Disability and Preventive Cancer Screening: Results from the 2001 California Health Interview Survey

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Objective. We sought to evaluate preventive cancer screening compliance among adults with disability in California.

Methods. We used data from the 2001 California Health Interview Survey to compare disabled and nondisabled adults for differences in preventive cancer screening behaviors. Compliance rates for cancer screening tests (mammography, Papanicolaou test, prostate-specific antigen, sigmoidoscopy/colonoscopy, and fecal occult blood test) between the 2 subpopulations were evaluated.

Results. Women with disabilities were 17% (Papanicolaou tests) and 13% (mammograms) more likely than women without disabilities to report noncompliance with cancer screening guidelines. Interactions between disability and reports of a doctor recommendation on cervical cancer screening were significant; women with disabilities had a lower likelihood of receiving a recommendation. Men with disabilities were 19% less likely than men without disabilities to report a prostate-specific antigen test within the last 3 years.

Conclusions. Despite higher rates of health insurance and more stable access to care, significant differences in the use of preventive cancer screening services by persons with disabilities persist. Symmetries in health promotion behaviors among the subpopulations suggest that individual health behaviors may be secondary to structural and/or clinical factors underpinning the differences found. (*Am J Public Health.* 2005;95:2057–2064. doi:10.2105/AJPH.2005.066118)

Despite publication of the Healthy People 2000 and 2010 National Health Promotion and Disease Prevention Objectives, use and quality of preventive cancer screening services by persons with disabilities remain suboptimal.[1,2] Roetzheim and Chirikos[3] reported that women with disabilities are diagnosed with breast cancer at a later stage and have higher mortality. Other researchers have found persistently lower rates of Papanicolaou (Pap) test and mammography use among women with major mobility impairments.[4–7] Moreover, these findings remained constant after control for demographic characteristics and health care access.

The 2000 US Census study identified nearly 1-in-5 Americans reporting some level of disability and more than 12% reporting a severe disability.[8] This large population is growing because of 3 demographic trends: longer life span, aging of the baby boomers, and the survival of previously fatal conditions because of technological advances in medicine.[9] According to Iezzoni et al.,[10] "the life expectancy of persons with disabilities is comparable with that of the general population, and, therefore, routine preventive cancer screening is essential to their quality of care." Existing health services research, however, has largely ignored this population,[11] and the current health care system may be unprepared to respond to the special needs of this growing and diverse population.

To better understand the dynamics of preventive cancer screening[12–17] and disability, we used a health services framework[18] to compare self-reported cancer screening behavior among persons with and without the presence of a disability. With cancer screening compliance as an outcome variable, a series of analyses were performed to inform how disability and health care access and utilization measures affect screening behavior using data from the 2001 California Health Interview Survey (CHIS 2001). In addition, we explored how 2 mediating factors—doctor's recommendation and health promoting behaviors—influence the utilization of cancer screening services.

METHODS

Data Source

CHIS 2001 interviewed 55 428 households drawn from every county in California in a geographically stratified, random-digit-dialed, cross-sectional multistage telephone survey conducted between November 2000 and September 2001. During the initial screener interview (59% response rate), one adult household member was randomly selected to be the subject of the adult extended interview (64% response rate). The overall adult response rate was 37.7%. Benchmarking of CHIS 2001 sample characteristics and estimates against other known reliable data sources (i.e., US Census and Behavioral Risk Factor Surveillance System) demonstrated that the CHIS 2001 sample is representative of the California household population, and the weighted data provide reliable estimates for adults statewide, as well as a large variety of additional population groups.[19]

Classification Measure in This Report: The Probable Presence of Disability

All empirical examinations of disability must struggle with the definition of disability and the operationalization of the concept to classify persons.[20] Spheres of human-environment integration is an evolving concept of human functioning and behavior proposed to study and synthesize the diverse political and medical models of disablement.[21–33] The locus of disablement within the human-environment integration paradigm is the relationship between the intrinsic characteristics of the individual, body, and mind (expressed as sensation and perception) and those that are extrinsic to the individual—the natural and societal milieus, both measurable and experiential.

