended well-child visits; however, much improvement is needed among public programs in providing recommended dental care, especially among adolescents and children in poor general health. *Pediatrics* 2002;110(6). URL: <http://www.pediatrics.org/cgi/content/full/110/6/e73>; *child, dental health services, multivariate analysis, preventive health services, professional organizations.*

ABBREVIATIONS. SCHIP, State Children's Health Insurance Program; AAP, American Academy of Pediatrics; NSAF, National Survey of America's Families; AAPD, American Academy of Pediatric Dentistry.

Many studies have documented inequalities in children's access to health care on the basis of their race and ethnicity, insurance status, and family income. Compared with white children, children who are black, Hispanic, or Native American have fewer physician visits, longer intervals between visits, and poorer health status.¹ Uninsured children and poor children are less likely to have a usual source of care, more likely to go without needed medical care, and more likely to use fewer or no health services than their insured and higher-income counterparts.²⁻⁹ Use of diagnostic and preventive dental care is highest among white and nonpoor children,¹⁰ whereas adolescents who are uninsured, male, and nonwhite are least likely to have an annual dental visit.²

Previous research also documents differences in access to care and insurance by age. Adolescents were more likely to be uninsured than children younger than 13 years, while children younger than 6 years were more likely to be publicly insured than children 6 to 18.¹¹ Older adolescents (15-18 years) were more likely to be uninsured than younger adolescents (10-14 years).¹² Before enrollment in a State Children's Health Insurance Program (SCHIP), older uninsured children experienced more unmet needs, delayed care, and parental limits on activities as well as fewer health care visits and a longer period of being uninsured than younger uninsured children.¹³

Receipt of care based on the American Academy of Pediatrics' (AAP's) Recommendations for Preventive Pediatric Health Care is important because these guidelines present the consensus opinion of pediatric experts for the appropriate number and timing of preventive care visits.^{14,15} Receipt of care as outlined in these guidelines has been shown to decrease avoidable hospital stays for infants, regardless of race, poverty, or health status.¹⁶ Receipt of recommended care is generally low and varies by race and ethnicity, insurance status, and income. In 1 upstate New York county, 46% of privately insured children were in compliance with the AAP recommendations compared with 35% of publicly insured children.¹⁷ An analysis of data from 1988 and 1991 found that white infants more likely to obtain all AAP-recom-

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Received for publication Mar 14, 2002; accepted Aug 14, 2002.

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mended care than were black or Hispanic infants.¹⁸ However, these studies and another¹⁹ that examined receipt of AAP-recommended care are confined to small geographic areas and limited age categories. No study seems to have examined age-specific risk factors for lack of recommended care. Furthermore, we found no studies that reported on children's receipt of dental care based on the recommendations of professional organizations.

This analysis explores the receipt of preventive medical and dental services on the basis of professionally recommended standards by children younger than 18 years, focusing on specific age categories. We use data from the 1999 National Survey of America's Families (NSAF) to provide national estimates about the impact of race and ethnicity, income, and insurance status as well as the additional factors of age and education of responding adult and child health status on receipt of well-child and dental care. The NSAF permits analysis from age 3 to 18 and provides detailed information on the use of both medical and dental care.

METHODS

Data Source

The 1999 NSAF is the second in a series of biannual surveys that examines the health, economic, and social characteristics of children and adults younger than 65 years and their families. The NSAF was conducted by the Urban Institute and Child Trends. It provides national estimates, as well as estimates for 13 selected states, of the civilian, noninstitutionalized population. Interviews in English or Spanish were conducted with 44 499 households through a random-digit dialing survey of households with telephones and an area sample conducted in person for households without telephones. An oversample of families with incomes below 200% of the federal poverty level was obtained. Interviews were conducted between February and October 1999.²⁰

