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Lay Beliefs About the Accuracy and Value of Cancer Screening

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Abstract

Introduction—Appreciating the accuracy and value of cancer screening is essential to informed decision making about screening. This study’s objectives were to (1) examine peoples’ beliefs about the accuracy and value of cancer screening, and (2) determine whether sociodemographics, cancer beliefs, and shared decision making are associated with these beliefs.

Methods—Data from the National Cancer Institute’s Health Information National Trends Survey (cycle 4, August–November 2014) were used. Respondents were non-institutionalized adults (aged 18 years, $n=3,677$). Weighted generalized linear modeling was used to examine bivariate and multivariate associations between key covariates and beliefs about cancer screening (assessed by four-item scale and independently). Secondary analyses examined whether these beliefs were associated with self-reported cancer screening. Data were analyzed between 2016 and 2017.

Results—Only 5.6% ($n=189$) of respondents answered all four cancer screening items correctly. Men, racial/ethnic minorities, those with lower education and higher cancer fatalism were less likely to have accurate beliefs about cancer screening. However, those who reported shared decision making for colorectal cancer screening were more likely to know that “when a test finds something abnormal, more tests are needed to know if it is cancer” and “when a test finds something abnormal, it is [not] very likely to be cancer” (adjusted risk ratio=1.13, $p<0.01$, adjusted risk ratio=1.25, $p<0.01$). Beliefs were not associated with likelihood of past mammography or pap testing.

Conclusions—Educators, researchers, and clinicians should consider opportunities (e.g., through shared decision making) to improve the accuracy of individuals’ beliefs about cancer screening.

INTRODUCTION

Patients are recommended to play active roles in cancer screening decision making through shared decision making (SDM) with their providers to attain high quality, patient-centered care.^{1,2} Consequently, appreciating the accuracy and value of cancer screening is fundamental for effective SDM. Cancer screening is not perfect; it shows whether someone

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is potentially at increased risk for cancer, and positive screens warrant follow-up tests to rule out or diagnose cancer. It is unclear whether laypeople appreciate the nature of such tests. These tests are only recommended when the benefits (accurate detection/mortality reduction) outweigh the risks (overdiagnosis/overtreatment³), and evidence suggests that individuals overestimate screening benefits.^{3–5}

This study aims to better understand peoples' beliefs about cancer screening and whether individual characteristics, cancer beliefs, and cues to action are associated with these screening beliefs.⁶ The secondary aim is to determine whether there is an association between these beliefs and past self-reported cancer screening (Appendix Figure 1 provides conceptual framework).

METHODS

Study Population

Data came from the National Cancer Institute's Health Information National Trends Survey (HINTS 4, cycle 4)⁷, which is administered via mail (August–November 2014) to a nationally representative sample of non-institutionalized adults ($n=3,677$).⁸ Analyses were conducted between 2016 and 2017 and restricted to respondents who answered all cancer screening belief items ($n=3,351$).

Measures

Outcome variables were derived from the four-item module assessing cancer screening beliefs: *As far as you know, which of the following statements are true or false about medical tests or exams such as colonoscopies, mammograms, and Pap tests that check for early signs of cancer? (a) These tests can definitely tell that a person has cancer; (b) When a test finds something abnormal, more tests are needed to know if it is cancer; (c) When a test finds something abnormal, it is very likely cancer; (d) The harms of these tests and exams sometimes outweigh the benefits.*⁷ The total number of items (a–d) answered correctly and each item (a–d, independently) were assessed.

Independent variables included:

1. sociodemographics (age, gender, marital status, personal and family cancer history, race, employment, health insurance, education, imputed income, general health, most recent medical check-up, trust in cancer information sources);
2. cancer beliefs (*How likely are you to get cancer in your lifetime; It seems like everything causes cancer; There's not much you can do to lower your chances of cancer; There are so many different recommendations about preventing cancer, it's hard to know which ones to follow*); and
3. cues to action (patient-centered communication⁹ and three SDM measures: *Has a doctor ever told you... there are different tests, such as colonoscopy, sigmoidoscopy, or blood stool tests to detect colorectal cancer?; ... that you could choose whether or not to have the Pap test?; ...that you could choose whether or not to have a mammogram?*)¹⁰ (Appendix Figure 1).

