

Reported Eye Care Utilization and Health Insurance Status Among US Adults

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Objectives: To estimate prevalence and correlates of eye care utilization by means of data from the National Health Interview Survey.

Methods: Nearly 290 000 adults 18 years or older participated in the survey from 1997 through 2005. Eye care utilization was based on self-reported contact with an eye care professional in the past year. Participants were classified by level of visual impairment based on response to 2 questions. The survey and logistic regression procedures in SAS statistical software were used to compute 1997 through 2005 pooled eye care utilization rates and to identify correlates of utilization.

Results: Overall eye care utilization rates were 58.3%, 49.6%, and 33.7%, respectively, for participants with se-

vere, some, and no visual impairment; rates for respondents without health insurance were 35.9%, 23.8%, and 14.3%, respectively. Multivariable logistic regression analyses completed in racial/ethnic and age category subgroups indicated that no reported visual impairment, lack of health insurance, male sex, and low education were associated with low eye care utilization rates.

Conclusions: Interventions designed to increase eye care utilization rates in select sociodemographic subgroups are needed. Overall utilization rates may also be enhanced if progress is made toward dramatically increasing the number of Americans with health insurance.

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THE TOTAL ANNUAL ECONOMIC impact of ocular disorders in the United States exceeds \$51 billion.¹ Blindness and visual impairment from most eye diseases can be reduced with early detection and treatment.² Recommendations for periodic eye examinations vary across ocular and medical organizations, but most recommend 1- to 2-year screening intervals depending on age and ocular risk factors.³ For example, annual comprehensive dilated-eye examinations play a critical role in preventing and/or delaying eye disease for those at higher risk for blindness, such as those older than 65 years, people with diabetes mellitus, or African Americans older than 40 years.² Routine eye examinations in the elderly have also been shown to reduce overall functional decline.⁴ Studies that estimate the prevalence of eye care utilization are extremely limited and are often only regionally applicable to the US population.⁵⁻⁹

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In 2006, the US Census Bureau reported that the number of nonelderly uninsured Americans had increased in 2005

by another 1.3 million, for a total of 46.6 million uninsured, continuing an upward trend that began in the year 2000.¹⁰ Lack of health insurance is associated with lower health care utilization in general¹¹ and with lower ocular health care utilization in particular,^{8,12} but national estimates of eye care utilization in adults with and without health insurance are limited¹³; furthermore, these associations have not been examined in adults by level of reported visual impairment. The analysis herein uses nationally representative National Health Interview Survey (NHIS) data to estimate the prevalence of eye care utilization in adults classified by reported visual impairment status and grouped according to sociodemographic indicators and health insurance status. Because of the study's large size and uniform data collection procedures, it is possible to pool data across survey years, permitting examination of associations between eye care utilization and insurance status in a large and diverse sample of adults, including nearly 1300 respondents with severe visual impairment. Multivariable modeling is also used to assess the relative contributions of visual impairment and sociodemographic and health insurance factors on eye care utilization rates.

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METHODS

The NHIS is an annual cross-sectional, multipurpose, and multistage probability area survey of the US civilian noninstitutionalized population living at addressed dwellings. A probability sample of households was selected with family members interviewed by trained personnel; 1 adult from each household was selected and administered a detailed health interview. Annual response rates to the 1997 through 2005 adult core ranged from 69% (in 2005) to 80% (in 1997).¹⁴⁻²² Nearly 290 000 adults 18 years or older participated in the adult core survey from 1997 through 2005.

Visual impairment of the participants was assessed by asking the following questions: "Do you have any trouble seeing, even when wearing glasses or contact lenses?" (yes indicated some visual impairment) and "Are you blind or unable to see at all?" (yes indicated severe visual impairment). Participants who answered yes to the question, "During the past 12 months have you seen or talked to any optometrist, ophthalmologist, or eye doctor (someone who prescribes eyeglasses)?" were classified as having utilized eye care. Interviewers were instructed to check no to this question if the only eye care provider seen in the previous 12 months was identified by the participant as an "optician."

Consistency of health insurance coverage in the 12 months prior to the interview and the type of insurance (public or private) was available.²³ One adult household member was asked about the insurance status for all members by means of the following question: "What kind of health insurance or health care coverage does [household member] have? Include those that pay for only 1 type of service (nursing home care, accidents, or dental care), and exclude private plans that only provide extra cash while hospitalized." Periods without health insurance coverage in the past 12 months were obtained for insured family members. The duration of noncoverage was also obtained for family members without health insurance at the time of interview. A household member was considered uninsured if he or she was not covered by private health insurance or government-sponsored (ie, public) insurance plans including Medicare, Medicaid, and military coverage.