Our analysis used the 1999 NSAF Child Public Use File, which includes 35 938 children younger than 18 years. For households with children, up to 2 children were sampled, 1 child age 5 or younger and 1 child between the ages of 6 and 17. The adult who was most knowledgeable about the child's health care, education, and well-being was asked to participate in the interview. (The responding adult was almost always the child's parent and will be referred to as the parent hereafter.) The national response rate for the child interviews was 81.4%.²¹

Description of Variables

The dependent variables include whether children had received recommended well-child care and dental care.^{14,15,22} The AAP recommends 1 well-child visit per year for children ages 3 to 18, skipping an annual visit for children ages 7 and 9. We used the parent's response to the following question to create our well-child care variable: "About how many of [the child's] visits to a doctor or other medical professional that you just told me about were for well-child care, such as check-ups?" When a child had 1 or more well-child visits in the year preceding the survey or had no well-child visit and was age 7 or 9, we determined that the child had met the AAP recommendation; conversely, when a child had no well-child visit in that year, we determined that the child had not met the recommendation.

The AAP recommends that children begin regular visits to a dental professional after age 3 (or when all 20 infant teeth have come in).²² Although the AAP recommendation does not specify the frequency of preventive dental care, both the American Academy of Pediatric Dentistry (AAPD) and *Bright Futures* recommend 2 visits per year beginning at age 1.^{23,24} On the basis of the parent's response to the question, "During the last 12 months, how many times did [the child] see a dentist or dental hygienist?" we identified those with 2 or more visits as meeting the AAPD/*Bright Futures* recommendation and those with 1 or fewer visits as not

meeting the recommendation. However, we are restricted in our application of this variable because the dental question does not strictly pertain to preventive visits. Although professional organizations recommend 2 visits per year, we also conducted a bivariate analysis to describe the population of children who did not receive at least 1 dental visit during the year, because receiving 1 dental visit may be a common practice.

Age was grouped on the basis of the categories used in the AAP's recommendations for preventive care: early childhood (ages 3–4), middle childhood (ages 5–10), early adolescence (ages 11–14), and late adolescence (ages 15–17). Data were not collected with enough detail to determine receipt of well-child and dental care among children younger than 3 years.

The independent variables include the child's health insurance status, race and ethnicity, health status, and postponement of dental care, as well as family income and parent's age and educational attainment. The variables regarding postponement of medical and dental care were based on survey questions that asked whether the child had not received care when needed in the past year. (Postponement of medical care was included in the original model but was eliminated because of multicollinearity with our dependent variable, well-child visits.) The race and ethnicity variable identifies non-Hispanic blacks, non-Hispanic whites, Hispanics, and people of other races; no other racial or ethnic groups were identified in the public use file. Health insurance status is presented as a 3-level variable, including those without insurance and those with public or private coverage. Public coverage includes Medicaid, the SCHIPs, and other state-specific programs. Private coverage includes employer-sponsored, military, and self-purchased coverage. Information on whether the children had continuous health insurance during the past year is unknown.

Statistical Analysis

Data analyses were conducted using WesVar 4.0, a statistical analysis package developed by Westat (Rockville, MD) to accommodate data generated by complex survey designs.²⁵ χ^2 tests and logistic regression models were used to examine the association between receipt of recommended well-child and dental care and the independent variables. Independent variables significant at $P < .05$ in the bivariate analysis were selected for inclusion in the regression models. Collinearity diagnostics were conducted using SAS based on standard approaches.²⁶ Three variables—no usual source of care, postponement of medical care, and nativity (foreign-born status)—were eliminated from the well-child model on the basis of their small eigenvalues, large condition number, and large variance proportion. Only nativity was eliminated from the dental model. P values are reported for the bivariate analysis. Adjusted odds ratios and 95% confidence intervals are reported for the multivariate analysis.

RESULTS

Sample Characteristics

Table 1 presents the distribution of sampled children by the variables of interest, including sociodemographic and economic indicators, measures of health status, and use of dental care. Overall, 23.4% of children had not met the AAP's well-child visit recommendation in the year preceding the survey interview. Considerably more, however, did not meet the AAPD/*Bright Futures* dental recommendation. Nearly half, 46.8%, had not seen a dentist or dental hygienist at least twice during that year, whereas 21.1% had not had 1 dental visit.

