Trends in colorectal cancer screening over time for persons with and without chronic disability

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Abstract

Background—Persons with disabilities have often experienced disparities in routine cancer screening. However, with civil rights protections from the 1990 Americans with Disabilities Act, such disparities may diminish over time.

Objective—To examine whether disability disparities exist for colorectal cancer screening and whether these screening patterns have changed over time.

Methods—We analyzed National Health Interview Survey responses from civilian, non-institutionalized U.S. residents 50–75 years old from selected years between 1998 and 2010. We specified 7 chronic disability indicators using self-reported functional impairments, activity/ participation limitations, and expected duration. Separately for women and men, we conducted bivariable and multivariable logistic regression analyses examining associations of self-reported colorectal cancer screening services with sociodemographic factors and disability type.

Results—Patterns of chronic disability differed somewhat between women and men; disability rates generally rose over time. For both women and men, colorectal cancer screening rates increased substantially from 1998 through 2010. Over time, relatively few statistically significant differences were reported in colorectal cancer screening rates between nondisabled persons and individuals with various disabilities. In 2010, reported screening rates were generally comparable between nondisabled and disabled persons. In the few statistically significant differences, persons with disabilities almost always reported higher colorectal cancer screening rates than nondisabled individuals.

Conclusions—According to national survey data, reported use of colorectal cancer screening is similar between nondisabled persons and individuals with a variety of different disability types.

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Despite physical demands of some colorectal cancer screening tests, disparities do not appear between populations with and without disability.

Keywords

Disability; Functional impairments; Colorectal cancer screening; Disparities; National Health Interview Survey

For nearly two decades, *Healthy People* initiatives sponsored by the Office of Disease Prevention and Health Promotion in the U.S. Department of Health and Human Services and other federal agencies have included persons with disability among populations at risk of experiencing health care disparities.[1,2] These assessments have focused largely on tests recommended by the U.S. Preventive Services Task Force (USPSTF), such as routine cancer screening.[3] In addition to *Healthy People* analyses, multiple studies and other public reports have documented disparities in mammography and Pap test screening between women with and without disability, although the extent of these disparities varies by specific disability type and some findings are contradictory.[4]

Although screening for colorectal cancer receives an A-level endorsement from USPSTF,[3] far fewer studies have examined disability disparities for this service.[5] Changes in the types of tests used to detect colorectal cancers over time can complicate these analyses.[6] Those studies that have compared colorectal screening for disabled and nondisabled populations have sometimes produced somewhat surprising findings.[7–10] Some studies have found roughly equivalent colorectal cancer screening rates across persons with and without disability,[8,9] while others have identified significant differences but sometimes for only subgroups of persons with disability.[11] Occasionally these differences involve persons with disability having lower colorectal cancer screening rates than nondisabled persons.[11] But in other studies, individuals with disability have higher colorectal cancer screening rates than nondisabled persons.[7,8,10]

These findings are surprising because of the physical demands of some colorectal cancer screening tests,[5,9] particularly the bowel preparation required before colonoscopy. In a qualitative study of primary care and persons with disabilities, some interviewees with significant physical disability mentioned this concern.[12] For example, Connie, who uses a power wheelchair because of muscular dystrophy, was scheduled for a routine screening colonoscopy as recommended by USPSTF, but she could not manage the bowel "cleanout" regimen at home. Her physician hospitalized her the night before the colonoscopy to assist with this process, but as Connie reported:

> I called the hospital in advance. I told them specifically what I needed: an egg-crate mattress and padded commode seat. They said there was no problem, but when I came in, they had none of it. I had to make a special trip back home to get what I needed. I brought back my PCA [personal care assistant] to train the nightshift how to transfer me. I had to bring in my own mattress and commode. I did all the work.[12]

Other screening tests – such as fecal occult blood testing (FOBT) are less physically burdensome. Thus, it is possible that observed higher cancer screening rates among persons

with disability might be explained by greater use of FOBT for screening in this population. No prior studies have compared screening rates by type of colorectal cancer screening test.

This study examined trends in colorectal cancer screening from 1998 to 2010 for persons with versus without chronic disability. Drawing upon findings from other studies,[6,13,14] our first hypothesis was that colorectal cancer screening has increased since 1998 for all persons in the target age group, including individuals with disability. Also based on the literature, our second hypothesis was that persons with disability had comparable screening rates as nondisabled persons (a null hypothesis). Finally based upon the differing physical burden of various colorectal cancer screening tests, we explored whether relative screening rates between persons with versus without disability vary by the type of test (e.g., FOBT versus colonoscopy).

Materials and methods

Because we used de-identified data, the Massachusetts General Hospital-Partners HealthCare Institutional Review Board exempted this study from oversight.

Data

We accessed NHIS Public Release data from the National Center for Health Statistics (NCHS) website, downloading information from years that included supplemental questionnaires on cancer screening services recommended by the UPSTF: 1998, 2000, 2003, 2005, 2008, and 2010. The NHIS Basic Module includes Family Core, Sample Adult Core, and Sample Child Core questionnaires. The Family Core gathers information on all family members in sampled households. One randomly selected adult (age ⩾ 18) receives the Sample Adult Core survey, which asks more details about health and functional status and the supplemental questions about cancer screening. A knowledgeable adult family member provides proxy responses when the randomly sampled adult is unavailable (e.g., not home) or physically or mentally unable to participate. NHIS oversamples black and Hispanic populations and since 2006 has oversampled Asians. By using NHIS sampling weights, analyses produce nationally representative estimates for civilian, non-institutionalized U.S. residents.

Chronic disability indicators

As described elsewhere,[15] we developed our chronic disability measures starting with algorithms specified at NCHS.[16] These algorithms take responses from Sample Adult Core "Adult Health Status and Limitations" questions about "difficulties" performing various functions "without using any special equipment" because of "any physical, mental, or emotional problem or illness (not including pregnancy)." Combining responses from different questions produces 7 disability indicators within two broad categories, as follows:

Basic Action Difficulties (BADs)

- Movement difficulty: walking, standing, stair climbing, sitting, stooping, reaching, grasping, or carrying "somewhat difficult," "very difficult" or "can't do at all"

- Sensory (hearing or seeing) difficulty: trouble seeing even when wearing glasses or contact lenses or blind/unable to see at all; deaf or a "lot of trouble" hearing without a hearing aid

- Emotional difficulty: sad, nervous, restless, hopeless, "everything was an effort," and worthless feelings in the past 30 days

- Cognitive difficulty: limited in any way because of difficulty remembering or because of periods of confusion

Complex Activities Limitations (CALs)

- Self-care limitation: difficulty with any component of activities of daily living (ADLs) or instrumental ADLs (IADLs)

- Social limitation: going out, participating in social activities or relaxing "somewhat difficult," "very difficult" or "can't do at all"

- Work limitation: cannot work at a job or business or limited in the kind or amount of work because of physical, mental or emotional problem

The 7 disability indicators are conceptually not mutually exclusive (e.g., individual BADs might contribute to CALs). We subdivided movement difficulties into 5 severity levels (level 1 = "least severe" to level 5 = "most severe") using NCHS methods.[1,16] This approach gives weights to each of 8 specific movement items based on "how important a particular function would be to maintaining an independent lifestyle."

