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ORIGINAL PAPER

Communication and colorectal cancer screening among the uninsured: data from the Health Information National Trends Survey (United States)

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Abstract
Objective Colorectal cancer screening allows for both prevention and early detection of the disease, with early detection often resulting in improved prognosis. Too few Americans over 50 are screened for colorectal cancer, but among certain subpopulations screening rates are particularly low for various reasons. We examined the role of communication factors and insurance, with a specific focus on the uninsured to examine disparities in colorectal cancer screening.
Methods We used Health Information National Trends Survey data to examine: disparities in colorectal cancer screening, by calculating proportions of subpopulations screened; and the association between communication and screening among the uninsured, by performing chi-square tests and simple logistic regression to examine the potential factors associated with screening.
Results The uninsured were 64% less likely to be screened than the insured. Provider recommendation was the only significant communication measure, with the uninsured lacking a recommendation 98.5% less likely to be screened than those with one.
Conclusion These data suggest expansion of programs of screening among the uninsured and more aggressive communication campaigns to promote the awareness and provider recommendation of screening as possible ways to increase screening and reduce mortality of colorectal cancer.

Keywords Colorectal neoplasms · Cancer screening · Medically uninsured · Disparities · Communication

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Introduction

In 2004, there were 56,730 deaths due to colorectal cancer in the United States [1]. The prognosis and treatment options for cancer are often more favorable for those diagnosed at early, rather than late, stages of the disease. For example, 5-year survival rates are 91% for localized colon cancer but 10% for distant colon cancer, yet 21% of cases in 1995–2000 were diagnosed at distant stage [1]. Colorectal cancer (CRC) screening detects precancerous growths that can then be removed, thus helping in both prevention and early detection. Widely endorsed screening tests are available for colorectal cancer, making this cancer among the most preventable and most treatable if detected early. The overall 5-year relative survival rate for colorectal cancer increased over time to 64% in 1995–2000 [1], but despite this progress, there remain disparities in colorectal cancer outcomes among underserved populations.

Lack of screening or late-stage detection may be one reason for high mortality due to colorectal cancer. The focus of this paper is to understand how two factors, insurance and communication could potentially be associated with CRC screening. In the United States, there are disparities in CRC mortality and survival rates among racial/ethnic groups and high and low poverty counties [1, 2]. Perhaps most vulnerable are the uninsured, who are consistently identified in the literature as having very low cancer screening rates. Stage of cancer is "one of the most important prognostic factors for most cancers" and Roetzheim et al. found that lack of insurance was significantly associated with later stage at diagnosis for all cancers considered, including colorectal cancer [3]. National Health Interview Survey results highlight large disparities in colorectal cancer screening rates, with the uninsured lagging the insured by 24% for men and 23% for women [4]. Using Behavioral Risk Factor Surveillance System data (1997 and 1999), Adams et al. found the uninsured were 56% less likely to receive sigmoidoscopy and 57% less likely to receive fecal occult blood tests (FOBT) than the privately insured [5].

Similarly, recent work has shown that communication plays a significant role across the cancer control continuum from prevention, diagnosis, treatment to survivorship or end of life [6]. Lack of awareness of the connection between life styles and behaviors could potentially deter people from screening and treatment but providers can play a significant role in influencing such behaviors [7]. Communication can be successful in raising awareness, help in decision making and motivating people to undergo screening [8–11].

We were therefore interested in how these two significant factors, lack of insurance and communication, may be associated with CRC screening. Four broad research questions guided this study: (a) Is insurance status associated with CRC screening, both ever having been screened, and with regard to FOBT being on schedule and repeating screening? (b) To what extent are communication factors such as attention to health in the media, experiences with providers and cancer information seeking related to CRC screening among the uninsured? (c) Is provider recommendation, another measure of communication, associated with screening among the uninsured? and (d) What are the reasons that deter the uninsured from undergoing CRC screening? We tested these questions drawing from the Health Information National Trends Survey (HINTS), a national RDD sample survey of cancer communication behaviors conducted by the National Cancer Institute (NCI). Such focus on communication between providers and patients and mediated communication, we hope, will contribute to identifying appropriate strategies for interventions to promote screening and reduce cancer-related disparities in morbidity and mortality.

