

The Connection Between Cancer Screening, Awareness, and Perceptions: Insights from the American Population

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Abstract

Cancer remains a major global public health challenge and is among the leading causes of disease burden in various countries. This study aimed to examine the relationship between key factors such as screening, awareness, and beliefs about cancer, a critical health issue. Data from the Health Information National Trends Survey (HINTS 6) were used to analyze responses from 6,252 American adults. Pearson correlation coefficient (r) was used to assess the association between cancer screening, awareness, and beliefs. The findings indicated moderate to strong correlations between these variables. A significant positive correlation was observed between concern about developing cancer and interest in screening ($r = 0.707$; $P < 0.001$), as well as between cancer prevention and factors such as treatment, screenings ($r = 0.608$; $P < 0.001$), and general health status ($r = 0.491$; $P < 0.001$). It is believed that increased screening programs and awareness initiatives have a beneficial effect on individual health behaviors. Consequently, developing effective strategies to promote cancer awareness and screening could contribute to substantial advances in public health and cancer prevention efforts.

Keywords: American population, Cancer screening, Cancer beliefs, Cancer awareness, Health behaviors

Introduction

Cancer represents a significant public health issue worldwide and stands as the second leading cause of death in the United States [1]. The growing incidence of cancer places immense physical, emotional, and economic strain on individuals, families, and healthcare systems. In nations with advanced healthcare services, survival outcomes for various cancer types can improve through timely detection, high-quality medical care, and comprehensive survivorship programs [2]. Increasing public knowledge, awareness, and understanding of cancer and available screening options is crucial for early detection and improved survival rates. Research has

shown that low levels of cancer awareness contribute to increased mortality and reduced survival, particularly within the Black American community. A lack of awareness often leads to delayed medical intervention, resulting in poorer health outcomes [3]. To address this issue, efforts should be directed toward fostering stronger beliefs about cancer and encouraging participation in screening programs, particularly for high-risk populations. However, numerous studies have identified barriers that hinder engagement with screening services. Cultural perspectives, attitudes toward cancer and screening, lack of healthcare access, communication challenges, skepticism toward medical institutions, and fatalistic viewpoints have all been cited as factors discouraging screening participation [4]. A review of existing studies suggests that individuals' beliefs about cancer play a critical role in shaping awareness and willingness to undergo screening. For instance, an investigation involving 108 participants examined cognitive and emotional perceptions of lung cancer and their inclination to seek screening via CT scans. Concerns such as fear of radiation exposure, fatalistic

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attitudes, and anxiety related to CT procedures were strongly associated with a reluctance to undergo screening. Additionally, differences in screening-related beliefs were noted between minority and non-minority participants [5].

Given that cognitive, emotional, and cultural influences significantly shape personal beliefs, and considering the close link between belief and behavior, this study examines how cancer-related beliefs impact awareness and participation in screening programs, particularly among cancer patients.

Materials and Methods

To ensure clarity in describing the study's methodological approach, this section is divided into distinct subsections.

Study period and location

Conducted between March 7 and November 8, 2022, this research aimed to collect 7,000 completed surveys across the United States. The study population comprised American respondents participating in the Health Information National Trends Survey (HINTS), overseen by the National Cancer Institute (NCI) [6].

Study approach

This study followed a descriptive cross-sectional design. It utilized a relational screening model, categorized under causal-comparative methods within the quantitative research framework. The research adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies (**Table 1**).

Table 1. STROBE statement—a checklist of items that should be included in reports of observational studies.

	Item No.	Recommendation	Page No.	Relevant text from the manuscript
Title and abstract	1	(a) Mention the study design using a widely recognized term in either the title or abstract.	269	
		(b) Ensure the abstract presents a well-structured and impartial summary of the research process and key findings.	269	
Introduction				
Background/rationale	2	Provide the scientific context and justification for the study.	269-270	
Objectives	3	Clearly define the study's objectives and state any predefined hypotheses.	269-270	
Methods				
Study design	4	Describe the principal aspects of the study design early in the manuscript.	270	
Setting	5	Detail the study setting, geographical locations, and relevant dates, including recruitment, exposure, follow-up, and data collection periods.	270	
Participants	6	(a) Cohort study—specify inclusion criteria, sources, and methods for selecting participants. Describe follow-up procedures. Case-control study—details inclusion criteria, sources, and methodology for selecting cases and controls. Explain the rationale behind selecting these groups. Cross-sectional study—outlines participant eligibility criteria and methods for participant selection.	270	
		(b) Cohort study—for studies with matching, specify matching criteria and the number of participants in exposed and unexposed groups. Case-control study—for matched designs, describe matching criteria and the ratio of cases to controls.	270	
Variables	7	Define all variables, including outcomes, exposures, predictors, confounding factors, and effect modifiers. Provide diagnostic criteria when relevant.	270	