Other sociodemographic measures included in the analyses were age group (18-44 years, 45-64 years, and ≥ 65 years), sex, educational level (less than high school, high school, and some college or higher), and family income ($< \$20\,000$ and $\geq \$20\,000$). Hispanic origin was based on response to the question, "Do you consider yourself Hispanic/Latino?" Respondents were instructed to select from a flash card a response category that best represented their Hispanic origin or ancestry. Race was based on response to the following questions: "What race do you consider yourself to be?" For those selecting more than 1 race group from the flash card shown, a second question was asked: "Which one of these groups [interviewer reads categories selected by respondent] would you say best represents your race?" Race and Hispanic origin were based on coding algorithms applied by the National Center for Health Statistics.²⁴

Prevalence rates of eye care utilization and corresponding 95% confidence intervals (CIs) were adjusted for survey design and pooling of data across survey years by means of the SUDAAN Proc Crosstab procedure.²⁵ We also analyzed data by multivariable logistic regression to determine the significance of the relationship between visual impairment, sociodemographic characteristics, and health insurance and the likelihood that NHIS adult participants 18 years or older had consulted an ocular health care provider within the past year. Before proceeding to multivariable analyses, we examined the data for potential collinearity among covariates as well as interactions among our covariates (eg, age \times visual impairment status). We also hypothesized that there would be a dose-response rela-

tionship between the consistency of health insurance coverage and eye care utilization prevalence rates even after adjustment for sociodemographic status. To test this, we performed trend analyses for qualitatively defined categories.²⁶ All analyses were performed with SAS survey procedures to incorporate sample weights and design effects.

Initial modeling that included all participants identified a number of interactions among covariates of interest, which led us to undertake analyses stratified by age group (ie, 18-44, 45-64, and ≥ 65 years) and race/ethnicity (ie, non-Hispanic whites, non-Hispanic blacks, and Hispanics of any race). We further explored all first-order interactions with visual impairment in each of the race/ethnicity-age models and found there were no significant interactions of interest. Participants who did not fall into the 3 racial/ethnic categories were excluded because of the heterogeneity of this category combined with numerous interactions among the covariates ($n = 10\,374$).

All multivariable logistic models included the following independent variables: category of visual impairment, sex, education, household income, and insurance status.

RESULTS

The prevalence of some visual impairment and severe visual impairment was 9.5% and 0.4%, respectively. The overall eye care utilization rates were 58.3% (95% CI, 55.0%-61.5%) for severe visual impairment, 49.6% (48.8%-50.4%) for some visual impairment, and 33.7% (33.3%-34.0%) for no visual impairment (**Table 1**). There was a higher prevalence rate of eye care utilization in older than in younger adults, in women than in men, in adults with more than a high school education than in adults with lower educational levels, and in those with an annual household income at or above \$20 000 than in those below it. With respect to racial/ethnic comparisons, whites and non-Hispanics with no or some visual impairment reported the highest eye care utilization rates (35%-51%), whereas Mexican Americans reported the lowest (17%-36%). The most dramatic differences in eye care utilization rates were noted in health insurance subgroups. The eye care utilization rates of adults without insurance were 14.3% (95% CI, 13.9%-14.7%) for no visual impairment, 23.8% (22.3%-25.4%) for some visual impairment, and 35.9% (26.5%-46.4%) for severe visual impairment. In contrast, corresponding rates for adults with insurance were much higher: 37.3% (95% CI, 36.9%-37.6%) for no visual impairment, 54.1% (53.3%-54.9%) for some visual impairment, and 60.3% (57.0%-63.6%) for severe visual impairment. Finally, those without health insurance for 12 months or longer had the lowest eye care utilization rates in each visual impairment category: 11.3% (95% CI, 10.8%-11.7%) for no visual impairment, 20.5% (18.9%-22.3%) for some visual impairment, and 33.5% (23.0%-46.0%) for severe visual impairment.