Materials and methods

The data for this study came from the HINTS [12], a national random sample survey of cancer communication behaviors of 6,369 American adults aged 18 and older. HINTS was first administered in 2002–2003 by the NCI to fill the void of information regarding use of cancer-related information and the factors that affect health communication behaviors [13]. The survey was conducted by telephone using a list-assisted random-digit-dial sample [13]. African Americans and Hispanics were oversampled [13], and therefore screening rates by demographic and health care access characteristics are presented using weighted data that adjusts for this oversampling. All other analyses used unweighted data, because the enormous sample sizes generated by weighting make it difficult to assess statistical significance in small subpopulation analyses, and create difficulty in modeling with logistic regression.

All analyses were conducted using SPSS version 12.0. We restricted our analyses to those aged 50–64 years, with the bottom cutoff point reflecting when the United States Preventive Services Task Force (USPSTF) recommends colorectal cancer screening to begin [14]. We selected a top cutoff point of age 65+ with the assumption that the number of uninsured is likely to be small as Medicare kicks in, and as Medicare covers colorectal cancer screening (full coverage of FOBT and 75–80% of cost for endoscopic screening) we would not expect insurance status to be a major barrier for elders seeking colorectal cancer screening. Also, it is unclear at which age screening should cease [14] Question wording for all survey items are available in the survey instrument [12] and in Table 1.

Dependent variables: colorectal cancer screening

We were specifically interested in two types of screening: (a) ever screened, and for FOBT we also considered (b) on schedule and repeat screening. For "ever screened" for colorectal cancer (or screening status), we excluded respondents (a) who had

Table 1 Variable definitions

Measure: Question wording on HINTS [Response categories, if other than yes/no]

Independent measures

Health insurance: Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?

Heard of at least one of the three tests: Composite of: Have you ever heard of a fecal occult or stool blood test? (IF NEEDED: You smear a small amount of stool on cards at home and send the cards back to the doctor or lab) Have you ever heard of a sigmoidoscopy or a colonoscopy?

Proxy for awareness: (agreement with statement). Getting checked regularly for colon cancer increases the chances of finding cancer when it's easy to treat. Recoded strongly agree and somewhat agree to "yes" and somewhat disagree, strongly disagree, and no opinion to "no"

Provider recommendation: Composite of: Did a doctor, nurse, or other health professional ever advise you to get....a sigmoidoscopy; a colonoscopy; During the past 12 months, did a doctor, nurse, or other health professional advise you to do a stool blood test using a *home* test kit?

Media attention/attention to media channels: How much attention do you pay to information about health or medical topics [on TV, the radio, in newspapers, in magazines, on the internet]? Would you say a lot, some, a little, or not at all? [A lot, some, a little, not at all]

Patient–provider interaction (CAHPS): During the past 12 months, how often did doctors or other health care providers [listen carefully to you, explain things in a way you could understand, show respect for what you had to say, spend enough time with you, involve you in decisions about your health care as much as you wanted]? Would you say always, usually, sometimes, or never? [Always, usually, sometimes, never]

Information seeking-respondent looked for cancer info: Have you ever looked for information about cancer from any source?

Information seeking-someone else looked for cancer info: Excluding your doctor or other health care provider, has someone else ever looked for information about cancer for you?

Reasons for not receiving sigmoidoscopy/colonoscopy: Is there any particular reason why you haven't gotten a {sigmoidoscopy/ (or) colonoscopy}{yet/in the past 10 years}? [Open-ended question code by NCI]

Reasons for not receiving FOBT: Is there any particular reason why you haven't done a home stool blood test{yet/in the past year}? [Open-ended question code by NCI]

Covariates

Usual provider: Not including psychiatrists and other mental health professionals, is there a particular doctor, nurse, or other health professional that you see most often?