On the basis of this disability paradigm, indications of health limitation across multiple

TABLE 1—California Adults Reporting Health Limitations and Proportion With Generalized Limitation in Adult Activity Approximating Disability: 2001 California Health Interview Survey and 2000 Census

	Percentage (95% CI)
Poor health rating	3.55 (3.36, 3.75)
Assistive device needs	5.97 (5.73, 6.21)
Health limitation	
Moderate activities	24.69 (24.21, 25.17)
Climbing stairs	35.21 (34.66, 35.76)
(Physical problems)—did less than wanted, past month	21.44 (20.99, 21.90)
Kind of work and other activities, past month	20.60 (20.15, 21.04)
Pain interfere with normal work, past month	42.11(41.55, 42.68)
(Emotional problems)—did less than wanted, past month	12.69 (12.29, 13.08)
Emotional problems interfere with work activities, past month	15.57 (15.14, 15.99)
Physical/emotional problems interfere with social activities, past month	30.46 (29.92, 31.00)
Arthritis problems	10.30 (10.00, 10.60)
Level of HL	
No (0 HL)	33.82 (33.27, 34.37)
Low (1–3 HL)	41.20 (40.62, 41.77)
Moderate (4–6 HL)	18.43 (17.99, 18.86)
High (7–9 HL)	6.56 (6.30, 6.82)
CHIS probable presence of disability[a]	11.51 (11.18, 11.85)
Presence of disability (Physical or Mental-Source CA PUMS 1%)	11.54
Presence of disability (Physical or Mental-Source CA PUMS 5%)	11.51

Notes: HL = health limitations; PUMS = public use microdata sample; CI = confidence interval; CHIS = California Health Interview Survey. No statistical difference between CHIS and Census Bureau probability weighted population estimates of Californians with physical, mental, or combined limitations in normative adult activity approximating disability (adjusted for survey design via SUDAAN version 8.0).
[a]Adults with poor health rating and/or assistive device needs and/or high health limitations.

normative adult activities were used to create a dichotomous variable for the probable presence of disability (PPD). Specifically, a composite measure was generated for every respondent (55 428) on the basis of self-reported responses to 11 items to identify those presenting with generalized physical, mental, and/or combined health limitations that approximate disability. For the purposes of this report, respondents reporting poor health status, assistive device needs, and the presence of any health limitation in 7 or more of 9 adult-normative activities assessed were classified as persons with PPD (Table 1). Although some researchers may question the appropriateness of classifying persons who report poor health status as "disabled," we believe this indicator is consistent with the generalized nature of disability. Sensitivity analysis, including and excluding poor health status from the definition of disability, showed no significant change in any of the results of this study. Moreover, among respondents classified with PPD (*i.e.,* 7 959), only 19 cases report poor health status alone; less than 1% (0.24%) of all classified persons with PPD. Also, the mean number of activity limitations among these adults was 6.5 (SD 1.9). Therefore including poor health as 1 of 3 dimensions to identify respondents presenting with PPD did not introduce bias to the classification.

When this disability classification was applied to the CHIS 2001 data, 2 745 931 adults (11.5%; aged 18 years and older) in California were estimated to have some form of physical, mental, and/or combined health limitations that substantially limited normative adult activity. To assess the validity of this disability classification, we compared our estimate with the 2000 US Census. According to census data for California (i.e., 5% public use microdata sample), there were an estimated 2 837 717 (11.5%) adults presenting with physical, mental, and/or combined limitations in normative adult activity approximating disability. The proximity of these independent estimates suggests that the disability classification used in this report is a reasonable proxy measure for the adult population in California with normative adult activity limitations.

Controls and Intervening Factors for Receiving Routine Healthcare

On the basis of the vast literature demonstrating the importance of enabling and predisposing factors for receiving routine healthcare,[18,34–53] we chose to introduce these factors in our analyses to avoid confounding the focal relationship of disability on cancer screening. Andersen[18] demonstrated predictive utility with regard to the use of health services among other vulnerable populations, and other researchers report that compliance with preventive cancer screening is likely to depend on having a "usual source of care."[54–56] For the purpose of this study, factors identified by Andersen[18] as predisposing and enabling health behaviors were operationalized as follows. Predisposing factors include demography (ethnicity, age, and gender) and social location measures (citizenship, educational attainment, English language proficiency, and marital status) and constitute statistical controls in these analyses. The enabling factors, operationalized as intervening covariates, include current employment status, HMO participation, health insurance payer type (public vs private vs uninsured), experience with cancer (self and relatives), receipt of test-specific doctor recommendation (where comparable), and a composite measure of health promotion behaviors. The health promotion behavior composite was comprised of 11 health behaviors: not currently a smoker; less than 5 days of alcohol consumption in the past month (none to intoxication); 7 or more servings of fresh fruits in the past week; no French fries consumed in the past week; 7 or more servings of potatoes in the past week (not fried); 7 or more servings of beans in the past week; 7 or more servings of salad in the past week; 7 or more servings of vegetables in the past week; 7 or more servings of tomatoes or tomato-based sauces in the past week; 7 or more servings of 100%

fruit juices in the past week; and daily vitamins and supplements in the past week. Each item was dichotomized according to whether the above criteria were satisfied (i.e., satisfied vs not satisfied) and summed to produce a health promotion composite; a higher score indicated a healthier lifestyle.