MULTIVARIABLE RESULTS FOR ADULTS 18 TO 44 YEARS OF AGE

Level of visual impairment was associated with ocular health care utilization among adults aged 18 to 44 years, irrespective of race/ethnicity (**Table 2**). However, the strongest association was found among non-Hispanic black respondents reporting severe visual impairment (odds ratio [OR], 7.94; 95% CI, 3.90-16.16), even after

Table 1. Prevalence of Eye Care Utilization in the Past 12 Months in Adults Grouped by Level of Reported VI: 1997-2005 National Health Interview Survey

Variable	No.	Eye Care Utilization Rate, % (95% CI)			
		All (N=289 442)	No VI (n=260 589)	Some VI (n=27 564)	Severe VI (n=1289)
Overall	289 442	35.2 (34.9-35.5)	33.7 (33.3-34.0)	49.6 (48.8-50.4)	58.3 (55.0-61.5)
Age, y					
18-44	146 914	26.2 (25.8-26.5)	25.4 (25.1-25.8)	38.3 (37.1-39.5)	48.1 (40.9-55.5)
45-64	87 254	40.6 (40.2-41.1)	39.8 (39.3-40.3)	47.3 (46.1-48.4)	60.4 (54.5-66.1)
≥65	55 274	54.4 (53.8-55.0)	52.2 (51.5-52.8)	65.1 (63.9-66.3)	62.4 (58.2-66.5)
Sex					
Male	125 864	30.8 (30.4-31.2)	29.5 (29.1-29.9)	46.3 (45.1-47.5)	54.2 (49.0-59.3)
Female	163 578	39.2 (38.8-39.6)	37.7 (37.3-38.1)	51.9 (51.0-52.8)	62.1 (57.9-66.2)
Race					
White	226 152	36.9 (36.5-37.2)	35.4 (35.1-35.8)	50.8 (49.9-51.7)	59.3 (55.7-62.9)
Black	40 475	28.3 (27.6-29.0)	26.3 (25.6-27.0)	45.3 (43.6-47.0)	59.1 (51.0-66.7)
Native American	2070	30.7 (28.5-33.0)	29.5 (27.2-32.0)	38.3 (31.8-45.2)	46.3 (19.7-75.2)
Asian	8127	30.0 (28.7-31.3)	29.1 (27.8-30.5)	46.3 (41.2-51.5)	28.9 (10.3-59.1)
Other	12 618	22.2 (21.2-23.2)	20.3 (19.4-21.4)	41.0 (37.3-44.8)	44.6 (30.0-60.2)
Spanish origin					
Non-Hispanic	240 842	36.9 (36.6-37.3)	35.5 (35.1-35.8)	50.6 (49.8-51.5)	59.2 (55.7-62.6)
Mexican American	28 933	18.5 (17.8-19.2)	17.1 (16.4-17.9)	36.1 (33.7-38.6)	46.1 (35.4-57.2)
Puerto Rican	4912	29.0 (27.4-30.6)	26.7 (25.1-28.3)	48.4 (43.2-53.7)	57.6 (31.6-80.0)
Cuban American	2815	24.2 (21.1-27.2)	22.5 (19.8-25.6)	47.4 (35.8-59.3)	41.6 (18.7-68.8)
Other Spanish	11 940	23.5 (22.3-24.8)	22.0 (20.7-23.3)	40.9 (36.9-45.0)	58.0 (43.1-71.6)
Education ^a					
<High school	58 440	27.0 (26.4-27.5)	24.2 (23.7-24.8)	43.8 (42.5-45.2)	50.3 (45.0-55.5)
High school diploma	83 080	32.6 (32.2-33.1)	31.0 (30.5-31.4)	47.9 (46.5-49.2)	63.4 (57.7-68.8)
Some college or higher	144 823	39.6 (39.2-40.0)	38.4 (38.0-38.8)	54.4 (53.3-55.6)	62.0 (56.1-67.5)
Annual household income, \$ ^a					
<20 000	77 821	31.1 (30.6-31.7)	28.5 (27.9-29.1)	45.8 (44.7-46.9)	58.6 (54.0-63.0)
≥20 000	193 809	36.4 (36.1-36.8)	35.2 (34.8-35.5)	51.2 (50.2-52.2)	57.5 (52.8-62.0)
Health insurance ^b					
Uninsured	47 823	15.2 (14.8-15.6)	14.3 (13.9-14.7)	23.8 (22.3-25.4)	35.9 (26.5-46.4)
Insured	240 549	38.9 (38.6-39.2)	37.3 (36.9-37.6)	54.1 (53.3-54.9)	60.3 (57.0-63.6)
Health insurance history ^b					
Insured ≥12 mo	227 704	39.4 (39.1-39.8)	37.8 (37.5-38.2)	55.1 (54.3-55.9)	61.4 (58.0-64.7)
Insured but gaps in past 12 mo	11 325	28.7 (27.6-29.7)	27.4 (26.3-28.6)	38.3 (35.2-41.5)	42.1 (27.1-58.6)
Not insured but some coverage in past 12 mo	10 596	21.9 (20.9-23.0)	21.1 (20.0-22.1)	31.0 (27.8-34.4)	46.1 (25.6-68.0)
Not insured for >12 mo	34 275	12.1 (11.7-12.5)	11.3 (10.8-11.7)	20.5 (18.9-22.3)	33.5 (23.0-46.0)
Health insurance type ^b					
Private only	158 214	35.7 (35.3-36.0)	34.8 (34.4-35.1)	49.0 (47.8-50.2)	56.0 (48.3-63.3)
Public only	47 374	38.4 (37.8-39.0)	35.6 (34.9-36.2)	51.3 (50.0-52.5)	58.5 (53.7-63.2)
Both public and private	34 442	57.7 (57.0-58.4)	55.5 (54.8-56.3)	68.9 (67.3-70.4)	66.5 (60.7-71.9)