We further refined all 7 disability indicators by including only those difficulties that were "chronic," defined here as having lasted for at least one year. We considered different timeframes (e.g., based on the periodicity of required screening services[3]). However, because those testing time-frames differ, we chose one year, the timeframe that the Social Security Administration uses when determining disability status.[17] To identify chronic disability, we examined responses to a question in the Sample Adult Core about how long the condition causing reported difficulties had lasted. We combined participants who reported non-chronic conditions with those without the particular disability.

In addition, we examined reported causes of cognitive difficulties. Because very few (0.1%) respondents listed intellectual disability (called "mental retardation" in NHIS files), we did not include them in the cognitive difficulty group: this exclusion makes the cognitive difficulty category more clinically homogeneous (i.e., persons who acquired cognitive difficulty in later life).

Colorectal cancer screening indicator

Colorectal cancer screening information came from a supplemental questionnaire administered to Sample Adult Core participants ages 50–75 years old. Questions have asked about three types of tests: (1) annual high-sensitivity FOBT; (2) sigmoidoscopy or proctoscopy every five years and high-sensitivity FOBT every three years; or (3) screening colonoscopy every 10 years. Changes in NHIS colorectal cancer screening questions over time paralleled advances in screening technologies. For instance, only the 1998 NHIS

contained questions specifically about proctoscopy; the 2000–2008 questionnaires asked together about sigmoidoscopy, colonoscopy, and proctoscopy; and only the 2010 NHIS asked individually about sigmoidoscopy, colonoscopy, and "CT colonography or virtual colonoscopy." Less than 1% of women and about 1% of men had a previous history of colorectal cancer and were excluded from the analysis.

Other variable definitions

We used information from Sample Adult Core responses to determine sociodemographic variables except for income, which we obtained from the Family Core survey. We grouped age into categories. Because NHIS is cross-sectional, we could not look at these factors longitudinally for individual respondents.

Analysis

NHIS revised its sampling design in 2006. Therefore, all analyses and statistical tests for trends over time accounted for possible correlations among data collected within periods with the same sample design (years 1998–2005 and 2008–2010).[18] Because demographics and disability rates and patterns differ somewhat between women and men (Tables 1 and 2), we performed analyses separately by sex.

Using methods described elsewhere,[15] we standardized colorectal screening rates by disability indicator using population age distributions from the 2010 U.S. Census (www.census.gov/prod/cen2010/briefs/c2010br-03.pdf). For each of the 6 years, we then compared colorectal cancer screening rates within each disability type with rates among persons without any of the 7 disabilities. To examine the first hypothesis (that screening rates had increased over time regardless of disability status), we tested whether these rates differed significantly within each year and also across years. For this latter analysis, we combined data across years and calculated adjusted percentages from separate logistic regression models with colorectal cancer screening as the outcome variable and disability type, survey year, and an interaction term between disability type and survey year as predictor variables. The interaction term tested whether the association of colorectal cancer screening and disability varied over time (first hypothesis). To test the statistical significance of a linear trend, we included only the survey year as a continuous variable in logistic regression models among individuals with specific disabilities.

We conducted separate multivariable logistic regressions for each year to evaluate predictors of receiving colorectal cancer screening by disability status (to examine the second hypothesis, that screening rates did not differ between persons with versus without disability). Before finalizing the multivariable models, we considered how to enter the 7 disability indicators by examining correlation coefficients among BADs and among CALs separately within each study year. For women, BADs and CALs were moderately correlated (correlation coefficients from 0.2 to 0.6), and correlations remained similar across the study years. For men, BADs and CALs were moderately correlated (correlation coefficients from 0.2 to 0.6), and correlations remained similar across the study years. For men and women separately, we performed two sets of multivariable logistic regressions, including the sociodemographic variables specified below and either: (1) each BAD or CAL separately in

7 individual models, along with an indicator of whether the person had any BAD or any CAL, as appropriate; or (2) all BAD and CAL indicators simultaneously in the model. We show only results from the first (1) model for 2010.

To examine factors including disability associated with colorectal cancer screening, we conducted 7 multivariable logistic regressions (one for each disability type) predicting screening separately for women and men (14 total models). These models included sociodemographic variables as follows: age category (50–64 years, 65–75 years); race (white, black, Asian, and other-multiple race); Hispanic ethnicity (yes/no); education (less than high school, high school, some college-associates degree, college graduate and advanced degrees); income below 100% of federal poverty level (yes/no); has health insurance (yes/no); and has a usual source of health care (yes/no). We used likelihood ratio tests to assess the effect of adding each sociodemographic variable to initial models that included only the specific disability indicator or set of 7 disability indicators. We also examined the effect of adding the individual disability indicator (or set of 7 indicators) to a model that included all sociodemographic variables.

Finally, we assessed whether the type of screening modality differed between people with versus without disability. For these analyses, we looked only at persons who had received colorectal cancer screening. Among these individuals, we calculated what fraction of women and men with and without different types of disability had different types of tests: FOBT in the last 12 months; FOBT in the last 3 years; proctoscopy in the last 5 years (1998 only); sigmoidoscopy in the last 5 years (2000 and later); and colonoscopy in the last 10 years (2000 and later).

We conducted all analysis in SAS 9.2 and SUDAAN 11.0. Analyses accounted for the complex sampling design and used NHIS sampling weights to produce nationally representative estimates for civilian, non-institutionalized U.S. residents.

Results

Tables 1 and 2 show demographic characteristics for women and men, respectively, ages 50–75 across the study years. Demographic attributes differed somewhat by sex. For example, higher percentages of women than men were: in the older age group; nonwhite; non-Hispanic; less educated; and living with incomes under the poverty threshold. Women were more likely than men to have a usual source of care; however, their relative rates of being uninsured varied over time. Both sexes had similar patterns of demographic changes over time, including increasing proportions in the younger age group (50–64), decreasing percentages of white race, increasing percentages of Hispanic ethnicity, improving education, but increasing poverty rates.

Tables 1 and 2 also display for women and men, respectively, rates of each chronic disability type over time. Rates differ somewhat between the sexes. For instance, approximately 10% more women than men reported mobility difficulties, although for both sexes movement difficulties were the most common disability type. Several percent more women than men reported sensory, emotional, and cognitive difficulties. Rates of having any chronic disability

remained largely flat over the years, with the highest rates in 2010 for both women (39.9%) and men (30.7%).

Using 2010 data, Table 3 compares sociodemographic characteristics between persons with any disability and those without, separately for women and men. For both women and men, compared with nondisabled individuals, persons with any disability were older, more likely to be black and less likely to be Asian, had lower educational attainment, and higher rates of poverty. Rates of lacking health insurance did not differ significantly. Differences by disability differed across women and men relating to Hispanic ethnicity and lacking a usual source of care.