Statistical Analysis

To directly estimate risk ratios, weighted generalized linear modeling was used with a Poisson family and log link¹¹ with Stata, version 14. Bivariate and multivariate associations were assessed among key independent and outcome variables. Independent variables were included in multivariable models if the bivariate association was $p < 0.05$. For analyses assessing SDM about colorectal, cervical, and breast screening, only screening eligible adults were included (colorectal: ages ≥ 50 years [$n=2,182$]; cervical: women ages 30–65 years [$n=1,258$]; and breast: women ages 50–74 [$n=927$]). Secondary analyses examined whether screening beliefs were related to women having had a mammogram within 2 years (aged 50–74 years) or Pap testing within 5 years (aged 30–65) using weighted generalized linear modeling.¹¹ Detailed information about colorectal or prostate screening was not collected in this HINTS cycle. For all analyses, complete case analysis was conducted, and complex probability sampling design was accounted for to obtain nationally representative estimates.

RESULTS

Only 5.6% ($n=189$) of respondents answered all screening questions correctly (Appendix Table 1). Across individual items, accuracy varied (Table 1). Most (91.5%) knew that follow-up tests are needed to know if an abnormal result is cancer. However, few (19.7%) respondents understood that screening test harms may outweigh the benefits. Factors associated with correctly answering each question varied, although some consistency emerged (Table 2, Appendix Table 2). Men, racial/ethnic minorities, lower education levels, and higher cancer fatalism (believing “there is not much you can do to prevent cancer”) were associated with less accurate screening beliefs. Conversely, reporting a family cancer history was associated with a higher likelihood of answering screening questions correctly. As perceived likelihood of being diagnosed with cancer decreased, likelihood of understanding that more tests are needed following an abnormal screen increased; this association held when controlling for other factors. Additional multivariable findings are presented in Table 2.

There were no significant associations between SDM measures for breast or cervical cancer screening and answering the cancer screening questions correctly. However, those who reported SDM for colorectal cancer (CRC) were more likely to answer correctly “when a test finds something abnormal, more tests are needed to know if it is cancer” and “when a test finds something abnormal, it is very likely to be cancer,” controlling for covariates (adjusted risk ratio=1.13, $p < 0.01$, adjusted risk ratio=1.25, $p < 0.01$). Further, SDM for CRC screening was associated with more accurate screening beliefs ($\beta=0.28$, $p < 0.01$). Accurate screening beliefs were not associated with likelihood of having a recent mammogram or Pap testing.

DISCUSSION

Respondents had low overall knowledge about cancer screening; particularly among men and underserved populations. These findings are supported by a body of literature that demonstrates low knowledge about cancer screening among these groups^{12,13–15} as well as

suboptimal screening uptake¹⁶ and follow-up.^{17,18} Although there was no association between beliefs and mammography and Pap testing uptake, low understanding of the harms and benefits of cancer screening could indicate that individuals often make decisions about screening based on an inaccurate understanding of these tests.

To improve understanding, SDM between patients and providers about screening tests may help. SDM about CRC screening may be associated with better understanding of the harms and benefits of cancer screening. Unlike mammography or Pap testing, undergoing routine CRC screening often involves choosing a CRC screening modality (e.g., colonoscopy, fecal occult blood test) in addition to deciding whether to be tested. Thus, patients and providers may spend more time discussing the harms and the benefits of each screening modality, such that patients have more accurate beliefs about the overall benefits and harms of cancer screening. Future studies could examine this explicitly. Although challenging, decision-support tools and team-based approaches may help increase the use of SDM in primary care settings.

Limitations

Although this national analysis describes individuals' understanding of cancer screening, HINTS did not include data necessary to examine CRC or prostate screening in the secondary analysis. In addition, SDM measures differed by cancer type, making it difficult to compare the association between reported SDM across different cancer screenings.¹⁹

CONCLUSIONS

Understanding relative harms to benefits of screening has the potential to improve informed decision making. Moving forward, opportunities to improve individuals' understanding of the accuracy and value of cancer screening should be considered, which may include SDM for cancer screening, particularly in cases like CRC, when multiple screening modalities must be discussed. SDM tools (e.g., decision aids) for CRC screening have been developed^{20–22}; future studies could focus on testing, adapting, and disseminating such evidence-based interventions more broadly, as well as examining longitudinal associations between beliefs and subsequent screening behavior.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Sheridan SL, Harris RP, Woolf SH. Shared Decision-Making Workgroup of the USPSTF. Shared decision making about screening and chemoprevention. a suggested approach from the U.S.