Most children, 70.9%, had some form of private or employer-sponsored health insurance, and >80% lived in families with income over the federal poverty level. The parent was typically between 30 and 49 years of age and had achieved at least a high school education. The majority of children were white (64.1%), with 15.3% black, 15.8% Hispanic, and 4.8% children of other races. More than three quar-

TABLE 1. Child and Respondent Demographic, Health Status, and Use of Preventive Care Variables

	Unweighted N (N = 35 938)	Weighted %
Independent variables		
Health insurance		
Uninsured	3608	12.3
Public	5922	16.8
Private	26 408	70.9
Income		
<100% of poverty	5431	17.9
100%–200% of poverty	8184	22.9
200%–300% of poverty	6935	19.5
300%+ of poverty	15 388	39.8
Age of respondent		
<25 y	2293	6.5
25–29 y	4525	13.1
30–39 y	15 542	45.6
40–49 y	10 976	29.0
50+ y	2602	5.7
Education of respondent		
No high school or GED	3551	12.6
Completed high school or GED	10 805	29.8
Vocational training/some college	11 394	31.5
College graduate	9958	26.2
Race/ethnicity of child		
Non-Hispanic black	4863	15.3
Hispanic	5236	15.8
Non-Hispanic white	24 583	64.1
Non-Hispanic other	1256	4.8
Health status of child		
Excellent	19 922	55.5
Very good	9903	27.0
Good	4530	12.9
Fair/poor	1583	4.6
Dental care postponed last year		
Yes	2293	6.7
No	33 645	93.3
Age of child		
3–4	4529	13.2
5–10	12 186	41.1
11–14	7263	26.2
15–17	6262	19.5
Dependent variables		
AAP well-child visit recommendation		
Yes	19 332	76.7
No	6103	23.4
AAPD/ <i>Bright Futures</i> dental visit recommendation		
Yes	16 706	53.3
No	13 534	46.8
Receipt of 1 dental visit		
Yes	24 268	78.9
No	5972	21.1

ters (82.5%) were in excellent or very good health, and 6.7% had postponed dental care when they needed it in the year preceding the survey. The sample was concentrated in middle childhood and early adolescence, with 41.1% of children between the ages of 5 and 10 and 26.2% between 11 and 14.

Bivariate Analyses

Table 2 presents the percentage of respondents who did not receive the number of professionally recommended well-child and dental visits for each of the variables presented in Table 1. It also includes the percentage of respondents who did not receive at least 1 dental visit. Each variable was significantly associated with a likelihood of not meeting these recommendations ($P < .05$). Uninsured children and nonpoor children were the groups most likely not to

receive recommended well-child care, as were children in good or fair/poor health status. Having a parent who completed high school and/or some higher education and having a parent older than 30 years were also associated with not receiving the recommended visits. It is interesting that those with public coverage were least likely not to receive the recommended visits, compared with the uninsured and those with private coverage. Also of note, black children were most likely to receive the recommended level of well-child care compared with children of white, Hispanic, and other racial/ethnic groups.

The proportion of children who did not receive the recommended number of dental visits was higher than that for well-child visits in all demographic categories. The majority of children in many catego-