Colorectal cancer screening over time

Our first hypothesis was that colorectal cancer screening rates had increased over time regardless of disability. As shown in Tables 4 and 5 for women and men, respectively, colorectal cancer screening rates did rise substantially: for all women, growing from 30.8% in 1998 to 58.6% in 2010; and for all men, rising from 31.4% in 1998 to 58.4% in 2010. Colorectal cancer screening rates rose for all subgroups from 1998 to 2010.

Colorectal cancer screening by disability status

Our second hypothesis (null hypothesis) was that colorectal cancer screening rates did not differ significantly between persons with versus without chronic disability. This null hypothesis generally appeared to hold. As shown in Tables 4 and 5, for women and men respectively, only scattered statistically significant differences existed in colorectal cancer screening rates between nondisabled individuals and persons within each of the 7 disability categories. Most striking, in almost all instances of statistically significant differences, persons with disability had significantly higher screening rates than nondisabled persons. In 2010, the most recent year of data, few differences were statistically significant.

As indicated in footnotes to Tables 4 and 5, some significant trends appeared in differences in colorectal cancer screening rates from 1998 through 2010. However, since almost all colorectal cancer screening rates in 2010 were similar between nondisabled individuals and persons within various disability subgroups, these trends involved narrowing gaps that were present earlier. Again, almost all of these earlier discrepancies involved persons with different disabilities reporting higher screening rates than nondisabled persons.

Multivariable regression results

For women and men respectively, Tables 6 and 7 present adjusted odds ratios (95% confidence intervals) of persons reporting colorectal cancer screening from multivariable logistic regression models using 2010 data. As predictors, models used sociodemographic characteristics, whether the individual had one of the 7 disability types, and whether the person had any BAD or CAL, as appropriate. According to likelihood ratio tests, all sociodemographic characteristics were substantially more important predictors of colorectal cancer screening than the disability indicators. For women across all 7 models (Table 6), reporting colorectal cancer screening was statistically significantly associated with older age cohort, higher education, incomes over the poverty threshold, having health insurance, and

having a usual source of care; Asian women were significantly less likely than white women to report screening. Sociodemographic associations for men (Table 7) were similar with two exceptions: Asian men did not report screening statistically significantly less often than white men; and Hispanic men were significantly less likely to report colorectal screening than non-Hispanic men (p = 0.01 or 0.02 across models).

After accounting for these sociodemographic characteristics, disability indicators in only one model had significant associations with reports of colorectal cancer screening. For women (Table 6), in the social limitations model, reporting social limitations had an adjusted odds ratio (AOR, 95% confidence interval) of 0.6 (0.5, 0.9, p = 0.02). But in that model, reporting any CAL yielded a higher AOR – 1.5 (1.1, 2.0, p = 0.01) – of reporting colorectal cancer screening. These somewhat contradictory findings are difficult to interpret: e.g., perhaps individuals with the other two CALs were still more likely to receive colorectal cancer screening even in the presence of social limitation.

In models where all 7 disability indicators were entered at once in each of the study years (data not shown), sociodemographic variables again were the most important predictors according to likelihood ratio tests. Among women, none of the disability indicators was significantly associated with screening. Among men, movement disability was significantly associated in 2000 (AOR [95% CI]: 1.6 [1.2, 2.1]; p = 0.0009) and 2008 (1.6 [1.2, 2.3]; p = 0.0035); self-care limitation was associated in 2008 (0.5 [0.3, 0.9]; p = 0.0169) and work limitation was associated in 1998 (1.6 [1.1, 2.3]; p = 0.0222).

Screening modality

As noted above, the types of tests used for colorectal cancer screening have changed since the late 1990s. We speculated that persons with and without disability might have different types of tests performed. Among persons who received colorectal cancer screening, Appendix A (available online) shows what percent of women and men with and without different types of disability had different types of tests: FOBT in the last 12 months; FOBT in the last 3 years; proctoscopy in the last 5 years (1998 only); sigmoidoscopy in the last 5 years (2000 and later); and colonoscopy in the last 10 years (2000 and later). Few patterns appeared to suggest that persons with and without disability get different types of colorectal cancer screening tests. For example, among women who reported screening in the 2010 NHIS, 55.6% of those without disability reported having had a colonoscopy within the last 10 years, as did 56.6% of women reporting movement difficulties, 54.2% with sensory difficulties, 44.0% with emotional difficulties, 53.0% with cognitive difficulties, 54.3% with self-care limitations, 52.2% with social limitations, and 55.3% with work limitations.

Discussion

Although disability disparities appear to exist for some other cancer screening services, persons with and without disability generally report colorectal cancer screening at similar rates. In the most recent data, few differences were observed in rates of reported colorectal cancer screening between nondisabled persons and those with various different chronic disabilities. Somewhat paradoxically, in the instances where differences have existed over the years, persons with chronic disability generally reported colorectal cancer screening at

higher rates than did nondisabled persons. In addition, among those who received colorectal cancer screening, few differences appeared in the type of testing performed between persons with and without chronic disability.

We use the word "paradoxical" to describe higher reported colorectal cancer screening rates among disabled persons because of the physical demands associated with the fiberoptic colorectal cancer screening tests compared with mammograms or Pap tests, for example. Studies of the general population have examined reasons for not undergoing colorectal cancer screening.[19–23] Common causes include: lacking a usual source of care; not having a physician recommend the test; lacking health insurance; not knowing or misunderstanding colorectal cancer risks and the value of screening; low education and poor health literacy; and apprehension about more invasive technologies, such as colonoscopy.[19–23] Our multivariable results confirm the negative consequences of poor education and lacking both a usual care source and health insurance. Other studies have also shown that these basic sociodemographic concerns are associated with low rates of cancer screening among persons with disabilities.[5] Survey data do not provide insights into other factors, such as knowledge or concerns about testing procedures.

However, interview studies relating to mammogram[12,24–34] and Pap tests[12,27–30] among women with disability suggest causes of observed disparities for these procedures that one might expect would also apply to colorectal cancer screening.[5] For instance, for mammograms, competing health priorities are critical considerations, when women's health conditions causing disability, comorbid health problems, or combinations of both lessen the presumed benefits of mammography. Communication barriers – due to sensory deficits (vision or hearing loss) or cognitive disability – complicate complex testing procedures (e.g., positioning, holding breath) and women's understanding of the value of mammography.[12,15] Women with movement difficulties confront obvious barriers to mammography, when women cannot stand and facilities have not accommodated them through wheelchair accessible equipment, specialized mammography chairs, additional technician support, or other adaptations.[12,32]

Comparable concerns should pertain to colorectal cancer screening, including competing health priorities, impediments to understanding the value of the test, and physical access barriers. As noted above, in a qualitative study, Connie reported considerable difficulties being hospitalized for her bowel cleanout.[12] One would have expected such experiences to discourage persons with mobility disability from agreeing to these screening procedures. However, it is also possible that, because of comorbid health problems, persons with disability are more likely than others to see primary care physicians, who then recommend colorectal cancer screening and follow-up to make sure that it happens. Our data do not allow us to explore possible explanations for these somewhat unexpected findings.