- Preventive Services Task Force. Am J Prev Med. 2004; 26(1):56–66. <https://doi.org/10.1016/j.amepre.2003.09.011>. [PubMed: 14700714]
2. Institute of Medicine. Crossing the Quality Chasm: A New Health System for the 21st Century. Washington, DC: 2001. <https://doi.org/10.17226/10027>
3. Woolf SH. The price of false beliefs: unrealistic expectations as a contributor to the health care crisis. Ann Fam Med. 2012; 10(6):491–494. <https://doi.org/10.1370/afm.1452>. [PubMed: 23149524]
4. Hudson B, Zarifeh A, Young L, Wells JE. Patients' expectations of screening and preventive treatments. Ann Fam Med. 2012; 10(6):495–502. <https://doi.org/10.1370/afm.1407>. [PubMed: 23149525]
5. Hoffmann TC, Del Mar C. Patients' expectations of the benefits and harms of treatments, screening, and tests: a systematic review. JAMA Intern Med. 2015; 175(2):274–286. <https://doi.org/10.1001/jamainternmed.2014.6016>. [PubMed: 25531451]
6. Hochbaum, G., Kegels, S., Rosenstock, I. Health belief model. U.S. Public Health Service; 1952.
7. [Accessed January 1, 2018] HINTS Health Information National Trends Survey. <https://hints.cancer.gov/.2017>
8. Westat. Health Information National Trends Survey 4 (HINTS 4): Cycle 4 Methodology Report. Rockville, MD: 2015.
9. Finney Rutten LJ, Agunwamba AA, Beckjord E, Hesse BW, Moser RP, Arora NK. The relation between having a usual source of care and ratings of care quality: Does patient-centered communication play a role? J Health Commun. 2015; 20(7):759–765. <https://doi.org/10.1080/10810730.2015.1018592>. [PubMed: 26010552]
10. Survey Instruments. [Accessed June 28, 2017] <https://hints.cancer.gov/instrument.aspx>. Published 2017
11. Zou G. A modified Poisson regression approach to prospective studies with binary data. Am J Epidemiol. 2004; 159(7):702–706. <https://doi.org/10.1093/aje/kwh090>. [PubMed: 15033648]
12. McAlearney AS, Reeves KW, Dickinson SL, et al. Racial differences in colorectal cancer screening practices and knowledge within a low-income population. Cancer. 2008; 112(2):391–398. <https://doi.org/10.1002/cncr.23156>. [PubMed: 18041073]
13. Ford JS, Coups EJ, Hay JL. Knowledge of colon cancer screening in a national probability sample in the United States. J Health Commun. 2006; 11(suppl 1):19–35. <https://doi.org/10.1080/10810730600637533>. [PubMed: 16641072]
14. James AS, Daley CM, Greiner KA. Knowledge and attitudes about colon cancer screening among African Americans. Am J Health Behav. 2011; 35(4):393–401. <https://doi.org/10.5993/AJHB.35.4.2>. [PubMed: 22040586]
15. Sach TH, Whynes DK. Men and women: beliefs about cancer and about screening. BMC Public Health. 2009; 9:431. <https://doi.org/10.1186/1471-2458-9-431>. [PubMed: 19930703]
16. Laiyemo AO, Doubeni C, Pinsky PF, et al. Race and colorectal cancer disparities: health-care utilization vs different cancer susceptibilities. J Natl Cancer Inst. 2010; 102(8):538–546. <https://doi.org/10.1093/jnci/djq068>. [PubMed: 20357245]
17. Nguyen KH, Pasick RJ, Stewart SL, Kerlikowske K, Karliner LS. Disparities in abnormal mammogram follow-up time for Asian women compared with non-Hispanic white women and between Asian ethnic groups. Cancer. 2017; 123(18):3468–3475. <https://doi.org/10.1002/cncr.30756>. [PubMed: 28603859]
18. Gupta S, Sussman DA, Doubeni CA, et al. Challenges and possible solutions to colorectal cancer screening for the underserved. J Natl Cancer Inst. 2014; 106(4):dju032. <https://doi.org/10.1093/jnci/dju032>. [PubMed: 24681602]
19. Jasem J, Fisher CM, Amini A, et al. The 21-gene recurrence score assay for node-positive, early-stage breast cancer and impact of RxPONDER trial on chemotherapy decision-making: Have clinicians already decided? J Natl Compr Canc Netw. 2017; 15(4):494–503. <https://doi.org/10.6004/jnccn.2017.0049>. [PubMed: 28404760]
20. Schroy PC 3rd, Emmons K, Peters E, et al. The impact of a novel computer-based decision aid on shared decision making for colorectal cancer screening: a randomized trial. Med Decis Making. 2011; 31(1):93–107. <https://doi.org/10.1177/0272989X10369007>. [PubMed: 20484090]