Sex [male, female]

Race/ethnicity: Are you Hispanic or Latino? Which one or more of the following would you say is your race? Are you...[American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, or White][a]

Annual household income: Is your annual household income from all sources....[< $25,000, < $20,000, < $15,000, < $10,000, < $35,000, < $50,000 ($35,000 to < $50,000), < $75,000 ($50,000 to < $75,000), $75,000 or more]

Employment status: Are you currently....[employed for wages, self-employed, out of work for more than one year, out of work for less than one year, a homemaker, a student, retired, unable to work]

Education: What is the highest grade or year of school you completed? [Never attended school or only kindergarten, grades 1 to 8 (elementary), grades 9 to 11 (some high school), grade 12 or GED (high school graduate), college 1–3 years (some college or technical school), college 4 years or more (college graduate)]

Rural/urban county: Counties were classified using United States Department of Agriculture rural-urban continuum codes

Dependent measures

Ever screened for colorectal cancer: Composite of: Have you ever done a stool blood test using a home test kit? [Yes, no, don't know, refused] Have you ever had...a sigmoidoscopy; a colonoscopy?[b]

On schedule screening: When did you do your most recent stool blood test using a home kit to check for colon cancer? [a year ago or less, more than 1 but not more than 2 years ago, more than 2 but not more than 5 years ago, over 5 years ago]

Repeat screening: You said your most recent stool blood test was { }. How long before *that* stool test was your last one? [A year ago or less before, more than 1 but not more than 2 years before, more than 2 but not more than 5 years before, over 5 years before, none before most recent]

[a] Because of small sample sizes for other racial/ethnic groups, we restricted this variable to non-Hispanic white, non-Hispanic black or African American, and Hispanic

[b] Respondents who had not heard of the tests were not surveyed regarding screening behavior, and were therefore classified as never screened

colorectal cancer, and because not all respondents received all the survey questions (b) those respondents who did not receive the colorectal cancer question set. After these exclusions, our sample size was 1,253. Respondents were classified as "ever screened" if they had undergone a home FOBT and/or a sigmoidoscopy and/or a colonoscopy at least once by the time of the survey administration. The never screened subjects had never received any of these three CRC screening tests or had never heard of these

tests when surveyed (respondents who had not heard of the tests were not surveyed regarding screening behavior[1]).

Respondents were considered on schedule with FOBT, based on USPSTF recommendations, if they had undergone screening with FOBT within the recommended time interval of 1 year (most recent FOBT was a year ago or less) [14]. Respondents were on schedule twice if, in addition to being on schedule once, they had used another FOBT within a year ago or less before their most recent FOBT. Timing of repeat screening, among those who had ever undergone screening with FOBT, was based on when respondents reported that their last home stool test was. Respondents who reported "none before the most recent" were considered to have had no prior FOBT, and therefore had not repeated FOBT screening. A small number of subjects who answered "don't know" or refused to answer a question were excluded from the relevant analyses.

Independent variables: communication and health insurance

We were interested in two independent variables: lack of insurance and communication. Insurance status was measured by asking respondents: Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?

Among the uninsured, the variable of communication was measured in three ways (Table 1): media attention and information seeking, patient–provider interaction (based on Consumer Assessment of Health Plans (CAHPS) measures[2]), and provider recommendation. Provider recommendation is a composite variable with "yes" for those who received a recommendation for FOBT within the past year or ever received a recommendation for a sigmoidoscopy or colonoscopy, and "no" for those who did not receive a recommendation for any test (includes those who said "no" to FOBT recommendation and those who did not answer the question because they had not visited a provider within 1 year).

Covariates: SES, demographics and usual provider

We examined colorectal cancer screening status by demographic variables (age, sex, race/ethnicity) and indicators of SES (education, income, employment status and residence in urban or rural counties) that have been identified in the literature [1–5] as associated with screening behavior in particular and characteristics associated with health services and health access more generally.

Reasons for not undergoing screening among the uninsured

Respondents reported reasons for not receiving FOBT and for not receiving a sigmoidoscopy or colonoscopy. The NCI grouped these open-ended reasons reported by respondents into themes: no reason; no problems/symptoms; no provider recommendation; cost/insurance; didn't need/didn't know needed; never heard of it/never thought about it; too painful, unpleasant, or embarrassing; put it off; and other. We created one additional theme of "lack of awareness" by grouping responses of didn't need/didn't know needed and never heard of it/never thought about it. We also labeled responses of too painful, unpleasant, or embarrassing as "discomfort."

Statistical analyses

To provide background on screening rates within subpopulations in our sample, we examined colorectal cancer screening status by demographic variables and usual provider status using cross-tabulations, chi-square tests, and Kendall's tau-b correlation coefficients.[3] Because age distributions were not normal, we compared age of the screened and never screened using the nonparametric Mann–Whitney test.