Data sources/ measurement	8*	Identify data sources for each variable and explain the assessment methods used. If multiple groups exist, describe the comparability of measurement techniques.	270
Bias	9	Discuss efforts made to minimize potential biases.	270
Study size	10	Explain the rationale for determining the study sample size.	270
Quantitative variables	11	Describe how quantitative variables were analyzed and explain any grouping strategies used.	270
Statistical methods	12	(a) Provide a detailed explanation of statistical analyses, including methods for controlling confounding factors.	270
		(b) Describe any analyses performed to investigate subgroup effects and interactions.	270
		(c) Explain the approach taken to handle missing data.	270
		(d) Cohort study—describe how loss to follow-up was addressed. Case-control study—explain methods for case-control matching. Cross-sectional study—describe how the sampling strategy was incorporated into the analysis.	
		(e) Report any sensitivity analyses performed.	
Results			
Participants	13*	(a) Provide participant numbers for each stage of the study, including eligibility screening, inclusion, follow-up completion, and final analysis.	270-274
		(b) State reasons for non-participation at each stage.	270-274
		(c) Consider including a flowchart illustrating participant progression.	270-274
Descriptive data	14*	(a) Report participant characteristics, including demographic, clinical, and social factors, as well as exposures and potential confounders.	270
		(b) Indicate missing data for each relevant variable.	270-274
		(c) Cohort study—summarize the duration of follow-up (e.g., average and total time observed).	
Outcome data	15*	Cohort study—provide numbers of outcome events or relevant summary measures over time.	
		Case-control study—report distribution of exposure categories and summary statistics.	270-274
		Cross-sectional study—provide outcome event counts or summary measures.	270-274
Main results	16	(a) Present both unadjusted and adjusted estimates with measures of precision (e.g., 95% confidence intervals). State which confounders were adjusted for and why.	270-274
		(b) Define category boundaries when continuous variables are categorized.	270-274
		(c) Where applicable, translate relative risk estimates into absolute risks over a meaningful timeframe.	270-274
Other analyses	17	Report findings from any additional analyses, including subgroup analyses, interaction effects, and sensitivity assessments.	270-274

Discussion			
Key results	18	Summarise key results concerning study objectives	270-274
Limitations	19	Discuss study limitations, considering potential bias sources and imprecision. Include an assessment of their magnitude and direction.	270-274
Interpretation	20	Offer a careful interpretation of the results, acknowledging the study's objectives, limitations, multiple comparisons, relevant literature, and supporting evidence.	270-274
Generalisability	21	Evaluate the study's generalizability (external validity).	270-274
Other information			
Funding	22	Identify funding sources and clarify the role of funders in both the current and any preceding studies forming the basis of this research.	270-274

*In case-control studies, it is essential to present data separately for cases and controls. Similarly, in cohort and cross-sectional studies, information should be clearly distinguished between exposed and unexposed groups. For further methodological guidance and examples of transparent reporting, refer to the STROBE checklist, which can be accessed alongside an accompanying Explanation and Elaboration article available on various reputable websites, including PLoS Medicine (<http://www.plosmedicine.org/>), Annals of Internal Medicine (<http://www.annals.org/>), and Epidemiology (<http://www.epidem.com/>). More details regarding the STROBE Initiative are also available at www.strobe-statement.org.

Study participants

The participants were adults aged 18 years and older, residing in the United States, who were non-institutionalized civilians. They took part in the Health Information National Trends Survey (HINTS) conducted by the National Cancer Institute (NCI).

Sampling procedure and sample size

The sampling process for the HINTS 6 survey was structured in two stages. In the first stage, addresses were selected in a stratified manner from a residential address file. In the second stage, one adult from each household was randomly chosen for participation. The final study included a sample of 6,252 individuals.

Data collection methods

Data were gathered through the HINTS 6 survey, conducted by the NCI and published in 2023. This survey collected demographic data, including information on gender, age, employment status, marital status, education, ethnicity, income, health institution visitation

frequency, and self-assessed health. It also covered cancer-related knowledge, such as awareness of lung, cervical, colorectal cancers, and HPV, and assessed participants' perceptions of cancer risk.

Data analysis techniques

The data analysis involved calculating frequencies and percentages for demographic and categorical variables. The Pearson Correlation Coefficient was utilized to analyze relationships between variables. Statistical significance was determined with a two-sided p-value of <0.05 and a 95% confidence interval. All analyses were performed using Jamovi version 2.4 [7, 8].