Our research has the important limitations of studies using cross-sectional survey data. Our analyses identify only associations not causal links. The NHIS data represent participants' self reports, which could be affected by memory lapses, cultural biases, or other factors. Unlike many studies of disability using NHIS data, we considered only conditions reported as chronic (lasting at least one year) instead of including temporary disabilities or conditions

regardless of time frame.[16] Given the time frames considered for colorectal cancer screening tests, it is possible that certain persons may not have been disabled at the time of their testing. Our NHIS data did not contain an indicator of rural residence, which has been shown to be associated with lower colorectal cancer screening rates among individuals with disability.[35] In addition, NHIS did not have sufficient numbers with intellectual disability to examine outcomes for that important population.

Our results provide fairly strong evidence that, at this population level, significant disparities do not exist in colorectal cancer screening for most persons with disability. This is excellent news for persons with disability – although, given the value of colorectal cancer screening, rates for everyone still need to grow beyond levels currently observed to improve population health. However, as for Connie,[12] we know from qualitative research and anecdotal reports that specific individuals with disabilities can experience significant barriers to obtaining colorectal cancer screening, especially colonoscopy. In the U.S., the numbers of persons in the targeted older age ranges with various disabilities will grow enormously in coming years with aging "baby boomers." It will be important to remain vigilant so that individuals with disability receive equal quality colorectal cancer screening services as do nondisabled persons.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Table 1

Demographic and disability characteristics over time among women aged 50–75 years

Variables	Year					
	1998	2000	2003	2005	2008	2010
NHIS respondents: n	5539	5477	5512	5827	4237	5336
Age in years: mean (SD)	61.1 (0.1)	60.8 (0.1)	60.3 (0.1)	60.2 (0.1)	60.3 (0.1)	60.4 (0.1)
Percent (standard error)						
Age category						
50–64 years	64.4 (0.7)	66.1 (0.7)	69.4 (0.8)	70.5 (0.7)	70.7 (0.8)	70.7 (0.7)
65–75 years	35.6 (0.7)	33.9 (0.7)	30.6 (0.8)	29.5 (0.7)	29.3 (0.8)	29.3 (0.7)
Race						
White	85.4 (0.5)	85.0 (0.6)	85.9 (0.6)	84.7 (0.6)	82.6 (0.7)	81.8 (0.6)
Black	10.3 (0.4)	10.2 (0.5)	10.4 (0.5)	10.8 (0.5)	11.4 (0.6)	11.7 (0.5)
Asian	2.4 (0.3)	2.2 (0.3)	2.4 (0.3)	3.0 (0.3)	4.0 (0.3)	4.3 (0.3)
Other, multiple races	1.9 (0.2)	2.7 (0.2)	1.3 (0.1)	1.5 (0.2)	1.9 (0.2)	2.3 (0.2)
Hispanic ethnicity	6.9 (0.3)	7.3 (0.4)	8.1 (0.4)	8.2 (0.4)	8.5 (0.5)	8.9 (0.4)
Education						
Less than high school	23.1 (0.7)	20.6 (0.7)	18.0 (0.6)	16.2 (0.6)	15.2 (0.6)	13.9 (0.6)
High school	37.3 (0.8)	36.4 (0.8)	35.0 (0.8)	33.6 (0.8)	31.6 (0.9)	29.2 (0.8)
Some college/associates degree	23.6 (0.6)	24.0 (0.7)	27.0 (0.7)	26.4 (0.6)	28.9 (0.9)	29.6 (0.7)
College and advanced degrees	16.0 (0.6)	18.9 (0.6)	20.1 (0.7)	23.7 (0.7)	24.3 (0.8)	27.2 (0.9)
Income less than poverty threshold	11.7 (0.6)	10.5 (0.5)	11.3 (0.6)	8.8 (0.4)	9.9 (0.5)	11.2 (0.5)
No health insurance	8.4 (0.4)	8.2 (0.4)	9.1 (0.5)	9.2 (0.5)	9.1 (0.6)	9.9 (0.5)
No usual source of health care	6.9 (0.4)	5.7 (0.4)	5.4 (0.3)	5.9 (0.4)	6.0 (0.5)	7.1 (0.4)
No disability[a]	61.3 (0.7)	64.0 (0.8)	63.4 (0.8)	63.3 (0.7)	63.3 (0.9)	60.1 (0.9)
Basic action difficulties (BAD)[a]						
Movement difficulty	34.8 (0.7)	32.8 (0.7)	33.5 (0.8)	33.9 (0.6)	33.4 (0.8)	37.0 (0.9)
Least severe	6.9 (0.4)	7.2 (0.4)	7.4 (0.4)	7.2 (0.4)	6.6 (0.4)	9.0 (0.5)
Level 2	9.3 (0.4)	8.4 (0.4)	8.2 (0.4)	8.9 (0.4)	9.0 (0.5)	9.5 (0.5)
Level 3	8.8 (0.4)	8.6 (0.4)	8.2 (0.4)	8.2 (0.4)	9.6 (0.6)	9.2 (0.5)
Level 4	5.5 (0.3)	5.2 (0.3)	5.5 (0.3)	5.5 (0.3)	5.0 (0.4)	5.6 (0.3)

Variables	Year					
	1998	2000	2003	2005	2008	2010
Most severe	4.2 (0.3)	3.4 (0.3)	4.2 (0.3)	4.1 (0.3)	3.2 (0.3)	3.8 (0.3)
Sensory difficulty	11.4 (0.5)	10.7 (0.5)	10.4 (0.5)	10.7 (0.5)	10.8 (0.6)	11.2 (0.5)
Emotional difficulty	2.9 (0.2)	2.9 (0.2)	3.5 (0.3)	3.3 (0.2)	3.1 (0.3)	3.9 (0.3)
Cognitive difficulty	3.0 (0.2)	2.4 (0.2)	2.9 (0.3)	3.2 (0.2)	3.3 (0.3)	3.9 (0.3)
Any BAD	37.3 (0.7)	34.8 (0.8)	35.6 (0.8)	35.8 (0.7)	35.6 (0.9)	39.1 (0.9)
Complex action limitations (CAL)[a]						
Self-care limitation	6.0 (0.3)	5.0 (0.3)	5.5 (0.3)	5.8 (0.4)	5.7 (0.4)	6.5 (0.4)
Social limitation	11.3 (0.5)	10.6 (0.5)	12.2 (0.5)	11.6 (0.5)	10.7 (0.6)	12.8 (0.6)
Work limitation	17.4 (0.5)	15.0 (0.5)	15.8 (0.6)	16.0 (0.5)	16.6 (0.7)	16.7 (0.6)
Any CAL	21.3 (0.6)	18.5 (0.6)	19.8 (0.6)	19.7 (0.6)	19.7 (0.7)	21.0 (0.7)
Any disability[a]	38.7 (0.7)	36.0 (0.8)	36.6 (0.8)	36.7 (0.7)	36.7 (0.9)	39.9 (0.9)

[a]Excludes women with histories of colorectal cancer.