To answer our first research question (Is insurance status associated with CRC screening, both ever having been screened, and with regard to FOBT being on schedule and repeating screening?), we did the following analyses: We examined colorectal cancer screening status by insurance status with a cross-tabulation, chi-square test, and a logistic regression model with insurance status (y/n) as the binomial independent predictor and screening status (ever screened = y/n) as the dependent variable. We opted

[1] It is worth noting that 33.3% of the uninsured had not heard of the tests, and therefore had a low level of awareness. In comparison, 24.6% of the insured had not heard of the tests.

[2] CAHPS are overseen by the Agency for Health Care Policy and Research and are used as tools for quality assessment.

[3] Kendall's tau-b is a rank correlation coefficient used to assess the relationship between two ordinal variables. We used this test for variables with more than two categories in a natural order.

for this simple regression model as we were interested in the odds ratio for the uninsured having ever received colorectal cancer screening regardless of other SES and demographic factors. On schedule and repeat screening with FOBT were assessed for the overall sample and by insurance status. On schedule screening was based on the USPSTF recommended time interval of every year for FOBT [14]. We therefore used the proportion that received FOBT within the year before the survey (among those who received FOBT) to assess on schedule screening with FOBT. To assess whether being on schedule for this test was related to insurance status we used cross-tabulations and chi-square tests. To assess repeat screening we produced frequencies of when (categorical time intervals) respondents received another FOBT before their most recent. For patterns in screening behavior, we produced cross-tabulations and chi-square tests for the timing of the most recent FOBT against the timing of another FOBT before the most recent, overall and by insurance status.

In considering the second research question (To what extent are communication factors such as attention to health in the media, experiences with providers and cancer information seeking related to CRC screening among the uninsured?) we assessed the relationship between: media attention measures (Table 4), information seeking (Table 5), patient–provider interaction (CAHPS measures, Table 4), and provider recommendation, and screening status among the uninsured by using cross-tabulations, chi-square tests, and Kendall's tau-b correlation coefficients. To examine the third research question (Is provider recommendation, another measure of communication, associated with screening among the uninsured?), and because the chi-square statistic was significant for provider recommendation, we generated a logistic regression model with screening status for the uninsured as the dependent variable (ever screened = y/n) and provider recommendation as the independent variable (y/n). The other communication measures were not significant at the bivariate level, and were therefore excluded from the final model.

Lastly, to answer our fourth research question (What are the reasons that deter the uninsured from undergoing CRC screening?), we examined the reasons reported by the uninsured for not undergoing screening. For the uninsured never screened, we combined all reported reasons for not receiving any of the tests and determined which accounted for the largest proportion of identified barriers: lack of awareness, provider recommendation, no problems or symptoms, and insurance or cost.

Results

We will first provide a descriptive overview of CRC screening by different demographic and socioeconomic status (SES) variables followed by a discussion of results for our research questions.

Ever screened: demographic, SES, and health care access variables

In our sample, about 71% of the respondents (50–64 years) reported that they have undergone at least one kind of colorectal cancer screening. The proportion of uninsured who have been screened (49%) is smaller compared to those who were insured (73%) (Table 2). Screening was strongly associated with SES and screening rates increased as income and education increased, and decreased as the county of residence became more rural (Table 2). The mean age for the ever screened was 56.8 years (median = 57) and 55.54 years (median = 54) for the never screened, with a small but significant difference in ranked age (Mann–Whitney test unweighted p-value < 0.001). Whites were most likely to have been screened compared to African Americans and Hispanics.

Our first research question focused on how insurance status may be associated with both CRC screening status as well as on schedule and repeat screening with FOBT. The data in Table 2 suggests that insurance is strongly associated with CRC screening. Screening rates were higher among the insured, and insurance status was a significant predictor in a simple logistic regression model, with the uninsured 64% (95% CI = 0.241–0.536) less likely to be screened than the insured.