Ethical considerations

As the study involved the use of de-identified publicly available data, ethical approval, and participant consent were not required.

Results and Discussion

Table 2. Results regarding the demographic information of the participants

	Variables	N	Total (%)
Gender	Missing data	410	6.6 %
	Male	2307	36.9 %
	Female	3535	56.5 %
Work full time	Missing data	412	6.6 %
	Yes	2778	44.4 %

	No	3062	49.0 %
	Missing data	390	6.2%
Occupation	Employed only	2761	44.16%
	Homemaker only	221	3.5%
	Student only	63	1.0%
	Retired only	1725	27.6%
	Disabled only	326	5.2%
	Multiple occupation statuses selected	473	7.6%
	Unemployed for one year or more only	148	2.4%
	Unemployed for less than one year only	101	1.6%
	Other occupation only	44	0.7%
Marital status	Missing data	415	6.6%
	Married	2624	42.0 %
	Living as married or living with a romantic partner	373	6.0 %
	Divorced	939	15.0 %
	Widowed	646	10.3 %
	Separated	136	2.2 %
	Single, never been married	1119	17.9 %
Education	Missing data	404	6.5%
	Less than eight years	116	1.9 %
	8 through 11 years	271	4.3 %
	12 years or completed high school	1068	17.1 %
	Post-high school training other than college vocational	433	6.9 %
	Some college	1239	19.8 %
	College graduate	1613	25.8 %
	Postgraduate	1108	17.7 %
Ethnicities	Missing data	644	10.3%
	Not Hispanic only	4607	73.7 %
	Mexican only	477	7.6 %
	Puerto Rican only	111	1.8 %
	Cuban only	41	0.7 %
	Other Hispanic only	331	5.3 %
	Multiple Hispanic ethnicities selected	41	0.7 %
Income ranges	Missing data	732	11.7%
	\$0 to \$9,999	389	6.2 %
	\$10,000 to \$14,999	304	4.9 %
	\$15,000 to \$19,999	266	4.3 %
	\$20,000 to \$34,999	729	11.7 %
	\$35,000 to \$49,999	732	11.7 %
	\$50,000 to \$74,999	937	15.0 %
	\$75,000 to \$99,999	694	11.1 %

	\$100,000 to \$199,999	1012	16.2 %
	\$200,000 or more	457	7.3 %
	Missing data	485	7.8%
Income feelings	Living comfortably on present income	2518	40.3 %
	Getting by on present income	2140	34.2 %
	Finding it difficult on present income	763	12.2 %
	Finding it very difficult on present income	346	5.5 %
	Missing data	117	1.9%
	None	698	11.2 %
	One time	862	13.8 %
Frequencies go, provider	Two times	1165	18.6 %
	Three times	973	15.6 %
	Four times	881	14.1 %
	5-9 times	962	15.4 %
	Ten or more times	594	9.5 %
	Missing data	234	3.7%
	Excellent	600	9.6 %
General health statues	Very good	2081	33.3 %
	Good	2249	36.0 %
	Fair	932	14.9 %
	Poor	156	2.5 %

The participants were predominantly women, with a higher proportion not working compared to those employed full-time. Among the employed, many were either working or retired. Most of the participants were married, had a college degree, and were not of Hispanic

origin. Regarding income, the majority earned between \$100,000 and \$200,000 annually and felt financially secure. Additionally, most participants sought healthcare services at least twice a year, and their general health was reported as good or excellent (**Table 2**).

Table 3. Participants results regarding cancer screening and awareness levels

	Variables	n
Has a healthcare provider ever discussed lung cancer screening with you?	Missing data	389
	I have never heard of this test	1408
	Yes	261
	No	3955
	Do not know	239
When was the last time you had a Pap test for cervical cancer?	Missing data	549
	Inapplicable, coded 1 in birth-gender	1069
	A year ago or less	1148
	More than 1, up to 2 years ago	605
	More than 2, up to 3 years ago	424
	More than 3, up to 5 years ago	287
	More than five years ago	829
	I have never had a Pap test	169

	I am male (Web only)	1172
	Missing data	454
Has a doctor or other healthcare professional ever informed you that there are various tests available for detecting colorectal cancer?	Yes	3011
	No	1379
	I have never discussed these tests with a doctor, or other he	1408
	Missing data	
Are you familiar with HPV?	Yes	3942
	No	1945
	Missing data	585
Do you believe that HPV can lead to cervical cancer?	Inapplicable, coded 2 in heard HPV	1753
	Yes	2468
	No	63
	Not sure	1383
	Missing data	417
Before today, were you aware of the cervical cancer vaccine or the HPV shot?	Yes	3730
	No	2105
	Missing data	

A considerable proportion of participants noted that they had not consulted a healthcare provider about lung cancer screening. Meanwhile, 18.4% of the female participants indicated they had undergone a Pap test for cervical cancer within the past year or more recently. Most participants shared that they were informed by a medical

professional about various tests available for detecting colorectal cancer. Additionally, a large number of participants reported being aware of HPV, believed it could cause cervical cancer, and had received information about the HPV vaccine or cervical cancer shot (**Table 3**).