Table 2

Demographic and disability characteristics over time among men aged 50–75 years

Variables	Year						
	1998	**2000**	**2003**	**2005**	**2008**	**2010**	
NHIS respondents: *n*	5539	5477	5512	5827	4237	5336	
Age in years: mean (SD)	60.5 (0.1)	60.4 (0.1)	59.9 (0.1)	59.9 (0.1)	59.8 (0.1)	60.1 (0.1)	
Percent (standard error)							
Age category							
50–64 years	67.7 (0.8)	69.1 (0.9)	71.7 (0.8)	72.6 (0.8)	72.8 (0.8)	72.4 (0.9)	
65–75 years	32.3 (0.8)	30.9 (0.9)	28.3 (0.8)	27.4 (0.8)	27.2 (0.8)	27.6 (0.9)	
Race							
White	87.2 (0.6)	85.5 (0.7)	86.9 (0.7)	85.8 (0.6)	84.7 (0.7)	84.6 (0.7)	
Black	8.5 (0.5)	8.4 (0.5)	9.2 (0.6)	9.3 (0.5)	9.6 (0.5)	10.2 (0.6)	
Asian	2.5 (0.3)	3.0 (0.4)	2.5 (0.3)	3.3 (0.3)	3.8 (0.3)	3.6 (0.3)	
Other, multiple races	1.8 (0.2)	3.1 (0.3)	1.4 (0.2)	1.6 (0.2)	1.9 (0.3)	1.7 (0.2)	
Hispanic ethnicity	7.3 (0.5)	7.3 (0.4)	7.4 (0.4)	7.9 (0.4)	9.1 (0.6)	9.3 (0.5)	
Education							
Less than high school	21.0 (0.7)	21.7 (0.7)	16.9 (0.7)	15.1 (0.6)	14.8 (0.8)	15.0 (0.6)	
High school	28.5 (0.9)	27.8 (0.8)	28.0 (0.8)	29.1 (0.8)	26.8 (0.9)	26.9 (0.8)	
Some college/associates degree	23.3 (0.7)	23.8 (0.8)	25.4 (0.8)	25.2 (0.8)	27.2 (0.9)	25.8 (0.9)	
College and advanced degrees	27.2 (0.8)	26.8 (0.8)	29.8 (0.9)	30.6 (0.8)	31.2 (1.0)	32.3 (0.9)	
Income less than poverty threshold	6.5 (0.4)	8.0 (0.5)	7.0 (0.5)	6.7 (0.5)	8.7 (0.6)	8.7 (0.5)	
No health insurance	6.9 (0.4)	8.0 (0.5)	8.0 (0.5)	8.9 (0.5)	9.5 (0.6)	10.6 (0.5)	
No usual source of health care	9.3 (0.5)	8.8 (0.5)	8.3 (0.4)	9.3 (0.5)	9.5 (0.6)	10.2 (0.6)	
No disability[a]	71.5 (0.8)	71.5 (0.8)	72.7 (0.8)	71.8 (0.8)	71.3 (1.0)	69.3 (0.9)	
Basic action difficulties (BAD)[a]							
Movement Difficulty	24.5 (0.8)	24.4 (0.7)	23.6 (0.8)	24.7 (0.8)	25.1 (1.0)	27.3 (0.8)	
Least severe	6.4 (0.4)	6.7 (0.4)	6.3 (0.4)	6.4 (0.4)	7.2 (0.5)	7.7 (0.5)	
Level 2	5.7 (0.4)	6.5 (0.4)	6.1 (0.4)	7.2 (0.5)	6.3 (0.5)	6.2 (0.4)	
Level 3	5.8 (0.3)	6.1 (0.4)	5.8 (0.4)	5.8 (0.4)	5.9 (0.5)	6.9 (0.4)	
Level 4	4.0 (0.4)	3.1 (0.3)	3.3 (0.3)	3.4 (0.3)	3.3 (0.3)	4.1 (0.4)	

Variables	Year					
	1998	2000	2003	2005	2008	2010
Most severe	2.6 (0.3)	2.1 (0.3)	2.0 (0.2)	1.9 (0.2)	2.4 (0.3)	2.3 (0.3)
Sensory difficulty	9.9 (0.5)	9.3 (0.5)	8.6 (0.5)	9.9 (0.5)	9.1 (0.6)	8.9 (0.5)
Emotional difficulty	1.8 (0.2)	2.0 (0.2)	1.8 (0.3)	1.7 (0.2)	2.4 (0.3)	2.5 (0.3)
Cognitive difficulty	2.4 (0.2)	2.6 (0.3)	2.7 (0.3)	2.4 (0.3)	3.2 (0.4)	3.3 (0.3)
Any BAD	27.0 (0.8)	27.1 (0.8)	26.0 (0.8)	27.0 (0.8)	27.3 (1.0)	29.0 (0.9)
Complex action limitations (CAL)[a]						
Self-care limitation	3.5 (0.3)	3.7 (0.3)	3.2 (0.3)	3.4 (0.3)	4.4 (0.5)	3.9 (0.3)
Social limitation	7.6 (0.5)	7.7 (0.5)	6.8 (0.5)	7.8 (0.5)	8.3 (0.6)	9.1 (0.5)
Work limitation	13.6 (0.7)	14.1 (0.6)	13.3 (0.6)	13.6 (0.6)	14.3 (0.7)	15.7 (0.7)
Any CAL	15.8 (0.7)	15.9 (0.7)	15.1 (0.7)	15.9 (0.6)	16.6 (0.8)	18.0 (0.7)
Any disability[a]	28.5 (0.8)	28.5 (0.8)	27.3 (0.8)	28.2 (0.8)	28.7 (1.0)	30.7 (0.9)

[a]Excludes men with histories of colorectal cancer.