Outcomes Evaluated: Preventive Cancer Screenings within Recommended Time Period

The preventive cancer screening procedures under investigation were mammography, Pap, prostate-specific antigen (PSA), colonoscopy/sigmoidoscopy, and fecal occult blood test (FOBT) and whether or not they were performed within recommended age- and gender-appropriate guidelines as prescribed by the US Preventive Services Task Force[57] with the exception of the PSA. According to USPSTF, there is inconsistent medical evidence on its effectiveness to warrant guidelines. The US Preventive Services Task Force, instituted under the auspices of the Department of Health and Human Service Agency for Healthcare Research and Quality, is an independent panel of clinical experts in primary health care and prevention that systematically review medical evidence of effectiveness and develop national recommendations for clinical preventive services, including preventive cancer screening guidelines.

For our analyses, compliance was defined for each preventive cancer screening as follows: mammography reported within the last 2 years among women aged 40 years and older, with no reports of breast cancer (20 537 cases); Pap test reported within the last 3 years among women aged 18 years and older, with no reports of cervical cancer, hysterectomy, or cervix removed (24 625 cases); PSA test reported within the last 3 years among men aged 50 years and older, with no reports of prostate cancer (9 180 cases); colonoscopy and/or sigmoidoscopy reported within the last 5 years among men and women aged 50 years and older, with no reports of colon cancer (23 715 cases); and FOBT test reported within the last year among men and women aged 50 years and older, with no reports of colon cancer (23 715 cases). The USPSTF recommends initiating screening at 50 years of age for men and women at average risk for colorectal cancer, and a 10 year interval has been recommended for colonoscopy on the basis of evidence regarding the natural history of adenomatous polyps. Five year intervals have been recommended for sigmoidoscopy. Because of limitations in the CHIS quesionnaire, the most conservative point-in-time approach was adopted because colonoscopy and sigmoidoscopy could not be treated independently; under the current operationalization, compliance via colonoscopy may be underestimated.

Statistical Analyses

An α level of 0.05 (2-tailed) was used for all statistical tests presented in this report. SAS version 8.2 (Cary, NC) was used to perform unweighted analyses of sample cases, and SUDAAN version 8.0 (Research Triangle Institute, Research Triangle Park, NC), with probability weighting using relevant strata and primary sampling unit (i.e., household), was used for population analyses. Most weighted and unweighted results did not differ. Unweighted and probability-weighted results are presented. Unweighted results are discussed, because the sample weights are related to key independent variables used in these analyses (i.e., age, gender, Latino ancestry, and race), and their use may increase standard errors and reduce the efficiency of parameter estimation in multifactorial regression.[58,59] The inclusion of these demographic variables in the hierarchical multinomial logistic regression models reduces or mitigates sample design bias while retaining the efficiency of parameter estimation. The distributions of demographic and health-related characteristics across the 2 CHIS 2001 subpopulations were evaluated using χ^2 tests. *t* tests with Satterthwaithe adjustments for unequal variances were used with continuous respondent characteristics (e.g., age).

After these preliminary analyses, multinomial logistic regression models were fit to the CHIS 2001 data in an effort to identify and assess whether significant associations existed between disability (with control for demographics and health-related characteristics) and self-reports of preventive cancer screening by type. Specifically, 3-stage generalized logit models were fit to the CHIS 2001 data to assess the associations between the presence of disability, with control for possible demographic and health-related confounders, and reports of preventive cancer screenings within recommended time periods. Each generalized logit model produces a set of intercepts and slope parameters for each response level other than the reference level (SAS, Cary, NC; reference group=nondisabled Whites, males; where applicable, i.e., colon cancer screenings).