Table 4. Relationship between cancer screening, awareness, and cancer beliefs (n = 6552)

Variables	N	Total (%)
	Missing data	91 1.5 %
	I already had cancer	562 9.0 %
How likely do you think it is that you will develop cancer compared to others of your age?	Very unlikely	482 7.7 %
	Unlikely	678 10.8 %
	Neither likely nor unlikely	1636 26.2 %
	Likely	905 14.5 %
	Very likely	287 4.6 %
	I do not know	1304 20.9 %

The majority of participants selected “neither likely nor unlikely” when asked about their perceived risk of

developing cancer compared to others of the same age (**Table 4**).

Table 5. Mean and standard deviation values for continuous variables for participants

	InterestedCaScreening	FreqWorryCancer	P3_ Total	P4_ Total	P5_ Total	P6_ Total	Genera I health	Age
N	6252	6252	6252	6252	6252	6252	6252	6252
Mean	2.40	2.04	7.07	3.49	7.95	3.61	2.28	54.6

Standard deviation	2.82	2.75	10.4	5.41	12.8	5.52	2.14	19.1
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InterestedCaScreening: Expressing an intention to undergo a cancer screening test within the coming year.

FreqWorryCancer: Concerned about the possibility of developing cancer.

P3_Total: Belief that all factors contribute to cancer, prevention is unattainable, there are excessive recommendations, and cancer is ultimately fatal.

P4_Total: Perception that sugary sodas contribute to cancer, as does alcohol consumption.

P5_Total: Association of cancer risk with overconsumption of processed meats, red meats, and fast foods, alongside insufficient intake of fruits and vegetables and inadequate sleep.

P6_Total: Views on the progression of cancer prevention and treatment advancements.

It appeared that only a small number of participants had experienced cancer, with nearly half expressing an interest in undergoing cancer screening tests. A minimal proportion of participants reported concerns about developing cancer. The majority of participants held the belief that cancer could be caused by nearly anything, that its prevention is impossible, that there are countless

recommendations regarding it, and that it is ultimately a fatal illness. A significant number of participants identified factors such as soda, sugar, alcohol, excessive consumption of processed meats, red meats, fast food, insufficient fruit and vegetable intake, and inadequate sleep as contributors to the risk of cancer (**Table 5**).

Table 6. Relationship between cancer screening, awareness, and cancer beliefs (n = 6552)

		Interested Ca Screening	FreqWorry Cancer	P3_Total	P4_Total	P5_Total	P6_Total	General health
InterestedCaScreening	Pearson's r	1						
	P-value							
FreqWorryCancer	Pearson's r	0.707***	1					
	P-value	< .001						
P3_Total	Pearson's r	0.688***	0.741***	1				
	P-value	< .001	< .001					
P4_Total	Pearson's r	0.626***	0.665***	0.776***	1			
	P-value	< .001	< .001	< .001				
P5_Total	Pearson's r	0.648***	0.686***	0.802***	0.875***	1		
	P-value	< .001	< .001	< .001	< .001			
P6_Total	Pearson's r	0.608***	0.665***	0.738***	0.777***	0.838***	1	
	P-value	< .001	< .001	< .001	< .001	< .001		
general health	Pearson's r	0.491***	0.505***	0.487***	0.490***	0.510***	0.488***	1
	P-value	< .001	< .001	< .001	< .001	< .001	< .001	

*P < 0.05; **P < 0.01; ***P < 0.001; InterestedCaScreening: Interested in having a cancer screening test in the next year;

FreqWorryCancer: Concerned about the likelihood of developing cancer.

P3_Total: Belief that nearly everything leads to cancer, prevention is unattainable, there are overwhelming amounts of cancer advice, and cancer is ultimately incurable.

P4_Total: Perception that sugary sodas and alcohol consumption increase the risk of cancer.

P5_Total: Association of cancer risk with excessive intake of processed meats, red meats, fast food, insufficient consumption of fruits and vegetables, and lack of adequate sleep.