Abbreviations: CI, confidence interval; VI, visual impairment.

^aSome participants did not provide this information.

^bExcludes those with unknown health insurance status, health insurance history, or health insurance type.

adjustment for all other covariates. Odds of ocular health care contacts were 1.41 to 1.64 times higher in women than men. Increasing levels of education were associated with the ocular health care contacts; this association was strongest in Hispanics with at least some college (OR, 3.01; 95% CI, 2.72-3.33). There was a small but significant increased odds of ocular health care contacts among those residing in households with yearly incomes of \$20 000 or more (range of ORs, 1.08-1.24). Odds of ocular health care contacts were 2.00 to 2.47 times higher in those with than without health insurance.

MULTIVARIABLE RESULTS FOR ADULTS 45 TO 64 YEARS OF AGE

Odds of ocular health care visits in adults aged 45 to 64 years were greater in those reporting than in those not re-

porting visual impairment. The strongest associations were seen for non-Hispanic blacks and Hispanics reporting severe visual impairment (OR, 5.25; 95% CI, 3.06-9.01 vs OR, 5.51; 95% CI, 3.00-10.14). Women were more likely than men to report ocular health care visits (range of ORs, 1.39-1.46); those with higher levels of education were also more likely to report ocular health care visits, although these associations were not as strong as those noted for younger adults. The strongest association between household income and ocular health care visits was found in non-Hispanic whites (OR, 1.29; 95% CI, 1.21-1.37). Odds of ocular health care contacts were approximately 2.5 times higher in those with than in those without health insurance. Odds of ocular health care contacts increased with survey years, reflecting increased utilization over time, particularly for non-Hispanic blacks and Hispanics (OR, 1.02; 95% CI, 1.00-1.04 vs OR, 1.04; 95% CI, 1.02-1.06).

Table 2. Age Group- and Racial/Ethnic Group-Specific Multivariable Predictors of Ocular Health Care Utilization in US Adults: 1997-2005 National Health Interview Survey