Controls entered with the classification variable in the initial stage of modeling included the predisposing variables of ethnicity, age, gender (for nongender-specific screenings), US citizenship, educational attainment, English language proficiency, and marital status. In the second stage, the enabling covariates, consisting of employment status, poverty, health insurance payer type, HMO participation, doctor recommendation, and the health promotion behaviors composite, were entered. In the final stage, the overall model was fit to the CHIS 2001 sample data, and type III sum of squares analyses of effects were generated to assess whether the association of the presence of disability with preventive cancer screening outcomes remained statistically significant after competing for variance with predisposing controls and enabling intervening factors. Because associations between disability and preventive cancer screenings are the focus of the study, only the final overall model and disability-related results are presented.

RESULTS

Demographic and Health-Related Characteristics

Statistically significant differences were found between subpopulations along several demographic and health-related characteristics (Table 2). Respondents with PPD were significantly more likely to be women (60.1% vs 50.1%), White (64.9% vs 62.3%), and African American (8.6% vs 5.2%), whereas Asian (7.7% vs 11.2%) and Hispanic (24.3% vs 28.8%) respondents were less likely to be classified with PPD. Also, adults with PPD reported ages significantly older than adults without disability (means: 59.2 vs 46.3). Adults with PPD reported higher mean

TABLE 2—2001 California Health Interview Survey Demography and Health Estimates

	Overall California[a] Population	Without Disability[a] (n = 21 101 484)	With Disability[a] (n = 2 745 931)	Test Statistics[b] (χ^2 or *t* test)
Female, %	51.22	50.07	60.13	215***
Age, y, mean (SD)	48.14 (17.16)	46.29 (16.47)	59.21 (17.01)	62.98***
Working age (18–64 y)	85.63	88.41	64.33	2510***
Retirement eligible (≥65 y)	14.37	11.59	35.67	
Ethnicity, %				
White	62.57	62.27	64.92	$_{MH}$25.85***
Multiracial	3.69	3.60	4.37	
African American	5.59	5.20	8.57	
Asian American	10.82	11.23	7.70	
American Indian/Alaska Native	0.44	0.43	0.55	
Pacific Islander	0.26	0.25	0.36	
Other ethnicity	16.62	17.02	13.54	
Hispanic descent, %	28.28	28.80	24.31	62.32***
US citizen, %	83.00	82.41	87.54	141.48***
Educational attainment, %				
Non–high-school graduate	15.69	14.53	24.60	$_{MH}$801.03***
High school graduate	26.27	26.12	27.37	
Some college/trade certification	18.92	18.82	19.68	
AA/AS	8.19	8.21	7.99	
BA/BS	19.10	19.89	13.10	
Postgraduate education	11.82	12.42	7.26	
Employed, %	58.40	62.59	26.26	3592.00**
Household income, $1000, %				
<10	7.96	6.69	17.66	$_{MH}$2932.66***
10–15	7.80	7.06	13.47	
15–20	8.49	7.91	12.94	
20–30	12.13	11.78	14.83	
30–40	11.33	11.44	10.50	
40–50	8.83	9.01	7.41	
50–60	6.90	7.15	5.02	
60–100	20.56	21.75	11.71	
>100	15.97	17.21	6.46	
Married, %	55.24	56.21	47.78	511.10***
Not English language proficient, %	13.16	12.94	14.85	25.35***
Venue(s) of usual health care, %				
None	14.22	15.03	8.04	$_{MH}$9.04**
Multiple venues	0.18	0.17	0.22	
Doctor office/HMO	60.86	60.40	64.40	
Clinic	23.20	22.92	25.36	
Emergency department	0.99	0.95	1.30	
Alternative medicine/nonmedical	0.31	0.31	0.31	
Other than specified	0.23	0.22	0.36	
Insurance status				
Months of health insurance, past 12 months, mean (SD)	10.45 (3.80)	10.39 (3.86)	10.78 (3.45)	9.09***
Uninsured, past 12 months, %	12.53	12.78	10.58	$_{MH}$86.91***

Continued

months of health insurance coverage than adults without PPD ($t_{55,428}=9.09$, $P<.001$). Moreover, adults with PPD were less likely to report an interruption in health insurance coverage (past 12 months) than adults without PPD (5.5% vs 8.3%). Corresponding with these observations, adults with PPD were significantly more likely to report public-based health coverage than adults without PPD (56.4% vs 19.5%).