P6_Total: Views on the advancements in cancer prevention and treatment.

A significant positive association was observed between individuals' interest in cancer screening and their concern about the possibility of developing cancer ($r = 0.707$; $P < 0.001$). Additionally, a strong correlation was found

between the combination of beliefs that everything causes cancer, prevention is not feasible, there is an overload of cancer-related recommendations, cancer is an incurable disease, and the willingness to pursue cancer

screening ($r = 0.688$; $P < 0.001$). A noteworthy positive relationship emerged between the belief that cancer risk is heightened by the consumption of soda, sugar, and alcohol and the interest in undergoing cancer screening ($r = 0.626$; $P < 0.001$). Furthermore, a positive link was identified between cancer and a composite variable that included excessive intake of processed meats, red meat, fast food, insufficient fruit and vegetable consumption, and poor sleep habits ($r = 0.648$; $P < 0.001$). Lastly, a strong positive correlation was found between cancer prevention, cancer treatments, and cancer screenings ($r = 0.608$; $P < 0.001$), as well as with general health status ($r = 0.491$; $P < 0.001$) (**Table 6**).

The study analyzed the responses of 6252 American adults regarding their cancer screening habits, awareness of cancer, and beliefs surrounding the disease. While similar studies have been conducted, they tend to focus on smaller, specific patient populations, which sets this research apart. For example, Tarı Selçuk *et al.* [9] focused specifically on women over the age of 40 years, whereas this study used a broader sample representing the U.S. population.

The findings of this study are largely consistent with existing research. It confirmed a strong positive link between individuals' concerns about developing cancer and their willingness to participate in cancer screening ($r = 0.707$; $P < 0.001$). Moreover, a moderate to strong relationship between cancer screening and other variables was established. Furthermore, the study found a significant connection between cancer prevention, cancer treatments, cancer screenings ($r = 0.608$; $P < 0.001$), and general health status ($r = 0.491$; $P < 0.001$). These results are consistent with Maladze *et al.* [10], who observed positive attitudes toward cancer prevention and screening, although they also noted concerns about the effectiveness of cancer treatments. Özdemir *et al.* [11] found that prostate cancer patients had limited knowledge of screening practices, moderate awareness of cancer's seriousness, and a high degree of health motivation. Lin *et al.* [12] also found that factors like age and socioeconomic status played a role in promoting more positive attitudes and a higher level of knowledge about cancer screening.

The positive link between cancer screening interest and cancer-related concern ($r = 0.707$; $P < 0.001$) was supported by research from Kong *et al.* [13], which demonstrated that individuals concerned about cancer were more likely to participate in screening programs.

Their findings highlighted that failure to engage in screening due to these concerns could result in late-stage cancer diagnoses and poorer outcomes. Similarly, Katherine *et al.* [14] noted that individuals with low engagement in cancer screening were more likely to report feeling overwhelmed by cancer-related information, adopting fatalistic views, and lacking knowledge of cancer prevention [14].

In addition to studies within the U.S., there have been cross-cultural studies on cancer screening and attitudes. Kam and Kenny [15] explored how Chinese cultural beliefs significantly shape cancer-related perceptions. In another study, McGregor *et al.* [16] showed that the inclusion of narrative brochures could positively influence attitudes toward cancer screening. Overall, the findings of this study suggest that cancer awareness, screening rates, and cancer-related beliefs are generally high and interrelated in the American population.

Conclusion

This research explored the connections between cancer screening, cancer awareness, and beliefs about cancer among the American population, using data from 6252 adults. The results indicated a strong positive correlation between cancer prevention, cancer treatments, cancer screening, and overall health status. Additionally, it was found that many participants held beliefs such as the idea that everything leads to cancer, cancer cannot be prevented, and there is an overload of recommendations. The study also revealed that individuals who were more inclined to undergo cancer screening were more concerned about the risks of cancer and had a greater interest in maintaining their general health. These findings suggest that increasing efforts toward cancer screening and enhancing cancer awareness could positively influence individuals' health behaviors. Based on the findings, the following recommendations are proposed:

- Cancer screening campaigns and educational programs should be widely available to the public.
- Activities aimed at correcting misconceptions about cancer and emphasizing the importance of early detection should be promoted.
- Public health policies should prioritize strategies to enhance cancer screening and awareness.

- Initiatives to improve cancer screening and awareness must be tailored to address ethnic and socioeconomic disparities.

By implementing these suggestions, community health behaviors could be improved, leading to significant progress in the fight against cancer by boosting cancer screening and awareness.

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