Table 3

Demographic characteristics by disability status among women and men aged 50–75 years surveyed in 2010[a]

Variables	Women			Men		
	Disability status			Disability status		
	Yes	No	p-value	Yes	No	p-value
NHIS respondents: n	1846	2447		1139	2314	
Age in years: mean (SD)	61.3 (0.2)	59.3 (0.2)	<0.0001	61.1 (0.3)	59.4 (0.2)	<0.0001
Age category			<0.0001			<0.0001
50–64 years	66.2 (1.3)	76.4 (1.0)		67.4 (1.6)	76.2 (1.0)	
65–75 years	33.8 (1.3)	23.6 (1.0)		32.6 (1.6)	23.8 (1.0)	
Race			<0.0001			0.0456
White	81.6 (1.0)	82.9 (0.9)		86.4 (1.1)	84.8 (0.8)	
Black	12.8 (0.9)	10.1 (0.7)		9.7 (0.9)	9.2 (0.7)	
Asian	2.3 (0.4)	5.4 (0.5)		2.5 (0.5)	4.1 (0.4)	
Other, multiple races	3.2 (0.5)	1.7 (0.3)		1.3 (0.3)	1.9 (0.3)	
Hispanic ethnicity	9.7 (0.7)	8.7 (0.6)	0.2672	8.1 (0.8)	9.9 (0.6)	0.0880
Education			<0.0001			<0.0001
Less than high school	18.8 (1.1)	9.8 (0.7)		19.9 (1.3)	12.1 (0.8)	
High school	31.0 (1.2)	26.1 (1.0)		30.6 (1.6)	24.2 (1.1)	
Some college/associates degree	31.7 (1.3)	29.5 (1.2)		29.4 (1.6)	24.3 (1.1)	
College and advanced degrees	18.5 (1.1)	34.6 (1.3)		20.1 (1.5)	39.3 (1.3)	
Income less than poverty threshold	17.8 (1.0)	6.0 (0.5)	<0.0001	13.8 (1.1)	5.4 (0.5)	<0.0001
No health insurance	10.3 (0.9)	10.2 (0.6)	0.9194	9.7 (1.0)	11.1 (0.8)	0.2712
No usual source of health care	5.8 (0.6)	7.5 (0.7)	0.0636	6.4 (0.7)	11.8 (0.8)	<0.0001

[a] Disability status = any disability. Includes NHIS respondents used in the multivariable regression models.

Table 4

Colorectal cancer screening rates by disability type among women aged 50–75 years with no colorectal cancer history

Disability type	Year					
	1998	2000	2003	2005	2008	2010
Percent (standard error)[a,b]						
All women	30.8 (0.8)	32.5 (0.7)	38.4 (0.8)	43.3 (0.9)	51.5 (0.9)	58.6 (0.9)
No disability	30.8 (1.0)	31.2 (0.9)	36.4 (1.0)	41.6 (1.1)	50.5 (1.2)	59.0 (1.1)
Basic action difficulties (BAD)[c]						
Movement difficulty	31.1 (1.3)	35.8 (1.3)§	42.1 (1.3)+	46.2 (1.3)§	55.0 (1.6)#	59.2 (1.5)
Least severe	31.6 (2.6)	33.4 (2.7)	42.9 (2.8)#	48.5 (2.6)#	57.7 (3.7)	62.8 (2.7)
Level 2	33.5 (2.6)	37.5 (2.6)#	45.5 (2.8)§	46.3 (2.6)§	58.3 (3.1)#	60.6 (2.6)
Level 3	28.3 (2.4)	36.8 (2.6)#	44.4 (2.7)§	48.0 (2.4)	51.6 (3.0)	53.5 (2.9)
Level 4	35.0 (2.9)	34.3 (3.3)	40.2 (3.2)	43.7 (3.3)	51.6 (4.4)	63.3 (3.0)
Most severe	26.6 (3.2)	35.6 (3.9)	32.4 (3.5)	42.2 (3.8)	55.0 (4.9)	55.5 (4.1)
Sensory difficulty	30.7 (2.2)	36.6 (2.4)#	38.9 (2.5)	47.6 (2.3)#	56.6 (2.5)#	57.2 (2.3)
Emotional difficulty	32.0 (3.8)	35.6 (4.2)	33.7 (4.0)	42.9 (3.9)	55.3 (5.4)	50.2 (4.4)#
Cognitive difficulty	27.0 (3.6)	36.7 (4.6)	37.5 (3.9)	43.2 (3.7)	55.3 (4.8)	54.2 (4.1)
Any BAD	31.1 (1.3)	35.3 (1.3)§	42.0 (1.3)+	46.1 (1.3)§	54.7 (1.6)#	58.6 (1.4)
Complex action limitations (CAL)[c]						
Self-care limitation	33.3 (3.0)	37.5 (3.1)#	38.9 (3.0)	38.4 (3.3)	51.5 (4.0)	56.8 (3.1)
Social limitation	32.4 (2.1)	37.4 (2.4)#	40.0 (2.1)	45.0 (2.4)	55.6 (3.0)	53.9 (2.3)#
Work limitation	32.6 (1.8)	36.0 (1.8)#	41.7 (1.8)§	45.9 (1.8)#	52.8 (2.3)	58.4 (1.9)
Any CAL	32.4 (1.6)	35.3 (1.7)#	41.4 (1.6)§	46.7 (1.8)§	52.2 (2.1)	57.8 (1.7)
Any disability	31.3 (1.3)	35.5 (1.3)§	42.3 (1.3)+	46.3 (1.3)§	54.3 (1.6)	58.4 (1.4)

[a] Percent adjusted by age distribution from the 2010 US Census.

[b] p-values for comparison with women without disability

+ p 0.001

§ p 0.01

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c Screening rates changed significantly for all disability groups ($p < 0.0001$). There was a statistically significant trend over time in the differences in screening rates between those with no disability and women within the following disability groups: movement difficulty severity level 3 (p 0.01); social limitation ($p = 0.03$); and any disability ($p = 0.04$).

$#$ p 0.05.

Table 5

Colorectal cancer screening rates by disability type among men aged 50–75 years with no colorectal cancer history

Disability type	Year					
	1998	2000	2003	2005	2008	2010
Percent (standard error)[a,b]						
All men	31.4 (0.9)	31.3 (0.8)	39.8 (0.9)	43.3 (0.9)	51.0 (1.1)	58.4 (0.9)
No disability	30.9 (1.1)	29.1 (1.0)	38.9 (1.1)	41.8 (1.0)	50.6 (1.3)	58.8 (1.2)
Basic action difficulties (BAD)[c]						
Movement difficulty	33.2 (1.6)	39.4 (1.9)*	43.0 (2.0)	48.9 (1.8)+	54.3 (2.0)	59.3 (1.7)
Least severe	29.1 (3.2)	43.6 (3.5)*	46.7 (3.7)#	47.2 (3.5)	56.3 (4.1)	60.5 (3.0)
Level 2	40.6 (3.9)#	37.1 (3.3)#	40.8 (3.5)	49.7 (3.3)#	61.9 (4.2)§	61.6 (3.6)
Level 3	33.3 (3.7)	36.9 (3.4)#	44.6 (3.9)	48.8 (3.9)	55.5 (4.1)	57.9 (3.5)
Level 4	28.1 (4.0)	39.1 (4.7)#	38.1 (4.7)	51.3 (4.9)	45.0 (5.8)	50.9 (4.3)
Most severe	34.3 (4.6)	41.5 (6.2)#	37.7 (5.4)	51.3 (5.8)	38.8 (5.8)#	69.4 (5.2)#
Sensory difficulty	34.0 (2.6)	40.5 (2.9)+	44.4 (3.1)	51.8 (2.9)+	46.5 (3.3)	62.0 (2.7)
Emotional difficulty	29.5 (5.6)	46.3 (5.7)§	31.6 (5.9)	46.1 (6.0)	46.0 (6.3)	55.3 (5.2)
Cognitive difficulty	34.9 (5.7)	40.0 (6.2)	38.8 (4.5)	46.3 (5.2)	59.2 (5.5)	59.8 (4.1)
Any BAD	33.1 (1.5)	38.8 (1.8)*	42.7 (1.9)	48.8 (1.7)+	54.0 (2.0)	59.7 (1.6)
Complex action limitations (CAL)[c]						
Self-care limitation	37.4 (4.6)	42.6 (4.8)§	39.5 (4.8)	44.0 (4.3)	44.1 (4.3)	57.5 (4.1)
Social limitation	33.2 (3.0)	38.3 (3.1)§	39.3 (3.3)	51.4 (3.2)§	45.9 (3.7)	56.3 (3.1)
Work limitation	36.2 (2.3)#	36.9 (2.4)§	42.9 (2.6)	48.9 (2.3)§	51.9 (2.6)	58.6 (2.2)
Any CAL	35.8 (2.2)#	36.3 (2.2)§	42.5 (2.5)	48.2 (2.1)§	51.3 (2.4)	58.5 (2.2)
Any disability	33.8 (1.5)	38.0 (1.7)*	42.8 (1.9)	47.8 (1.6)§	53.8 (1.9)	59.4 (1.6)