Variable	Non-Hispanic Whites		Non-Hispanic Blacks		Hispanics	
	No.	OR (95% CI)	No.	OR (95% CI)	No.	OR (95% CI)
Age 18-44 y						
Visual impairment						
None	77 411	1 [Reference]	18 558	1 [Reference]	28 374	1 [Reference]
Some	4871	1.77 (1.66-1.89)	1251	2.15 (1.84-2.52)	1546	2.65 (2.30-3.06)
Severe	147	2.70 (1.80-405.00)	53	7.94 (3.90-16.16)	49	3.46 (1.76-6.81)
Sex						
Male	38 421	1 [Reference]	7329	1 [Reference]	13 461	1 [Reference]
Female	44 008	1.48 (1.43-1.54)	12 533	1.64 (1.51-1.79)	16 508	1.41 (1.30-1.53)
Education						
<High school	7273	1 [Reference]	3354	1 [Reference]	12 630	1 [Reference]
High school diploma	22 475	1.38 (1.27-1.49)	6283	1.39 (1.20-1.60)	7634	1.71 (1.53-1.91)
Some college or higher	52 681	2.13 (1.98-2.29)	10 225	2.26 (1.98-2.58)	9705	3.01 (2.72-3.33)
Annual household income, \$						
≥20 000	16 245	1 [Reference]	7541	1 [Reference]	11 373	1 [Reference]
<20 000	66 184	1.08 (1.03-1.15)	12 321	1.24 (1.12-1.36)	18 596	1.19 (1.09-1.30)
Health insurance						
No	69 014	1 [Reference]	15 056	1 [Reference]	17 204	1 [Reference]
Yes	13 415	2.00 (1.88-2.12)	4806	2.06 (1.85-2.30)	12 765	2.47 (2.24-2.71)
Yearly trend, per y	82 429	1.02 (1.01-1.02)	19 862	1.01 (0.99-1.03)	29 969	1.01 (1.00-1.03)
Age 45-64 y						
Visual impairment						
None	50 359	1 [Reference]	9261	1 [Reference]	9230	1 [Reference]
Some	6324	1.38 (1.29-1.47)	1593	1.96 (1.75-2.21)	1319	1.90 (1.64-2.20)
Severe	199	2.13 (1.53-2.97)	71	5.25 (3.06-9.01)	65	5.51 (3.00-10.14)
Sex						
Male	26 165	1 [Reference]	4457	1 [Reference]	4636	1 [Reference]
Female	30 717	1.39 (1.34-1.45)	6468	1.46 (1.34-1.60)	5978	1.40 (1.26-1.57)
Education						
<High school	6134	1 [Reference]	2853	1 [Reference]	5138	1 [Reference]
High school diploma	17 215	1.20 (1.11-1.29)	3310	1.29 (1.14-1.46)	2392	1.22 (1.06-1.41)
Some college or higher	33 533	1.57 (1.47-1.69)	4762	1.71 (1.51-1.93)	3084	1.62 (1.44-1.84)
Annual household income, \$						
≥20 000	8914	1 [Reference]	4094	1 [Reference]	3949	1 [Reference]
<20 000	47 968	1.29 (1.21-1.37)	6831	1.12 (1.01-1.23)	6665	1.04 (0.94-1.16)
Health insurance						
No	51 082	1 [Reference]	8981	1 [Reference]	7368	1 [Reference]
Yes	5800	2.47 (2.30-2.66)	1944	2.55 (2.23-2.92)	3246	2.57 (2.28-2.91)
Yearly trend, per y	56 882	1.01 (1.00-1.02)	10 925	1.02 (1.00-1.04)	10 614	1.04 (1.02-1.06)
Age ≥65 y						
Visual impairment						
None	31 738	1 [Reference]	4340	1 [Reference]	3680	1 [Reference]
Some	6344	1.81 (1.69-1.94)	1080	1.84 (1.59-2.13)	768	2.03 (1.66-2.48)
Severe	440	1.75 (1.41-2.17)	61	0.88 (0.52-1.49)	67	1.27 (0.76-2.13)
Sex						
Male	14 752	1 [Reference]	1967	1 [Reference]	1768	1 [Reference]
Female	23 770	1.24 (1.19-1.30)	3514	1.48 (1.30-1.68)	2747	1.41 (1.24-1.61)
Education						
<High school	10 712	1 [Reference]	3003	1 [Reference]	3087	1 [Reference]
High school diploma	13 380	1.30 (1.22-1.38)	1259	1.17 (1.02-1.36)	727	1.11 (0.90-1.36)
Some college or higher	14 430	1.62 (1.53-1.73)	1219	1.36 (1.18-1.58)	701	1.57 (1.27-1.95)
Annual household income, \$						
≥20 000	15 715	1 [Reference]	3615	1 [Reference]	2940	1 [Reference]
<20 000	22 807	1.18 (1.12-1.24)	1866	1.37 (1.22-1.55)	1575	1.03 (0.87-1.22)
Health insurance						
No	38 372	1 [Reference]	5406	1 [Reference]	4370	1 [Reference]
Yes	150	2.73 (1.79-4.16)	75	1.82 (1.05-3.14)	145	4.07 (2.32-7.16)
Yearly trend, per y	38 522	1.03 (1.02-1.04)	5481	1.01 (0.99-1.04)	4515	1.04 (1.01-1.07)

Abbreviations: CI, confidence interval; OR, odds ratio.

Table 3. Association of Consistency of Health Care Insurance Coverage and Ocular Health Care Utilization: 1997-2005 National Health Interview Survey