A significantly larger proportion of the adult population with PPD reported personal experiences with cancer (17.6%) than the nondisabled adult population (7.2%). Adults with PPD also reported familial experiences with cancer at a rate of 43.8%, whereas their nondisabled counterparts reported a significantly lower rate of 33.4%. Yet, significant differences in experience with cancer observed do not seem to have translated into similar differences in health promotion behaviors as indicated by the health promotion behaviors composite. This health measure failed to demonstrate significant differences among these subpopulations ($t_{55,428}=1.66$, $=.10$); both reported a low level of health promoting behaviors.

Associations Between Disability, Controlled for Demography, Health-Related Confounders, and Preventive Cancer Screenings

Most of the demographic and health-related characteristics evaluated in the preliminary analyses proved not to be statistically independent of disability. Additional evaluation was required to disentangle these relationships. Hierarchical multinomial logistic regression analyses confirmed the differential associations between the subpopulations and preventive cancer screenings observed in the preliminary analyses. The differential relationship among adult women with PPD and receipt of the Pap test remained significant (PPD $_{24,624}\chi^2_{WALD1}=7.95$, $P<.005$) in the presence of the control and intervening factors (Model $_{24,624}\chi^2_{WALD\ 17}=1827$, $P<.0001$). Adult women with PPD were 1.17 (95% confidence interval [CI]=1.05, 1.31) times as likely as their nondisabled counterparts to report noncompliance with PAP screening guidelines (Table 3). The interaction between PPD and reports of doctor

TABLE 2—*Continued*

Partial-insured, past 12 months, %	7.99	8.31	5.52	
Insured, all past 12 months, %	79.48	78.90	83.90	
Health insurance payer types, %				1435.67***
Currently uninsured (%)	15.66	16.01	12.97	
Public-based health insurance, %	23.74	19.49	56.35	
Private-based health insurance, %	60.60	64.50	30.68	
Experiences with cancer				
Self, %	8.35	7.15	17.60	840.98***
Family members, %	34.58	33.38	43.83	284.91***
Discriminated against receiving health care, past 12 months, %	4.62	3.68	11.85	881.79***
Health promotion score, mean (SD)	3.89 (1.72)	3.88 (1.72)	3.92 (1.73)	NS
Papanicolaou test, %	85.13	85.67	80.51	98.56***
Mammography, %	74.96	75.64	72.13	29.64***
Prostate-specific antigen, %	51.24	52.36	46.06	19.52***
Colonoscopy, %	43.04	43.35	41.91	NS
Fecal occult blood, %	22.96	23.08	22.52	NS

Notes: AA/AS = Associate Arts/Associate Science; MH = Mantel-Haenzel; HMO = health maintenance organization; NS = not significant.
[a]CHIS probability-weighted population estimates adjusted for survey design with SUDAAN version 8.0.
[b]Nominal variables were tested with Pearson (where degrees of freedom = 1) or Mantel-Haenszel (where degrees of freedom > 1) χ^2 statistic tests. All other variables are continuous variables and were tested with Satterthwaithe statistical *t* tests. All statistical tests were performed on sample (unweighted) data with SAS version 8.2.
*P < .05; **P < .001; ***P < .0001.

recommendation also proved significant (DOCREC1*PPD $_{24,624}\chi^2_{WALD1}=6.61$, $P<.01$); women with PPD had a lower likelihood of receiving a recommendation for a Pap test. Doctor recommendation was only asked of those in and out of compliance for receiving a Pap test in the CHIS questionnaire; the role of this factor could not be assessed for other screening outcomes.

In addition, the differential relationship among adult women aged 40 years and older with PPD and receipt of a mammography remained significant (PPD $_{20,536}\chi^2_{WALD1}=8.51$, $P<.004$) after competing for variance with controls and other significant intervening factors (Model $_{20,536}\chi^2_{WALD\ 16}=1{,}375$, $P<.0001$). Adult women aged 40 years and older with PPD were 1.13 (95% CI = 1.04, 1.23) times as likely as their nondisabled counterparts to report noncompliance with mammography guidelines.

The differential relationship among adult men aged 50 years and older with PPD and receipt of PSA within the last 3 years remained significant (PPD $_{9,179}\chi^2_{WALD1}=8.66$, $P<.003$) after competing for variance with controls and other significant intervening factors (Model $_{9,179}\chi^2_{WALD\ 17}=1{,}145$, $P<.0001$). Adult men aged 50 years and older with PPD were 1.19 (95% CI = 1.06, 1.34) times as likely as their nondisabled counterparts to not report receiving a PSA test within the last 3 years. Among men and women aged 50 years and older, the differential association between those with and without PPD and colonoscopy/sigmoidoscopy (PPD $_{23,713}\chi^2_{WALD1}=0.34$, $P=.56$) and FOBT (PPD $_{23,713}\chi^2_{WALD1}=1.20$, $P=.27$) screening compliance remained nonsignificant.