TABLE 2. Receipt of Recommended Preventive Care by Selected Characteristics

	Did Not Meet AAP Well-Child Visit Recommendations (23.4%*)		Did Not Meet AAPD/ <i>Bright Futures</i> Dental Visit Recommendations (46.8%*)		Did Not Have 1 Dental Visit During the Year (21.1%*)	
	%	P Value†	%	P Value†	%	P Value†
Health insurance		<.001		<.001		<.001
Uninsured	31.6		72.9		49.9	
Public	14.8		55.7		24.6	
Private	24.2		40.2		15.2	
Income		<.001		<.001		<.001
<100% of poverty	17.1		58.8		31.0	
100%–200% of poverty	24.2		58.5		30.4	
200%–300% of poverty	25.8		47.7		21.0	
300%+ of poverty	24.1		34.5		11.6	
Age of respondent		<.001		<.001		<.001
<25 y	13.5		68.4		41.6	
25–29 y	15.8		57.7		30.3	
30–39 y	22.4		48.8		21.3	
40–49 y	27.6		38.5		16.1	
50+ y	27.0		44.7		19.6	
Education of respondent		.020		<.001		<.001
No high school or GED	22.3		63.5		41.5	
Completed high school or GED	24.7		50.4		23.5	
Vocational training/some college	24.5		46.4		18.2	
College graduate	21.2		34.9		12.2	
Race/ethnicity of child		<.001		<.001		<.001
Non-Hispanic black	11.6		56.1		25.7	
Hispanic	21.4		57.7		33.8	
Non-Hispanic white	26.4		42.0		17.1	
Non-Hispanic other	21.7		45.1		19.3	
Health status of child		<.001		<.001		<.001
Excellent	21.1		43.4		17.7	
Very good	24.5		48.1		21.8	
Good	28.0		53.8		29.4	
Fair/poor	30.6		58.1		32.3	
Dental care postponed last year				<.001		<.001
Yes	NA		68.4		42.3	
No			45.0		19.3	
Age of child		<.001		<.001		<.001
3–4	19.4		73.6		43.1	
5–10	16.1		43.4		17.0	
11–14	30.3		39.4		17.0	
15–17	33.9		45.6		20.2	

NA indicates not applicable.

* Overall percentage of children who did not meet the recommendation.

† Rao-Scott (RS3) χ^2 test.

ries did not receive the recommended visits, including children who were uninsured, poor, Hispanic or black, and in good or fair/poor health and who had postponed dental care in the year preceding the survey. Children with a young parent as well as those with a parent who had not completed high school or its equivalent were also more likely not to receive the recommended number of visits. The proportion of children who did not have at least 1 dental visit followed these findings to a lesser degree.

As shown in Table 3, fewer than half of children received both the recommended number of well-child and dental visits. However, nearly two thirds received the recommended well-child care and at

least 1 dental visit. Of those who had not received the recommended well-child visits, only 12.3% had received 2 dental visits.

Multivariate Results: Well-Child Recommendation

Table 4 presents the multivariate analyses of the factors that influence receipt of recommended well-child visits after controlling for the child’s health insurance, income, race and ethnicity, and health status and parent’s age and education. These findings generally followed the direction indicated by the bivariate analysis. Being uninsured, low parental educational attainment, and poor health status acted as risk factors for not obtaining the recommended

TABLE 3. Use of Dental Care by Receipt of Recommended Well-Child Care

Receipt of AAP Recommended Well-Child Care	Receipt of Dental Care		
	2 or More Dental Visits	1 Dental Visit	No Dental Visits
Yes	44.8%	19.7%	12.2%
No	12.3%	5.9%	5.2%

TABLE 4. Multivariate Analysis Examining Children's Receipt of Recommended Preventive Care