Variable	OR (95% CI) ^a		
	Non-Hispanic Whites	Non-Hispanic Blacks	Hispanics
Insurance Status			
Age 18-44 y			
Insured ≥12 mo	1 [Reference]	1 [Reference]	1 [Reference]
Insured but gaps in past 12 mo	0.85 (0.79-0.91)	0.94 (0.81-1.09)	0.84 (0.71-0.98)
Not insured but some coverage in past 12 mo	0.71 (0.64-0.77)	0.68 (0.57-0.82)	0.59 (0.50-0.70)
Not insured for >12 mo	0.37 (0.34-0.40)	0.38 (0.33-0.43)	0.34 (0.30-0.38)
Age 45-64 y			
Insured ≥12 mo	1 [Reference]	1 [Reference]	1 [Reference]
Insured but gaps in past 12 mo	0.71 (0.62-0.81)	0.69 (0.53-0.90)	0.76 (0.56-1.02)
Not insured but some coverage in past 12 mo	0.58 (0.50-0.68)	0.53 (0.39-0.71)	0.70 (0.56-0.88)
Not insured for >12 mo	0.32 (0.29-0.35)	0.36 (0.31-0.42)	0.33 (0.28-0.37)
Age ≥65 y			
Insured ≥12 mo	1 [Reference]	1 [Reference]	1 [Reference]
Insured but gaps in past 12 mo	0.82 (0.59-1.16)	0.54 (0.26-1.11)	1.50 (0.80-2.78)
Not insured ^b	0.30 (0.18-0.50)	0.56 (0.33-0.96)	0.23 (0.13-0.44)
Insurance Type			
Age 18-44 y			
Private	1 [Reference]	1 [Reference]	1 [Reference]
Public	0.94 (0.88-1.01)	0.99 (0.87-1.12)	1.04 (0.91-1.18)
Both	1.26 (1.03-1.52)	1.03 (0.71-1.50)	1.45 (0.95-2.20)
None	0.50 (0.47-0.53)	0.48 (0.43-0.54)	0.41 (0.37-0.46)
Age 45-64 y			
Private	1 [Reference]	1 [Reference]	1 [Reference]
Public	1.07 (0.98-1.16)	1.15 (0.99-1.32)	1.54 (1.31-1.81)
Both	1.39 (1.24-1.55)	1.69 (1.31-2.20)	1.98 (1.28-3.05)
None	0.42 (0.39-0.45)	0.42 (0.37-0.49)	0.45 (0.39-0.51)
Age ≥65 y			
Private	1 [Reference]	1 [Reference]	1 [Reference]
Public	1.05 (0.93-1.18)	0.87 (0.65-1.16)	1.15 (0.83-1.59)
Both	1.52 (1.35-1.71)	1.37 (1.01-1.85)	1.56 (1.11-2.19)
None	0.52 (0.35-0.80)	0.60 (0.35-1.02)	0.32 (0.17-0.60)

Abbreviations: CI, confidence interval; OR, odds ratio.

^aAdjusted for visual impairment, sex, education, income, and survey year; all tests for insurance status trend were significant at $P < .05$.

^bCategory includes some with coverage in the past 12 months.

MULTIVARIABLE RESULTS FOR ADULTS 65 YEARS OR OLDER

In general, associations between covariates and ocular health care utilization were not as strong for adults 65 years or older relative to younger adults. There was no evidence of a dose-response association between degree of visual impairment and ocular health care visits, irrespective of race/ethnicity. Consistent with the findings for younger adults, odds of ocular health care contacts were higher in women than in men. Associations existed between level of education, household income, and ocular health care visits, although no OR exceeded 1.62. The association between insurance and ocular health care utilization was strongest among Hispanics (OR, 4.07; 95% CI, 2.32-7.16). Eye care utilization rates increased during the survey period for all 3 racial/ethnic groups (range of ORs, 1.01-1.04).

MULTIVARIABLE RESULTS FOR ALTERNATE HEALTH INSURANCE INDICATORS

There were strong dose-response associations between the consistency of health care coverage and the odds of

accessing ocular health care in the previous 12 months within nearly all examined racial/ethnic subgroups (**Table 3**). The test for trend was significant in each of the multivariable models ($P < .05$). Relative to those with consistent coverage for at least 12 months, adults without health insurance coverage for 12 months or longer had the lowest odds of ocular health care access, irrespective of age group and racial/ethnic status. The demographic subgroup with the strongest inverse association was found to be Hispanics 65 years or older. Compared with those consistently insured, older Hispanics who either had a gap in coverage in the past 12 months or were uninsured for longer than 12 months had the lowest odds of ocular health care utilization in the past year (OR, 0.23; 95% CI, 0.13-0.44). Among adults younger than 65 years, there were also significantly lower odds of ocular health care utilization among those who were uninsured for longer than 1 year relative to those who were consistently insured, irrespective of race/ethnicity (range of ORs, 0.32-0.38). In these same age groups, insured adults who reported a gap in insurance coverage in the past 12 months also had statistically significantly lower odds of ocular health care utilization than did those who were consistently insured (range of ORs, 0.69-0.94).