21. Dolan JG, Frisina S. Randomized controlled trial of a patient decision aid for colorectal cancer screening. *Med Decis Making*. 2002; 22(2):125–139. <https://doi.org/10.1177/02729890222063017>. [PubMed: 11958495]
22. Ruffin MT, Feters MD, Jimbo M. Preference-based electronic decision aid to promote colorectal cancer screening: results of a randomized controlled trial. *Prev Med*. 2007; 45(4):267–273. <https://doi.org/10.1016/j.ypmed.2007.07.003>. [PubMed: 17689600]

Table 1

Weighted Proportion of Respondents Who Answered Each Question About Cancer Screening Correctly

Question	% Correct ^a	95% CI
These tests can definitely tell that a person has cancer...(False)	71.5	69.0, 74.1
When a test finds something abnormal, more tests are needed to know if it is cancer...(True)	91.6	90.1, 93.0
When a test finds something abnormal, it is very likely to be cancer...(False)	34.5	31.8, 37.3
The harms of these tests and exams sometimes outweigh the benefits...(True)	19.7	16.7, 22.7

^aIncorrect and “Don’t know” responses were combined.

Table 2

Risk Ratio Results From Five Multivariable Regression Models^a

Variable	Total number correct	Q1: These tests can definitely tell if a person has cancer aRR n=2,794	Q2: When a test finds something abnormal, more tests are needed to know if it is cancer aRR n=2,864	Q3: When a test finds something abnormal, it is very likely to be cancer aRR n=2,938	Q4: The harms of these tests and exams sometimes outweigh the benefits aRR n=3,061
Male (vs female) ^c	Adjusted Beta ^b n=2,794 -0.27***	0.73**	0.95**	0.85***	-
Married (vs unmarried)	0.08	1.13	-	1.12*	-
Personal cancer history (vs none)	-	-	1.00	-	-
Family cancer history (vs none)	0.22**	1.34*	1.06**	1.10	-
Race (vs white)					
Non-Hispanic black	-0.20*	0.63*	0.94*	1.04	0.71*
Hispanic	-0.20*	0.58**	0.97	0.89	1.06
Non-Hispanic Asian	-0.34	0.8	0.88	0.69**	1.23
Non-Hispanic other	-0.03	1.15	0.97	0.92	0.98
Employed (vs unemployed)	-	1.12	-	-	-
Health insurance (vs uninsured)	0.15	1.24	1.09*	-	-
Education (vs less than high school)					
High school	0.08	2.04	-	1.12	1.06
Post high school	0.26*	2.33*	-	1.29*	1.2
College	0.23	2.72*	-	1.29*	0.83
Post college	0.35*	3.24**	-	1.22	1.28
Imputed income range ^d (vs <\$10,000)					
\$10,000–\$14,999	0.08	1.05	1.03	-	-
\$15,000–\$19,999	0.03	0.99	1.02	-	-
\$20,000–\$34,999	-0.23	0.78	0.9	-	-
\$35,000–\$49,999	0.03	1.00	1.03	-	-
\$50,000–\$74,999	0.04	1.08	1.00	-	-
\$75,000–\$99,999	0.02	1.09	0.99	-	-
\$100,000–\$199,999	0.12	1.15	1.02	-	-
>\$200,000	0.14	1.28	1.03	-	-

Variable	Total number correct	Q1: These tests can definitely tell if a person has cancer	Q2: When a test finds something abnormal, more tests are needed to know if it is cancer	Q3: When a test finds something abnormal, it is very likely to be cancer	Q4: The harms of these tests and exams sometimes outweigh the benefits
	Adjusted Beta ^b n=2,794	aRR n=2,794	aRR n=2,864	aRR n=2,938	aRR n=3,061
General health scale (1, excellent–5, poor)	–0.01	0.97	–	–	–
Health belief scales (1, strongly agree–4, strongly disagree)					
There's not much you can do to lower your chances of cancer	0.12**	1.13*	1.04*	1.09**	–
There are so many different recommendations about preventing cancer, it's hard to know which ones to follow	–	–	–	–	0.89
How likely are you to get cancer in your lifetime (1, very unlikely–5, very likely)	0.05	1.10	1.04**	–	–
Trust in cancer information sources scale ^d	–	0.88	–	–	–

Note: Boldface indicates statistical significance (* $p<0.05$; ** $p<0.01$; *** $p<0.001$).

^a Models examine multivariable associations with total number of correctly answered cancer screening questions and for answering each screening question correctly, adjusting for all other predictors found to be significant in bivariate analyses.

^b Linear regression models were used to examine associations with this outcome

^c "–" indicates that bivariate analyses were non-significant ($p \geq 0.05$) and therefore were not included in the multivariable model.

^d In a subpopulation of individuals who reported looking for information about health from family, friends/co-workers, doctor, Internet, newspapers, or magazines (n=2,163).
aRR, adjusted risk ratio