[a] Percent adjusted by age distribution from the 2010 US Census.

[b] p-values for comparison with men without disability

* p 0.0001

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[c] Screening rates changed significantly for all disability groups ($p \leq 0.01$). There was a statistically significant trend over time in the differences in screening rates between men with no disability and men within the following disability groups: movement difficulty ($p \leq 0.01$); least severe movement difficulty ($p \leq 0.01$); movement difficulty severity level 4 ($p = 0.02$); most severe movement difficulty ($p = 0.04$); sensory difficulty ($p \leq 0.01$); emotional difficulty ($p = 0.02$); any BAD ($p = 0.01$); social limitation ($p \leq 0.01$); and any disability ($p = 0.04$).

[+] $p \leq 0.001$

[§] $p \leq 0.01$

[#] $p \leq 0.05$.

Table 6

Adjusted odds of reporting colorectal cancer screening in 2010 accounting for sociodemographic factors and disability status among women with a disability: adjusted odds ratio (95% confidence interval), p values[a]

Variables	Models						
	Movement	Sensory	Emotional	Cognitive	Self-care	Social	Work
NHIS sample: n	4, 324	4, 323	4, 311	4, 178	4, 272	4, 189	4, 272
Sociodemographic							
Age category (p-values)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
50–64 years	1.0	1.0	1.0	1.0	1.0	1.0	1.0
65–75 years	1.4 (1.2, 1.7)	1.4 (1.2, 1.7)	1.4 (1.2, 1.6)	1.4 (1.2, 1.7)	1.4 (1.2, 1.7)	1.4 (1.2, 1.7)	1.4 (1.2, 1.7)
Race (p-values)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
White	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Black	1.0 (0.8, 1.3)	1.0 (0.8, 1.3)	1.0 (0.8, 1.3)	1.0 (0.8, 1.3)	1.0 (0.8, 1.3)	1.0 (0.8, 1.3)	1.0 (0.8, 1.3)
Asian	0.5 (0.3, 0.7)	0.5 (0.3, 0.6)	0.5 (0.3, 0.6)	0.5 (0.3, 0.6)	0.5 (0.3, 0.6)	0.5 (0.3, 0.6)	0.5 (0.3, 0.6)
Other, multiple races	1.1 (0.7, 1.8)	1.1 (0.7, 1.8)	1.1 (0.6, 1.8)	1.2 (0.7, 2.0)	1.1 (0.7, 1.8)	1.2 (0.7, 2.0)	1.1 (0.7, 1.8)
Hispanic ethnicity (p-values)	0.9236	0.8857	0.8792	0.6728	0.7498	0.6126	0.7546
Yes	1.0 (0.8, 1.3)	1.0 (0.8, 1.3)	1.0 (0.8, 1.3)	1.1 (0.8, 1.4)	1.0 (0.8, 1.3)	1.1 (0.8, 1.4)	1.0 (0.8, 1.3)
No	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Education (p-values)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Less than high school	1.0	1.0	1.0	1.0	1.0	1.0	1.0
High school	1.2 (1.0, 1.6)	1.2 (1.0, 1.5)	1.2 (1.0, 1.5)	1.2 (0.9, 1.5)	1.2 (1.0, 1.5)	1.2 (0.9, 1.5)	1.2 (1.0, 1.5)
Some college/associates degree	1.6 (1.3, 2.1)	1.6 (1.3, 2.0)	1.6 (1.3, 2.1)	1.5 (1.2, 2.0)	1.6 (1.3, 2.1)	1.6 (1.2, 2.0)	1.6 (1.3, 2.1)
College and advanced degrees	1.8 (1.4, 2.3)	1.8 (1.4, 2.3)	1.8 (1.4, 2.3)	1.8 (1.4, 2.3)	1.8 (1.4, 2.3)	1.8 (1.4, 2.3)	1.8 (1.4, 2.3)
Income less than poverty threshold (p-values)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Yes	0.5 (0.4, 0.7)	0.5 (0.4, 0.7)	0.5 (0.4, 0.7)	0.5 (0.4, 0.6)	0.5 (0.4, 0.7)	0.5 (0.4, 0.6)	0.5 (0.4, 0.7)
No	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Health insurance (p-values)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Yes	1.0	1.0	1.0	1.0	1.0	1.0	1.0
No	0.3 (0.3, 0.5)	0.3 (0.3, 0.5)	0.3 (0.3, 0.5)	0.3 (0.3, 0.5)	0.4 (0.3, 0.5)	0.3 (0.3, 0.5)	0.4 (0.3, 0.5)
Has usual source of care (p-values)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Yes	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Variables	Models						
	Movement	Sensory	Emotional	Cognitive	Self-care	Social	Work
No	0.3 (0.2, 0.5)	0.3 (0.2, 0.5)	0.3 (0.2, 0.5)	0.4 (0.2, 0.5)	0.3 (0.2, 0.5)	0.4 (0.2, 0.5)	0.3 (0.2, 0.5)
Basic action difficulties (BAD)							
Severity of movement difficulty (p-values)	0.1035						
Least severe	1.5 (0.9, 2.7)						
Level two	1.7 (1.0, 3.0)						
Level three	1.2 (0.7, 2.1)						
Level four	1.9 (1.0, 3.5)						
Most severe	1.7 (0.9, 3.1)						
No	1.0						
Sensory difficulty (p-values)		0.7538					
Yes		1.0 (0.8, 1.4)					
No		1.0					
Emotional difficulty (p-values)			0.4990				
Yes			0.9 (0.6, 1.3)				
No			1.0				
Cognitive difficulty (p-values)				0.9741			
Yes				1.0 (0.7, 1.5)			
No				1.0			
Any BAD	0.2248	0.3393	0.2193	0.3228			
Yes	0.7 (0.4, 1.2)	1.1 (0.9, 1.3)	1.1 (0.9, 1.3)	1.1 (0.9, 1.3)			
No	1.0	1.0	1.0	1.0			
Complex action limitations (CAL)							
Self-care limitation (p-values)					0.8875		
Yes					1.0 (0.7, 1.5)		
No					1.0		
Social limitation (p-values)						0.0183	
Yes						0.6 (0.5, 0.9)	
No						1.0	
Work limitation (p-values)							0.8839
Yes							1.0 (0.7, 1.4)

	Models						
Variables	**Movement**	**Sensory**	**Emotional**	**Cognitive**	**Self-care**	**Social**	**Work**
No							1.0
Any CAL					0.2446	0.0088	0.3841
Yes					1.1 (0.9, 1.4)	1.5 (1.1, 2.1)	1.2 (0.8, 1.7)
No					1.0	1.0	1.0

[a] Analysis account for the complex NHIS sampling design.