On schedule and repeat screening for FOBT: insured versus uninsured

The data in Table 3 suggest that insurance also has some relationship with on schedule and repeat screening with FOBT. In addition to those who were on schedule for FOBT because they received the test within the recommended time interval of one year (Table 3), 18.1% overall received the test within 2 years. There was no significant association between timing of the most recent FOBT and insurance status, but a greater proportion of the uninsured had received only their first FOBT (no prior FOBT) compared to the insured. In addition, more insured respondents repeated FOBT screening (two consecutive tests), with a 10.7% point disparity between the insured and uninsured. The majority of those who were on schedule for FOBT screening once were on

Table 2 Percent ever screened for colorectal cancer (weighted), ages 50–64, by demographic, SES, and health care access characteristics

Subpopulations (unweighted sample size)	Percent screened	Difference from highest subpopulation	Tests (p-values)
All (1,253)	71.2		
Age in years			
Median age among ever screened = 57			Mann–Whitney unweighted p-value < 0.001
Median age among never screened = 54			
Insurance			
Yes (reference group) (1,123)	73.2		Chi-square (< 0.001)
No (109)	49.3	23.9	logistic regression Ex(B) = 0.360 (95%CI 0.241, 0.536) (< 0.001)
Usual provider			
Yes (1,030)	74.7		Chi-square (< 0.001)
No (220)	55.2	19.5	
Sex			
Female (780)	72		Chi-square (< 0.001)[a]
Male (473)	70.3	1.7	
Race/ethnicity			
Non-Hispanic white (927)	74.5		Chi-square (< 0.001)
Non-Hispanic black or African American (134)	59.6	14.9	
Hispanic (103)	46.6	27.9	
Annual household income			
Less than $10,000 (59)	55.1	22.4	Chi-square (< 0.001) Kendall's
$10,000 to < $15,000 (51)	55.7	21.8	tau-b = –0.111 (< 0.001)
$15,000 to < $20,000 (69)	59.7	17.8	
$20,000 to < $25,000 (74)	66.1	11.4	
$25,000 to < $35,000 (138)	72.2	5.3	
$35,000 to < $50,000 (182)	72.1	5.4	
$50,000 to < $75,000 (216)	72.5	5	
(≥$75,000 (312)	77.5		
Employment			
Employed for wages (642)	71.3	11.9	Chi-square (< 0.001)
Self-employed (138)	66.9	16.3	
Out of work for more than one year (22)	75.4	7.8	
Out of work for less than one year (27)	64.3	18.9	
A homemaker (92)	67.3	15.9	
A student (5)	77	6.2	
Retired (208)	83.2	27	
Unable to work (95)	56.2		
Rural/urban county			
Metro area, pop. 1 m or more (614)	73	1.8	Chi-square (< 0.001)
Metro area, pop. 250,000 to 1 m (259)	74.8		
Metro area, pop. < 250,000 (129)	71	3.8	Kendall's tau-b = –0.067 (< 0.001)
Nonmetro adjacent to metro, urban pop. ≥20,000 (82)	74.2	0.6	
Nonmetro not adjacent, urban pop. ≥20,000 (23)	71.6	3.2	
Nonmetro adjacent to metro, urban pop. 2,500–19,999 (69)	56.5	18.3	
Nonmetro not adjacent, urban pop. 2,500–19,999 (44)	59.3	15.5	
Nonmetro adjacent to metro, rural or urban pop. < 2,500 (18)	29.8	45	
Nonmetro not adjacent, rural or urban pop. < 2,500 (15)	69.9	4.9	
Education			
Never attended school or only kindergarten (5)	31.9	46.9	Chi-square (< 0.001) Kendall's
Elementary (49)	51.7	27.1	tau-b = –0.130 (< 0.001)
Some high school (75)	62.2	16.6	
High school graduate (338)	68.8	10	
Some college or technical school (319)	72.5	6.3	
College graduate (445)	78.8		

[a] Unweighted p-value = 0.539

Table 3 On schedule and repeat screening with home FOBT

FOBT screening patterns	Percent screened	Sample size
On schedule (received FOBT within one year)		
On schedule		
Overall	44.1	642
Insured	44.2	600
Uninsured	42.9	42
On schedule twice		
Overall	56.9	606
Insured	57.4	569
Uninsured	50	37
Repeat		
Prior FOBT within one year		
Overall	34.2	606
Insured	35	569
Uninsured	21.6	37
No prior FOBT		
Overall	33.2	606
Insured	32.5	569
Uninsured	43.2	37

schedule twice, but fewer of the uninsured did so than the insured. (Table 3)

Communication and screening among the uninsured

Our second research question focused on the role of communication in CRC screening among the uninsured. Communication was measured along three dimensions: attention to health in the media, cancer information seeking and patient–provider interactions. There was no statistically significant relationship between any of the communication measures and screening status (Tables 4 and 5).