DISCUSSION

We found relationships between demographic and health-related characteristics, reported needs, and utilization of preventive cancer screening procedures among a statewide population-based sample of adults with and without probable indications of disability. The primary findings were that statistically significant inverse relationships between PPD and the likelihood of receiving cervical, breast, and prostate cancer screening exist. Moreover, these relationships remained significant even with control for potential demographic and health-related confounders and competing for variance with other significant intervening factors. These findings were consistent with previous findings reported in the literature.[1,2,4–7,12–16] However, we have extended the understanding of these relationships by taking initial steps to assess whether the preventive cancer screening disparities observed were a function of individual characteristics, health promoting behaviors, social factors, or clinical factors; the limited empirical evidence available in this report points to the latter.

Disability was significantly related to preventive cancer screening among adults in 3 of 5 screening procedures surveyed. Results showed that women with PPD were 17% and 13% more likely to be in noncompliance with routine screenings for cervical and breast cancer, respectively, than women without indications of disability. Men with disabilities were 19% less likely than men without disabilities to report having a PSA test within the last 3 years. None of the preventive cancer screening guidelines examined in the present report called for separate screening modalities for persons with disabilities.

In an important twist on the extant health services research paradigm, persons with PPD were less likely to be in compliance with cancer screening guidelines than their nondisabled counterparts despite higher levels of both health insurance coverage and a usual source of care. These factors are standard predictors for receiving health care services, such as cancer screening, but failed to explain the lower rates of breast, cervical, and prostate cancer screening observed among adults with PPD in California.

Although limited, the additional information gleaned about PAP compliance points to one partial explanation of this finding. Not only were women with PPD less likely to receive a Pap test in the recommended guideline than those without PPD, they were less likely to report receiving a doctor's recommendation to have an examination. Overall, it appeared that a doctor's recommendation was a robust factor related to cervical cancer screening compliance. Unfortunately, limitations of the CHIS 2001 data prevented our

TABLE 3—Associations Between Disability, After Control for Demography and Health-Related Confounders, and Preventive Cancer Screenings: 2001 California Health Interview Survey

	Unadjusted Odds Ratio (95% CI) [a]	Adjusted Odds Ratio (95% CI) [b]
Papanicolaou test (noncompliance)		
Disability	1.17** (1.05, 1.31)	1.23* (1.03, 1.46)
Health promotion measure	0.93*** (0.91, 0.95)	0.94** (0.91, 0.98)
Doctor recommendation	0.62*** (0.56, 0.69)	0.65*** (0.55, 0.76)
Mammography (noncompliance)		
Disability	1.13** (1.04, 1.23)	1.12 (0.99, 1.28)
Health promotion measure	0.93*** (0.91, 0.95)	0.93*** (0.91, 0.95)
Prostate-specific antigen (noncompliance)		
Disability	1.19** (1.06, 1.34)	1.21* (1.01, 1.45)
Health promotion measure	0.90*** (0.87, 0.92)	0.89*** (0.85, 0.92)
Colonoscopy and/or sigmoidoscopy (noncompliance)		
Disability	0.98 (0.92, 1.05)	1.05 (0.95, 1.15)
Health promotion measure	0.93*** (0.93, 0.96)	0.94*** (0.92, 0.97)
Fecal occult blood (noncompliance)		
Disability	1.04 (0.97, 1.13)	1.07 (0.97, 1.18)
Health promotion measure	0.91*** (0.90, 0.93)	0.92*** (0.90, 0.94)

Notes: CI = confidence interval. Data fit assessed in hierarchical multinomial logistic regressions with generalized logit-link function.
[a]Analysis was performed on sample (unweighted) data adjusted for demographic controls and health-related confounders with SAS version 8.2.
[b]Analysis was performed on probability-weighted sample data adjusted for survey design, demographic controls, and health-related confounders with SUDAAN version 8.0.
*P < .05; **P < .001; ***P < .0001.

ability to assess the relationship between a doctor's recommendation and other cancer screening outcomes (i.e., only those in noncompliance were asked about a doctor's recommendation).