Characteristic	All Ages		Ages 3–4		Ages 5–10		Ages 11–14		Ages 15–17	
	Adjusted OR	95% CI	Adjusted OR	95% CI	Adjusted OR	95% CI	Adjusted OR	95% CI	Adjusted OR	95% CI
Model 1: Did not receive recommended well-child visit										
Health insurance										
Uninsured	1.59	1.29–1.96	2.04	1.30–3.20	2.03	1.45–2.86	1.21	0.76–1.93	1.48	0.98–2.23
Public	0.69	0.57–0.83	0.73	0.41–1.30	0.83	0.62–1.12	0.57	0.40–0.81	0.77	0.43–1.35
Private	1.0		1.0		1.0		1.0		1.0	
Income										
<100% of poverty	0.87	0.69–1.11	1.20	0.61–2.37	0.81	0.54–1.22	0.91	0.59–1.41	.80	0.49–1.30
100%–200% of poverty	1.07	0.89–1.29	1.37	0.89–2.09	0.98	0.76–1.26	1.22	0.83–1.79	.91	0.62–1.31
200%–300% of poverty	1.10	0.92–1.32	1.53	1.13–2.07	0.98	0.72–1.32	1.03	0.77–1.39	1.17	0.82–1.67
300%+ of poverty	1.0		1.0		1.0		1.0		1.0	
Age of parent										
<25 y	0.61	0.45–0.82	0.38	0.23–0.61	0.96	0.50–1.85	1.44	0.35–5.86	1.19	0.46–3.07
25–29 y	0.70	0.57–0.86	0.74	0.52–1.07	0.94	0.68–1.29	0.62	0.33–1.14	0.68	0.08–6.11
30–39 y	1.0		1.0		1.0		1.0		1.0	
40–49 y	1.37	1.22–1.53	1.08	0.68–1.71	1.20	0.95–1.53	1.17	0.91–1.49	0.87	0.62–1.21
50+ y	1.44	1.15–1.80	1.01	0.40–2.54	1.15	0.74–1.79	1.04	0.73–1.46	1.03	0.71–1.50
Education of parent										
No high school or GED	1.41	1.10–1.80	1.68	0.96–2.93	1.11	0.69–1.79	1.45	0.93–2.26	1.21	0.72–2.06
Completed high school or GED	1.43	1.25–1.64	2.05	1.33–3.17	1.28	0.97–1.69	1.29	0.94–1.77	1.19	0.86–1.67
Vocational training/some college	1.36	1.18–1.56	1.36	0.94–1.97	1.22	0.95–1.56	1.38	1.02–1.87	1.46	1.08–1.96
College graduate	1.0		1.0		1.0		1.0		1.0	
Race/ethnicity of child										
Non-Hispanic black	.37	0.30–0.45	0.25	0.14–0.47	.43	0.29–0.63	.32	0.21–0.49	0.40	0.26–0.62
Hispanic	.70	0.59–0.83	0.51	0.32–0.81	.67	0.50–0.92	.76	0.54–1.08	0.81	0.54–1.24
Non-Hispanic white	1.0		1.0		1.0		1.0		1.0	
Non-Hispanic other	.74	0.54–1.02	0.57	0.25–1.29	.79	0.49–1.28	.81	0.43–1.51	0.55	0.28–1.06
Health/status of child										
Excellent	1.0		1.0		1.0		1.0		1.0	
Very good	1.26	1.10–1.43	1.30	0.88–1.92	1.10	0.87–1.39	1.14	0.90–1.45	1.60	1.22–2.10
Good	1.60	1.34–1.92	1.64	1.07–2.51	1.50	1.07–2.12	1.47	1.10–1.98	1.87	1.33–2.64
Fair/poor	2.06	1.54–2.75	1.84	0.85–3.98	1.16	0.73–1.85	2.70	1.55–4.70	2.00	1.12–3.58
Model 2: Did not receive recommended dental visits										
Health insurance										
Uninsured	2.61	2.17–3.14	1.79	0.99–3.25	2.48	1.96–3.15	3.10	2.00–4.81	3.11	1.88–5.13
Public	1.15	0.99–1.34	0.95	0.64–1.40	1.14	0.92–1.42	1.41	1.02–1.94	0.96	0.66–1.41
Private	1.0		1.0		1.0		1.0		1.0	
Income										
<100% of poverty	1.39	1.16–1.67	0.86	0.53–1.38	1.69	1.27–2.25	1.18	0.83–1.68	2.65	1.67–4.22
100%–200% of poverty	1.66	1.45–1.90	1.24	0.83–1.84	1.61	1.31–1.99	1.88	1.38–2.56	2.35	1.65–3.36
200%–300% of poverty	1.36	1.16–1.59	1.22	0.86–1.75	1.47	1.21–1.79	1.51	1.17–1.95	1.27	0.90–1.78
300%+ of poverty	1.0		1.0		1.0		1.0		1.0	
Age of parent										
<25 y	1.69	1.32–2.17	1.19	0.78–1.83	1.36	0.94–1.97	0.97	0.28–3.38	0.53	0.21–1.36
25–29 y	1.20	1.01–1.42	1.11	0.82–1.50	1.00	0.80–1.27	1.03	0.41–2.60	0.47	0.07–2.95
30–39 y	1.0		1.0		1.0		1.0		1.0	
40–49 y	0.75	0.68–0.83	0.98	0.70–1.37	0.78	0.65–0.93	0.92	0.73–1.15	0.94	0.70–1.27
50+ y	0.86	0.72–1.03	0.59	0.27–1.27	0.73	0.51–1.04	1.28	0.96–1.73	1.11	0.75–1.66
Education of parent										
No high school or GED	1.45	1.15–1.82	1.47	0.77–2.79	1.29	0.94–1.77	2.03	1.20–3.42	1.83	1.12–2.98
Completed high school or GED	1.29	1.14–1.47	1.30	0.91–1.86	1.26	1.02–1.54	1.64	1.23–2.17	1.55	1.17–2.04
Vocational training/some college	1.22	1.07–1.38	1.27	0.88–1.83	1.17	0.96–1.42	1.28	1.04–1.56	1.59	1.21–2.08
College graduate	1.0		1.0		1.0		1.0		1.0	
Race/ethnicity of child										
Non-Hispanic black	1.31	1.14–1.52	0.91	0.65–1.27	1.11	0.85–1.45	1.77	1.33–2.37	1.68	1.20–2.34
Hispanic	1.23	1.10–1.38	0.97	0.70–1.34	1.27	1.02–1.56	1.33	0.99–1.78	1.09	0.77–1.54
Non-Hispanic white	1.0		1.0		1.0		1.0		1.0	
Non-Hispanic other	1.21	0.95–1.55	0.76	0.43–1.33	1.60	1.11–2.32	0.96	0.57–1.62	1.41	0.81–2.44
Health status of child										
Excellent	1.0		1.0		1.0		1.0		1.0	
Very good	1.10	0.98–1.23	1.14	0.84–1.54	1.12	0.98–1.28	1.10	0.87–1.41	1.12	0.84–1.49
Good	1.12	0.96–1.31	0.84	0.55–1.31	1.16	0.92–1.46	1.27	0.99–1.63	1.15	0.82–1.62
Fair/poor	1.10	0.88–1.37	0.70	0.32–1.52	0.83	0.60–1.15	1.75	1.04–2.94	1.04	0.67–1.62
Dental care postponed										
Yes	2.18	1.74–2.72	1.92	1.12–3.28	2.09	1.52–2.87	2.61	1.72–3.96	2.96	1.93–4.55
No	1.0		1.0		1.0		1.0		1.0	