The third research question focused on a patient–provider communication issue of provider recommendation. Provider recommendation appears to be a significant factor associated with screening even among the uninsured ($n = 61$, chi-square p-value < 0.001). Almost 91% of the uninsured who have received provider recommendation have undergone screening, compared to about 13% of those who did not receive a recommendation by their provider. In a simple logistic regression model, this parameter was significant (p-value < 0.001) and the uninsured *without* a recommendation were 98.5% (95% CI = 0.003–0.083) less likely to have ever received colorectal cancer screening than those who did. This parameter was also significant (p-value < 0.001) when the model was run for the insured ($n = 630$), with the insured who did not receive a provider recommendation 92% (95% CI = 0.054–0.119) less likely to have been screened for colorectal cancer, but the model for the uninsured was better at predicting never screened (Hosmer-Lemeshow classification of 94.4% vs. 73.3%).

Reasons for not undergoing screening among the uninsured

The last research question explored the reasons why the uninsured have not undergone specific modes of screening (Figs. 1, 2). The primary reasons reported by the uninsured *never* screened for not receiving *all* tests were lack of awareness (35%), lack of provider recommendation (19%), no problems/no symptoms (9%), and financial barriers (3%). In addition, 21% reported no reason.

Table 4 Attention to media channels for health or medical topics and CAHPS measures in association with screening status among the uninsured

Communication measure	Percent screened				Sample size	Chi-square p-value, Kendall's tau-b p-value
Attention to media for health or medical topics	By level of attention: A lot	Some	A little	Not at all		
Radio	47.6	40	60	53.5	109	0.563, 0.418
TV	48.9	61.3	43.5	40	109	0.496, 0.692
Newspapers	53.3	68	50	34.4	109	0.090, 0.069
Magazines	43.3	60.7	75	41	109	0.108, 0.770
Internet	71.4	28.6	75	45.6	108	0.091, 0.117
CAHPS (How often providers ... during last 12 months)	By how often: Always	Usually	Sometimes	Never		
Listened carefully	68.8	63.6	53.8	50[a]	74	0.750, 0.306
Explained clearly	69.2	57.1	64.3	—	74	0.645, 0.507
Showed respect	64.2	84.6	37.5	—	74	0.088, 0.844
Spent enough time	65	68.4	45.5	100[a]	74	0.252, 0.890
Involved you in decisions	68.1	66.7	52.9	50[a]	72	0.699, 0.276

[a] Sample size for subpopulation <5

Table 5 Looking for cancer information (respondent or someone else for respondent) and screening status among the uninsured

Looked for cancer information	Percent screened	Sample size	Chi-square *p*-value
Respondent		108	0.345
Yes	54.2		
No	48.3		
Someone else		109	0.547
Yes	60		
No	48.3		

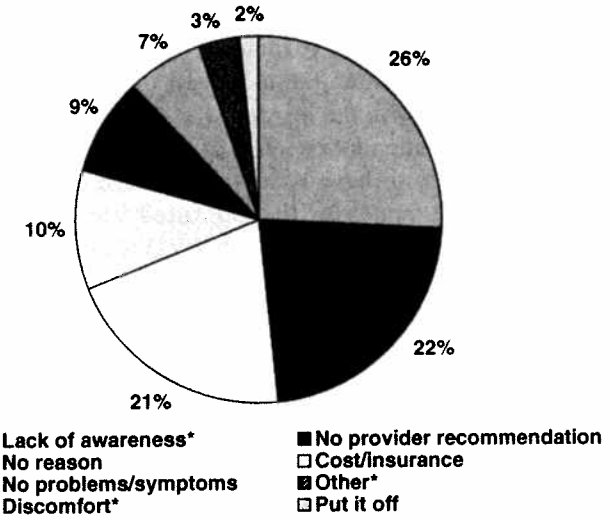

Fig. 1 Reasons reported by uninsured for not receiving sigmoidoscopy/colonoscopy (some respondents reported more than one reason) ever or within the last 10 years *Lack of awareness=didn't need/didn't know needed and never heard of it/never thought about it; Discomfort = too painful, unpleasant, or embarrassing; No patterns in the "other" responses