With 1 notable exception, there were no significant differences in ocular utilization rates among adults with private vs public health insurance after adjustment for model covariates (Table 3). Adjusted odds of ocular health care utilization rates were significantly greater in Hispanics 45 to 64 years of age with public vs private insurance (OR, 1.54; 95% CI, 1.31-1.81). Although not always statistically significant, adults covered by both public and private health insurance had higher odds of ocular health care utilization than did adults with private insurance only (range of ORs, 1.03-1.98).

COMMENT

Overall eye care utilization rates in the 12 months prior to the household interview were 50% to 58% in participants with at least some reported visual impairment and 34% among participants without reported visual impairment. Utilization rates also increased modestly during the survey period. Nevertheless, these results suggest that many Americans do not adhere to recommendations to visit eye care professionals every 1 to 2 years.³ Consistent with previous reports,^{6,27} eye care utilization rates were also suboptimal in adults 65 years or older (52%-65%). The need for routine screening in this age group is unequivocal.²⁸ For example, one 9-year longitudinal study of Medicare beneficiaries documented that the prevalence of having at least 1 major ocular condition (eg, age-related macular degeneration, retinopathy, and glaucoma) increased from 13% to 45%.²⁹

The association between low eye care utilization rates and lack of, or inconsistent, health insurance coverage, even after adjustment for income and educational attainment (Table 3), suggests that overall ocular health care access would be enhanced if progress is made toward securing coverage for the 46.6 million Americans who do not currently have health insurance.¹⁰ Our findings have also identified troubling gaps in eye care utilization among adults with health insurance coverage. Adults who reported an interruption in health insurance coverage in the 12 months prior to the interview were less likely to report a visit to an ocular health care provider than were those who were consistently insured. In our analyses, 3.8% or an estimated 7.8 million US community-residing adults annually reported such a coverage gap in the past 12 months.

We also found that adults who reported concurrent private and public health care coverage were generally more likely to report an ocular health care visit in the preceding 12 months than were adults who had private insurance only, even after adjustment for level of visual impairment, sex, and educational attainment. The NHIS did not assess whether ocular care was included as part of the participants' insurance coverage. It is nevertheless possible that public coverage filled in some of the well-known gaps in ocular health care coverage of many of the private health care plans offered in the United States. For example, Medicare and Medicaid typically include basic eye care services, such as annual eye examinations (<http://www.medicare.gov>; <http://www.nei.nih.gov/health/financialaid.asp>). Our findings point to the need for ad-

ressing the coverage limitations for ocular care in private insurance plans as well as addressing the broader need for health insurance for all Americans.

Hispanics experience a wide variety of barriers when they interact with the health care system (eg, language differences and discrimination), which lead to lower utilization of ocular health care as well as general health care.^{9,30,31} For example, relative to whites, Hispanic individuals are less likely to receive ambulatory health care services and to report a usual source for health care, and they are more likely to report that they are dissatisfied with the care received by family members.^{32,33} Our findings suggest heterogeneity in eye care utilization in Hispanic subgroups. For example, among those reporting some visual impairment, eye care utilization prevalence was lowest among Mexican Americans relative to other Hispanic subgroups (36% vs 41%-48%). Among Hispanics reporting severe visual impairment, eye care utilization rates were lowest in Cuban Americans (42%) and Mexican Americans (46%) relative to Puerto Ricans and those listed as "other Spanish" (58%). Previous research has also documented low ocular health care utilization rates in Mexican Americans with diabetes mellitus.⁵ Of note, previous analyses of Hispanic subgroups have also documented lower rates of ambulatory health care utilization in Mexican and Cuban Americans relative to Puerto Ricans.³⁴ These findings indicate that Hispanics in general, and select Hispanic subgroups in particular (eg, Mexican Americans), may benefit from tailored, culturally competent educational programs designed to increase ocular health care utilization.³⁵

Our findings also support previous studies that indicate that less educated individuals, younger vs older adults, and males vs females have lower eye care utilization rates.^{6,9} Our findings with respect to sex are consistent with those reported in the Beaver Dam Eye Study (adjusted OR comparing women vs men, 1.27).⁸ Men in general interact with the health care system at lower rates than women,³⁶ and interventions designed to increase ocular health care utilization by men may be warranted. Only 40% to 60% of middle-aged adults reported an ocular health care visit in the preceding 12 months. This age group should also be targeted for public health messaging campaigns to increase awareness of recommended time intervals for periodic eye examinations.³ Establishing good screening practices in middle age should lead to a greater likelihood that such preventive practices will carry over into the older years, when annual ocular examinations become increasingly important for early disease detection.