OR indicates odds ratio; CI, confidence interval.

care, whereas Hispanic ethnicity, black race, public coverage, and parent younger than 30 years were protective.

For all age groups combined, being uninsured was significantly associated with not receiving the recommended well-child visits. Young children (younger than 11 years) were least likely to meet the recommendation when they were uninsured. Not meeting the well-child recommendation was significantly associated with parents' low educational attainment across most age groups, with the highest odds of not meeting the recommendation seen in children whose parents had a high school diploma. Children in fair/poor health were twice as likely not to receive the recommended number of visits as were children in excellent health. Across all age categories, the likelihood of not meeting the recommendation increased as health status declined.

In contrast to the bivariate results, Hispanic children were significantly less likely to go without the recommended well-child visits than were non-Hispanic white children across most age groups in the multivariate analysis. This suggests that eliminating differences in insurance status, family income, and parent education may eliminate differences in receipt of recommended well-child care for Hispanic children. Despite adjustment for these factors, findings for black children were consistent between the bivariate and multivariate analysis. Black children's odds of meeting the recommendations were nearly 3 times those of white children. Black children were significantly less likely not to go without the recommended care across all ages. Children with public coverage were protected in obtaining their well-child visits across age categories, and this was significant for children 11 to 14 years of age. Young parental age was also protective against not receiving the recommended care for the youngest children.