Table 7

Adjusted odds of reporting colorectal cancer screening in 2010 accounting for sociodemographic factors and disability status among men with a disability: adjusted odds ratio (95% confidence interval), p values[a]

Variables	Models						
	Movement	Sensory	Emotional	Cognitive	Self-care	Social	Work
NHIS sample: *n*	3, 493	3, 492	3, 484	3, 358	3, 439	3, 371	3, 439
Socio-demographic							
Age category (*p*-values)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
50–64 years	1.0	1.0	1.0	1.0	1.0	1.0	1.0
65–75 years	1.7 (1.4, 2.0)	1.7 (1.4, 2.0)	1.7 (1.4, 2.0)	1.7 (1.4, 2.1)	1.7 (1.4, 2.1)	1.7 (1.4, 2.1)	1.7 (1.4, 2.1)
Race (*p*-values)	0.1307	0.1197	0.1423	0.1466	0.1283	0.1487	0.1289
White	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Black	1.0 (0.7, 1.2)	1.0 (0.7, 1.2)	1.0 (0.7, 1.2)	1.0 (0.7, 1.3)	1.0 (0.7, 1.2)	1.0 (0.7, 1.2)	1.0 (0.7, 1.2)
Asian	0.7 (0.4, 1.0)	0.6 (0.4, 1.0)	0.6 (0.4, 1.0)	0.6 (0.4, 1.0)	0.6 (0.4, 1.0)	0.6 (0.4, 1.0)	0.6 (0.4, 1.0)
Other, multiple races	0.7 (0.4, 1.2)	0.7 (0.4, 1.2)	0.7 (0.4, 1.2)	0.7 (0.4, 1.2)	0.7 (0.4, 1.2)	0.7 (0.4, 1.2)	0.7 (0.4, 1.2)
Hispanic ethnicity (*p*-values)	0.0187	0.0173	0.0161	0.0090	0.0092	0.0087	0.0086
Yes	0.7 (0.5, 0.9)	0.7 (0.5, 0.9)	0.7 (0.5, 0.9)	0.7 (0.5, 0.9)	0.7 (0.5, 0.9)	0.7 (0.5, 0.9)	0.7 (0.5, 0.9)
No	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Education (*p*-values)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Less than high school	1.0	1.0	1.0	1.0	1.0	1.0	1.0
High school	1.4 (1.1, 1.8)	1.4 (1.1, 1.8)	1.3 (1.0, 1.7)	1.3 (1.0, 1.7)	1.3 (1.0, 1.7)	1.4 (1.0, 1.8)	1.3 (1.0, 1.7)
Some college/associates degree	1.9 (1.4, 2.4)	1.9 (1.4, 2.5)	1.9 (1.4, 2.5)	1.9 (1.4, 2.5)	1.9 (1.4, 2.5)	1.9 (1.4, 2.5)	1.9 (1.4, 2.5)
College and advanced degrees	2.5 (1.9, 3.3)	2.6 (2.0, 3.4)	2.5 (1.9, 3.3)	2.5 (1.9, 3.3)	2.5 (1.9, 3.3)	2.5 (1.9, 3.4)	2.5 (1.9, 3.3)
Income less than poverty threshold (*p*-values)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Yes	0.5 (0.4, 0.7)	0.5 (0.4, 0.7)	0.6 (0.4, 0.7)	0.5 (0.4, 0.7)	0.5 (0.4, 0.7)	0.5 (0.4, 0.7)	0.5 (0.4, 0.7)
No	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Health insurance (*p*-values)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Yes	1.0	1.0	1.0	1.0	1.0	1.0	1.0
No	0.3 (0.2, 0.4)	0.3 (0.2, 0.4)	0.3 (0.2, 0.3)	0.3 (0.2, 0.4)	0.3 (0.2, 0.4)	0.3 (0.2, 0.4)	0.3 (0.2, 0.4)
Has usual source of care (*p*-values)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Yes	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Variables	Models						
	Movement	Sensory	Emotional	Cognitive	Self-care	Social	Work
No	0.2 (0.1, 0.3)	0.2 (0.1, 0.3)	0.2 (0.2, 0.3)	0.2 (0.2, 0.3)	0.2 (0.2, 0.3)	0.2 (0.1, 0.3)	0.2 (0.2, 0.3)
Basic action difficulties (BAD)							
Severity of Movement difficulty (*p*-values)	0.1860						
Least severe	0.6 (0.3, 1.3)						
Level two	0.7 (0.3, 1.6)						
Level three	0.7 (0.3, 1.5)						
Level four	0.5 (0.2, 1.2)						
Most severe	1.0 (0.4, 2.4)						
No	1.0						
Sensory difficulty (*p*-values)		0.0874					
Yes		1.3 (1.0, 1.8)					
No		1.0					
Emotional difficulty (*p*-values)			0.5460				
Yes			0.8 (0.5, 1.5)				
No			1.0				
Cognitive difficulty (*p*-values)				0.7129			
Yes				1.1 (0.7, 1.8)			
No				1.0			
Any BAD	0.1130	0.4083	0.0584	0.1816			
Yes	1.8 (0.9, 3.8)	1.1 (0.9, 1.4)	1.2 (1.0, 1.5)	1.2 (0.9, 1.4)			
No	1.0	1.0	1.0	1.0			
Complex action limitations (CAL)							
Self-care limitation (*p*-values)					0.6654		
Yes					1.1 (0.7, 1.7)		
No					1.0		
Social limitation (*p*-values)						0.8947	
Yes						1.0 (0.7, 1.5)	
No						1.0	
Work limitation (*p*-values)							0.9735
Yes							1.0 (0.5, 2.1)

	Models						
Variables	**Movement**	**Sensory**	**Emotional**	**Cognitive**	**Self-care**	**Social**	**Work**
No							1.0
Any CAL					0.1932	0.3715	0.6068
Yes					1.2 (0.9, 1.5)	1.2 (0.8, 1.6)	1.2 (0.6, 2.4)
No					1.0	1.0	1.0

[a] Analysis account for the complex NHIS sampling design.