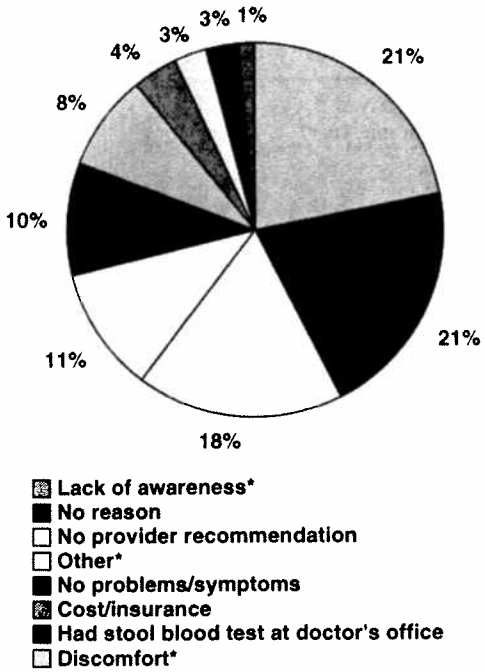

Fig. 2 Reasons reported by uninsured for not receiving FOBT (some respondents reported more than one reason) ever or within the last year *Lack of awareness = didn't need/didn't know needed and never heard of it/never thought about it; Discomfort = too painful, unpleasant, or embarrassing; No patterns in the "other" responses

Discussion

Implications

These data both support and add to the extant literature on CRC screening. Consistent with other national surveys such as the BRFSS [15], our data show clear disparities in CRC screening of any type among different racial/ethnic, educational and income groups. Whites, more educated, and high income groups were much more likely to report CRC screening compared to African Americans, Hispanics, less educated and low income groups. We also found differences among the urban and rural dwellers. People in metro areas or close to metro areas were much more likely to have been screened compared to those in rural areas. Lack of access to health services in the form of a usual provider was also associated with CRC screening status. Of great concern, the uninsured, our population of interest, were 64% less likely to be screened than the insured. The uninsured often access the health care system in acute and emergency situations, and underscreening of the uninsured likely results in more late stage diagnoses and a financial burden on the free care system. Pignone et al. reported that colorectal cancer screening is cost-effective compared with no screening, regardless of screening modality [16].

While fewer uninsured were ever screened, there was no significant association between insurance status and on schedule FOBT. FOBT is more affordable out-of-pocket, which likely increases the number of uninsured who opt for FOBT, and correspondingly, some insured may skip the FOBT and begin screening with an endoscopic test. With regard to repeat screening with FOBT, however, fewer uninsured received two annual tests and more uninsured had just received FOBT for the first time. This suggests that beginning FOBT screening when recommended and maintaining regular screening patterns is less common among the uninsured than the insured. Although the lower cost makes FOBT more affordable, because more frequent FOBT increases the screening sensitivity, the

uninsured are not fully benefiting if they do not repeat the test.

The USPSTF provides a thorough discussion of test sensitivities, specificities, and risks, but recommends several tests [14], and because patient preference also varies, shared decision making has been recommended [7]. Any choice has a tradeoff, with colonoscopy more sensitive but also more invasive and expensive than FOBT, for example. Colonoscopy, however, is standard follow-up to other tests with positive results.

While general communication measures did not appear to be associated with screening, provider recommendation appears to be strongly influential in screening. It seems that access, coverage (cost), awareness (from the provider) and persuasion (recommendation) conferred by insurance are more important than other general communication measures. In our analysis, provider recommendation was beneficial for the uninsured although fewer uninsured received a recommendation (36.1%) than the insured (62.5%). This was also reported in other studies. Brawarsky et al. found the inadequately insured were 65% less likely to receive colorectal cancer screening recommendations than those with adequate insurance [17], although in Subramanian et al.'s literature review, cost or insurance of the patient was not a significant factor affecting a physician's decision to recommend colorectal cancer screening [18]. This suggests that communication that is specific to CRC may be a strong determinant of screening status, a factor that warrants further investigation.