Multivariate Results: Dental Recommendation

Table 4 also presents the multivariate analyses of the factors that influence receipt of recommended dental care. Not meeting the dental recommendation was associated with being uninsured, low income, black and Hispanic race/ethnicity, postponed dental care, and low educational attainment and young age of the parent. As with the well-child recommendation, being uninsured predicted greater likelihood of not meeting the dental recommendation, and this likelihood increased with the child's age. Children ages 3 to 4 were nearly twice as likely not to meet the recommendation when uninsured compared with 3 times as likely as children older than 11 years. Publicly insured children were at approximately the same risk of not meeting the recommendation as were privately insured children. Although income was not a major predictor in the well-child analysis, it was an important factor in the dental analysis. Each income category below 300% of poverty was significantly associated with not meeting the dental recommendation, an effect that grew with age. Although parent age under 30 was a risk factor for not receiving the recommended dental care generally,

parent age between 40 and 49 was protective for children ages 5 to 10.

Unlike the well-child analysis, nonwhite race was not protective in meeting the dental recommendation. Black and Hispanic children were significantly more likely not to meet the dental recommendation than were white children. The odds of not meeting the recommendation increased with age for black children, with children 11 and older most likely not to receive the recommended dental care. Postponing dental care in the past year was significantly associated with not meeting the dental recommendation across all age groups. Children in all age groups were twice as likely to go without the recommended services when they had postponed care, whereas older children approached 3 times the likelihood. Parent educational attainment of less than college was significantly associated with not meeting the recommendation, and this increased with the child's age.

The use of preventive medical and dental care may not be entirely independent events, but the relationship between the 2 is not clear. Including receipt of well-child care as a covariate in the multivariate analysis of the receipt of dental care yields contradictory results on the basis of the number of dental visits analyzed (data not shown). In the 1-visit model, getting well-child care is protective against not receiving at least 1 dental visit. In the 2-visit model, getting well-child care is a risk factor for not receiving 2 dental visits.

DISCUSSION

More than one quarter of US children did not receive the AAP-recommended visits for well-child care, and this outcome was associated with poor health status, especially among older children. This contrasts with findings in adult populations in which those with fair/poor health status are more likely to have physical examinations.²⁷ Alternatively, it may be that children in poor health use greater levels of acute or specialty care, perhaps at the expense of needed preventive services.

Children with public health insurance were more likely to receive the recommended well-child care than were those who were uninsured or privately covered. This concurs with previous research that found that Medicaid-covered children receive more services and visits than privately insured low-income children²⁸ and may indicate that public programs, such as Medicaid and SCHIP, are relatively successful at promoting and financing preventive care. Although these programs may have lower income eligibility standards for adolescents, older children did as well as younger children in meeting the recommendation.

We found black and Hispanic race/ethnicity to be protective across all ages against not receiving the recommended well-child care. Several previous studies support this finding.^{3,16,29-31} In particular, Newacheck et al³ found black, Hispanic, and other race/ethnicity to be protective against unmet need and that race and ethnicity were correlated with income and insurance status. Thus, higher levels of

participation in public programs by nonwhite groups may influence this finding.

Nearly one half of US children do not receive dental care in accordance with the AAPD/*Bright Futures* recommendations, and the youngest children were the least likely to receive dental care. Although this may be attributable to variation in the age of initiation of dental care, parents may be unaware of or have limited exposure to the recommendations for dental visits, especially when they are caring for their first child. School-aged children were most likely to receive the recommended dental care. Adolescents' lower likelihood of receiving 2 dental visits may be influenced by their greater participation in their health care, resulting in fewer dental visits or postponed care. In addition, parents of adolescents may be financing other dental services, such as orthodontic care, that diverts resources from preventive care.