Health promotion behaviors were significantly related to cancer screening compliance. However, no significant differences were observed among the subpopulations in question with regard to health promotion behaviors and the various screening compliance outcomes evaluated. Specifically, the variability related to health promotion behaviors did not differentiate along the PPD. These observed symmetries in health promotion behaviors among the subpopulations suggest that individual health behaviors may be secondary to structural (health insurance and access to care) and/or clinical factors (doctor's recommendation) underpinning the differences observed in preventive cancer screening outcomes evaluated.

Given that neither individual health behaviors nor the structural factors measured and analyzed in this study account for the cancer screening disparities found indicates that other forces are at work. Clearly, the clinical setting may be an important part of the answer. Our analysis demonstrated that women with PPD were not only less likely to receive a Pap test, but they were also less likely to report receiving a doctor's recommendation for a Pap test than their non-PPD counterparts. Additional research into the clinical experiences of adults with PPD and additional factors beyond those traditionally included in health services and utilization models is warranted.

Revisiting the behavioral model of Andersen,[18] our evaluation of several measures of access to health care along the dimensions of predisposing and enabling factors contrasts with prior health services research. Adults with PPD, who were significantly more likely to report having a usual venue for health care and higher mean months of health insurance coverage, both reported in the literature as significant predictors of compliance with preventive cancer screening guidelines, were consistently (and significantly in 3 of 5 screenings) less likely to be in compliance with cancer screening guidelines evaluated in this report.

Strengths and Limitations

There are several limitations to our study. CHIS 2001 did not ask about disability using standard activities for daily living and instrumental activities for daily living questions used in other surveys, such as the National Health Interview Survey. To overcome this limitation, we applied the theoretical framework of human-environment integration used in the World Health Organization Disability Assessment Schedule II[33] to identify individuals presenting with generalized physical, mental, and/or combined health limitations approximating disability.

The data source for this report, CHIS 2001, presented both weaknesses and strengths. CHIS 2001 was a telephone survey that relies on self-report data and had a relatively low adult response rate. Also, there is no assurance that the self-report health status, assistive device use self-classifications, and functional limitations reported by CHIS 2001 respondents would correspond with clinical assessments. Furthermore, as a telephone survey of the noninstitutionalized population, CHIS 2001 did not include deaf or hard-of-hearing persons or those living in groups, such as nursing homes, who may have functional limitations. On the other hand, CHIS 2001 was a very large, random-digit-dial sample of adults, administered in 6 languages, and well represents the residential household population of adults in California.

Another strength of this research is the rigorous and multistage hypothesis testing methods used. Preliminary bivariate associations were evaluated in binomial logistic regression, confirmed in hierarchal multinomial logistic regression with controls, and competed for variance with other significant predisposing and intervening factors. Statistical analyses in the present report were performed on actual CHIS 2001 adult sampled cases and parallel almost all of the results performed on probability-weighted sample data adjusted for survey design.

Conclusions

Persons with disabilities constitute one of the largest and most diverse subpopulations in the country and transcend age, ethnic, geographic, political, racial, and socioeconomic groups in our society. Moreover, their life expectancy appears to be similar to the general population and, therefore, compliance with routine cancer screenings is essential to reducing morbidity and mortality because of cancer disease. Toward this goal, we identified and evaluated significant differential relationships between the presence of disability and the likelihood of receiving routine preventive cancer screening within recommended guidelines in California. Findings suggested that individual health behaviors played a subordinate role to structural and clinical factors underpinning significant differences in preventive cancer screenings. Despite demonstrable improvements in health care access resulting from the Americans with Disabilities Act also evident in the present results (i.e., significantly higher rates of health insurance coverage and more stable venues of health care), significant differences in preventive cancer screening services by persons with disabilities in California persist. ■

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Contributors

A. Ramirez conceptualized ideas and operationalized measures; assisted in literature review; conducted analyses and interpretation of results; and wrote the initial draft of the report. G.C. Farmer and D. Grant originated the study and supervised and participated in all aspects of the study. T. Papachristou performed the initial literature review and assisted in all aspects the study. All authors reviewed and participated in subsequent revisions of the report.

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Human Participant Protection

The data drawn for this article are from the California Health Interview Survey and the United States Census Bureau and have been prepared for public release as free public use files. Because the files contain individual respondent records, they have been designed to minimize the risk of respondent identification yet preserve the broadest range of descriptive demographic data. No direct identifiers, such as respondent name, telephone number, or address, are available in any of these data files.

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