Such specific efforts in communication focused on CRC have been attempted [19–21], including CDC's Screen for Life Campaign. But the success of public health communication campaigns, in general, depends on meeting such conditions as: (a) successful manipulation of the information environment to define colorectal cancer as a problem and in achieving enough message exposure, (b) use of sophisticated social marketing tools, (c) use of communication theories in designing messages and executing campaigns, (d) understanding the determinants of CRC screening behavior, and (e) creating a supportive environment that will enable people to act on recommendations such as access to screening services [22]. It is reasonable to ask if these national campaigns have been specifically developed for the underserved and if they took these factors into account. Our data also suggest the need for more efforts on surveillance of communications specific to CRC which may be helpful in intervention planning.

Aggressive and active efforts should focus on increasing provider recommendation. The inclusion of a CRC screening measure on the Health Plan Employer Data and Information Set, which is designed to encourage provider behaviors, suggests provider recommendation will increase [23]. In addition, existing programs like the CDC's National Breast and Cervical Cancer Early Detection Program (NBCCEDP) [24] could be expanded or could serve as a model to increase provider recommendation and to address disparities in colorectal cancer screening. The NBCCEDP provides screening, surgical consultation, diagnostic testing, and case management for low income, uninsured, and underserved women, and there is corresponding Medicaid coverage for treatment to women diagnosed through NBCCEDP. To date, only one-fifth of the women eligible for the NBCCEDP have actually enrolled [24], and similarly, CRC screening awareness is low among our uninsured never screened sample. Due to the cost and skilled personnel required for endocsopic screening, cost-effectiveness and capacity must be considered for any colorectal cancer screening program for the uninsured, and the CDC determined that there is capacity to screen the low-income uninsured population aged 50–64 [25, 26].

Expanding the NBCCEDP to include 100% FOBT screening (with follow-up colonoscopy) for the uninsured and incorporating messages about this program in the Screen for Life Campaign is one potential avenue to improve colorectal screening rates for the uninsured, and therefore reduce their disproportionate burden of colorectal cancer mortality. Providers also should be encouraged to screen and make recommendations to their patients. Until health insurance covers our whole population, disparities in preventive care will exist for the uninsured, and the disparity in colorectal cancer screening is one manifestation of this problem that requires our attention.

Limitations

Double-contrast barium enema is one of the USPSTF recommended screening tests, although it is characterized as a less sensitive alternative [14]. Because HINTS did not include barium enema, those who received only barium enema were misclassified as never screened, and approximately 2.4 million barium enemas are performed each year [26]. Misclassification is also possible if respondents received screening but had not heard of the test names or of the description of FOBT that was supplied, as those respondents were not surveyed regarding screening behavior and were therefore classified as never screened. In contrast, our data may overestimate screening because studies have found overreporting of colorectal cancer screening

when self-reported [27], and available statistics cannot distinguish between tests used as screens versus diagnostics [15]. Similarly, it is possible to identify the number of respondents who received both FOBT and endoscopy, but responses with regard to timing of tests are categorized broadly and as a result, it is not possible to identify respondents who received endoscopy as follow-up to FOBT. Responder bias is possible if responders to HINTS have different screening behavior than the general population. Because we examined demographic characteristics at the bivariate level and did not control for other demographics, the disparities should be interpreted only as rates for the subpopulations, not as measures of the effect of demographic characteristics. Because the study is cross-sectional, insurance status is a self-reported measure at the time of survey administration and respondents were not asked how long they had been uninsured, making it possible that a change in insurance status occurred after receiving screening but before the survey.

The communication measures have limitations. With the exception of provider recommendation, the communication measures do not deal with screening but only measure general media attention and information seeking. More specific measures could be more relevant in assessing the importance of communication. The quality of the patient–provider interaction is assessed for respondents with a provider visit within 12 months before the survey. Only 12.7% of the insured had not had a provider visit within 12 months compared to 51.9% of the uninsured in our sample. The tally for provider visits within 12 months excludes ER visits, which are likely a significant source of contact with the health care system for the uninsured. Similarly, provider recommendation occurs only with provider visits.

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