Overall, slightly more than two thirds of all children received both the recommended well-child care visits and at least 1 dental visit, indicating that families value preventive care. Although nearly half of children did not receive the recommended 2 dental visits a year, more than three quarters received 1 visit. Thus, it is possible that the apparent lack of receipt of the full course of recommended dental visits reflects not lack of motivation to use preventive services but barriers to care based on lack of knowledge or financial resources. We also found a paradoxical relationship between well-child and dental care; whereas those who received the recommended well-child services were more likely to receive 1 dental visit, they were less likely to receive 2 dental visits. This suggests that if a family's energy and resources go into ensuring receipt of well-child care, they may have less to devote to dental care.

Receipt of dental care may depend more on families' ability to pay out-of-pocket for dental care rather than insurance status, because even children with medical insurance may not have coverage for dental care.³² This is demonstrated in the greater likelihood of poor children going without recommended care compared with children with higher family income. Although we did not know which families had dental insurance, the Medicaid program includes periodic dental screening and referral under its Early and Periodic Screening, Diagnosis, and Treatment benefit through age 21. Children with public coverage were at approximately the same risk of not meeting the dental recommendation as those with private coverage, suggesting that even when a child has dental coverage, access to services may be limited. Problems with provider participation in publicly funded insurance programs have been documented.^{33,34} In addition, some payers may cover only 1 dental visit a year. For example, a recent study of dental benefits in 15 separate SCHIPs found 1 state that limited preventive dental visits to once a year.³³

Limits on access to dental services, particularly among publicly insured children, have prompted a wide range of policy recommendations. Some of these, such as a federal requirement for dental service or an increase in provider reimbursement, have been shown to have limited or no effect on receipt of

care.^{35,36} For encouraging greater provision of preventive dental care, outreach to pediatricians, dentists, and other providers through their professional associations may be appropriate. Health professionals could consider referral arrangements to facilitate dental care or continuing education programs in effective referral strategies. Pediatricians and other providers see more than three quarters of all children for well-child care, providing substantial opportunity for them to advise parents of dental standards of care. Many pediatricians are willing to incorporate preventive dental guidance, fluoride application, and identification of dental problems into their practices, although they have received little formal training, have limited knowledge of dental health issues, and have experienced difficulties in making dental referrals.³⁷ To encourage pediatricians to provide their patients with accurate guidance, the AAP might consider clarifying its preventive care standards to describe more specifically the frequency of recommended preventive dental visits.

The potential role of pediatricians in promoting dental care underlines the importance of increasing utilization of preventive medical care as well. To that end, providers and policy makers could support efforts to promote and educate families on the importance of preventive care, remind them of upcoming appointments, provide for after-hours care, eliminate long waits to schedule appointments as well as long waits at providers' offices, and overcome language barriers or other cultural obstacles.

Several potential limitations to this study should be noted. The data are limited to children age 3 and older, missing young children and their frequent visit schedule. However, selected groups of very young children have been studied elsewhere.^{16,18} Because of the limits of the NSAF, we do not know whether our dental care variable included acute and emergent care as well as preventive care, and we could not determine the effect of dental insurance on compliance with the recommendations. Our findings are also limited by any inaccuracies in parents' reports of their children's health and parents who did not distinguish between well-child visits and visits for sick or emergent care. In addition, the NSAF public use file did not identify Asian or Pacific Islander and American Indian racial categories, precluding our analysis of these populations.

These findings suggest that publicly insured children do comparatively well in obtaining the recommended well-child visits; however, much improvement is needed among public programs regarding access to recommended dental care, especially among adolescents. However, despite variations, a substantial portion of all US children do not receive preventive care according to professionally recommended standards.

ACKNOWLEDGMENTS

This work was supported by federal Maternal and Child Health Bureau contract 240-97-0033 and in part by CDC grant U48/CCU915773.

We appreciate the technical assistance of Jeffrey Butera, PhD.

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Pediatrics 2002;110:e73

DOI: 10.1542/peds.110.6.e73

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