Our findings also highlight the importance of educational levels in influencing preventive screening behaviors. In addition to visual impairment levels and insurance status, educational attainment was a strong correlate of ocular health care utilization, particularly when rates were compared among those with less than a high school education vs those with at least some college (Table 2). The reasons for lower preventive screening behaviors among the less educated are complex and may relate, in part, to lower lifetime income-earning opportunities and fewer opportunities to obtain affordable and stable health insurance coverage. In addition, numerous studies have

shown that the quality of physician-patient communications is lower among less educated vs more educated patients.³⁷ Ocular health care providers should be mindful to ensure that they are effectively communicating with their less educated patients. It is also essential that the reading level required for any educational materials provided by practitioners be appropriate for their diverse patient populations.³⁸

There are several advantages to the use of the NHIS to examine eye care utilization rates in the United States. The NHIS is designed to be representative of the US population; only institutionalized and military groups have been omitted from direct sampling. In addition, the large number of respondents surveyed permitted us to examine the issue of ocular health care utilization in large numbers of US adults reporting severe visual impairment (n=1289) as well as in understudied populations, such as Hispanic subgroups other than Mexican Americans.

Several study limitations should be noted, including the self-report nature of the NHIS, which could lead to inaccuracies in the reporting of ocular health care visits. Participants in the NHIS were not asked to indicate what type of eye care professional they had visited in the previous year. Of note, previous ocular health care utilization studies have reported that 71% to 89% of annual visits to ocular health care providers were to ophthalmologists.^{6,27,39} The NHIS also does not collect information on health insurance premiums and out-of-pocket health care expenditures, which may also be associated with the likelihood of ocular health care utilization. Finally, we did not have information on the degree of health insurance coverage provided for ocular-related health care needs.

Because of the self-reported nature of the NHIS, there is likely some misclassification of reported visual impairment. For example, although prevalence estimates of blindness among participants 40 years or older are similar to US estimates based on best-corrected visual acuity (0.56% vs 0.78%), NHIS estimates of some visual impairment are higher than poor-vision estimates based on a best-corrected visual acuity of less than 20/40 in the better-seeing eye (11.8% vs 2.0%).² It should be noted that the "some visual impairment" category in the NHIS captures an unknown proportion of respondents with impaired contrast sensitivity or reduced visual fields who may not have significant refractive error. These ocular conditions are independently associated with self-reported visual disability.⁴⁰ The "some visual impairment" category in the NHIS should be considered a broader indicator of functional visual impairment relative to acuity-only definitions of visual impairment. Finally, the response rate to the adult household interview in which the eye care utilization and visual impairment questions were administered has been declining in recent years and was 69% in 2005.²²

In a recent 5-state survey of ocular health care utilization, the most common reason given for no eye care visit in the preceding 12 months was "no reason to go."⁹ Effective educational campaigns designed to educate the public on the need for periodic eye care examinations are needed, especially in sociodemographic subgroups identified in our analysis as having low rates of ocular health care utilization.^{35,41} The effectiveness of such campaigns

might be enhanced if the major ocular organizations could agree on an easy-to-follow set of recommendations regarding the frequency of eye examinations.³ Consistent screening intervals would also make it easier for national surveys such as the NHIS to write survey questions specifically designed to monitor adherence to these recommendations.

Our findings also support the need for comprehensive health care reform to increase the proportion of Americans with health insurance. Ocular health care professionals should seek an active voice in this national discussion for several reasons. First, development of a comprehensive and affordable health insurance system will increase the proportion of Americans who adhere to ocular health screening recommendations, leading to the early detection of disabling ocular conditions. Second, ocular health care professionals must educate health care reform leaders about the need for routine coverage of corrective lenses which, if fully implemented, would cost about \$3.8 billion annually.^{31,42} For example, most policy leaders are unaware that more than 80% of Americans with visual impairment, as defined as a visual acuity of 20/50 or worse in the better-seeing eye on initial examination, could achieve acceptable to good visual acuity if provided with accurately prescribed corrective lenses⁴³ and that the provision of such correction and other poor-vision rehabilitative services leads to measurable improvements in quality of life.^{44,45} Finally, focus group data suggest that adults may view ocular health as distinct from, and perhaps less important than, their overall health because preventive ocular health care services are often not covered by health insurance.³¹ Meaningful progress toward the correction of this misperception may not be possible until all health insurance plans provide adequate coverage for ocular health care.

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Capsular exfoliation is typically bilateral. The anterior capsule is affected within the papillary region. The edge of the detachment lies peripherally, behind the iris. The rupture of the capsule occurs approximately concentric with the pupil, and the free edges of the central flap curl forward.

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