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Trust in national health information sources in the United States: comparing predictors and levels of trust across three health domains

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Abstract

Public trust in traditional sources of health information is essential for public health agencies and organizations to perform necessary public health functions. Little research has examined levels and predictors of trust in government health agencies and national health organizations. Additionally, few studies have simultaneously analyzed trust in multiple health topics. The major aim of this study was to compare levels and factors associated with trust in national health sources across three health topics: information about tobacco, electronic cigarettes, and general health. Data from two cycles of the National Cancer Institute's Health Information National Trends Survey collected in 2015 and 2017 were merged and analyzed for this study (n = 5,474). A series of weighted multivariable logistic regression models calculated odds of high trust in government health agencies and health organizations for each health topic. More respondents reported high trust in health organizations than for government health agencies across all topics. More participants reported high trust in these sources tobacco information, as compared to general health or e-cigarette information. Logistic models found that those higher in information seeking confidence were more likely to report high trust across all models. Other demographic variables were inconsistent predictors of trust across topics. This study highlights inconsistent sociodemographic predictors of trust across multiple health topics and national health sources. Researchers, practitioners, and policymakers should consider the unique context of specific health topics in health promotion campaigns, partner with existing community-based organizations, and encourage and enable health information seeking.

Keywords

National health information sources, Trust, Confidence in health information seeking, Tobacco

Implications

Practice: The formative research phase of national health communication campaigns should carefully evaluate source trust in a specific context and, when appropriate, collaborate with community-based organizations with an established history of trust.

Policy: Resources directed toward better understanding the public's trust in national health information sources is essential for government health agencies and national health organizations to effectively disseminate health information.

Research: Future research is needed to further examine the relationship between confidence in health information seeking and trust in national health organizations.

INTRODUCTION

In recent years, there has been a growing body of public health research focused on understanding predictors and outcomes of trust in sources of health information [1–3]. Findings from diverse health contexts suggest that trust in health organizations and government health agencies—such as the National Institutes of Health (NIH), the U.S. Food & Drug Administration (FDA), and the Centers for Disease Control and Prevention (CDC)—play a critical role in health-related decision making and behaviors. In public health emergencies, such as an influenza outbreak or a bioterrorism attack, individuals who report high trust in government health agencies respond more quickly and are more likely to comply with the health recommendations provided by the agencies [4–6]. Trust in government health agencies is also associated with routine health outcomes, such as seasonal and pediatric vaccination uptake, medical adherence, and fewer emergency room visits [7–9]. In all, the research suggests that maintaining public trust is essential for public health researchers, communicators, and practitioners to effectively disseminate health information and perform necessary public health functions in society.

While the ways that trust has been conceptualized and operationalized differ widely across disciplines, it can generally be thought of as a heuristic that occurs when an individual experiences uncertainty, and it typically plays a more prominent role in decision making when individuals feel vulnerable [10,11]. As a theoretical construct, trust is complex and multidimensional and is most commonly thought to include

elements of perceived competence, honesty, and concern [12].

Much of the empirical research reviewing trust in the public health context has examined the predictors and outcomes of *interpersonal* trust for health information (e.g., trust in a personal health care provider [13]). However, there has been less empirical attention paid to public trust in national health organizations—defined as government health agencies (e.g., FDA, NIH, CDC) and nongovernment national health organizations (e.g., American Cancer Society)—that are comprised primarily of highly educated health clinicians, professionals, and researchers [14]. Conceptually, trust in national health organizations is unique as it requires a reliance on unknown individuals and broader organizations and entities [15]. Additional research understanding predictors of trust in these organizations is warranted for several reasons. First, government health agencies are charged with acquiring and disseminating evidence-based health information to the public through public health campaigns, national health guidelines, and published research [16]. The degree to which they can accomplish these missions is largely dependent on the extent to which they are perceived as trustworthy and competent by the public. For example, smokers who trust the FDA and CDC will likely be more inclined to favorably respond to messages from tobacco-focused public health campaigns, such as *Every Try Counts* and *Tips from Former Smokers* [17].

Moreover, as national health organizations often provide the context of interpersonal healthcare interactions, understanding the predictors of trust in these organizations can inform future research on why individuals may choose to (mis)trust those they may see as representatives of these organizations. Consider the example of a parent who does not adhere to a healthcare provider's recommendation for pediatric immunization. It is possible that her decision was based not only on interpersonal and communication factors between her and her provider, but also a mistrust in the guidelines developed and disseminated by the health organizations from which the provider's recommendation originated [8].

Traditionally, Americans have trusted national health agencies and organizations to inform health decisions when their personal health knowledge is limited. However, recent studies suggest this trust may be declining in some communities [18]. There are several factors that may be influencing this decline. First, polarizing or sensationalized media coverage involving cases where public health officials have modified or reversed recommendations, such as evolving mammography guidelines, may lead to confusion and disintegration of trust [2]. Additionally, perceptions of financial involvement of lobbyist groups, pharmaceutical companies, and the tobacco industry may influence how forthcoming or honest individuals perceive health expert systems are being with the current evidence base [8].

Finally, lay access to on-line scientific (mis)information and the "democratization" of health information via social media has exploded in recent years [19,20]. While the literature has reported positive health outcomes of these technological advances, this rapid increase of accessibility may also lead to confusion and subsequent loss of trust when individuals are exposed to misinformation that contradicts recommendations received from national health sources [21,22].

Limited research specific to trust and perceived credibility of national health organizations paint a murky picture as to sociodemographic predictors of trust. One explanation for inconsistent predictors of trust found in the extant literature is that source trust may vary widely depending on personal saliency and the social or political context of the topic at hand. For example, two studies from the same sample analyzed predictors of trust in the FDA [17,23]. The first study, which focused on overall trust in the agency, found only income status to be significantly predictive of high trust. The second study, which asked specifically about the FDA's role as a tobacco regulator (e.g., "Do you trust the FDA to inform the public about the risks of tobacco products?") found other demographic predictors (being male, older age, and African American) associated with lower trust and perceived credibility of the FDA in this role [23]. These findings are consistent with conceptualizing trust as a nuanced, multidimensional concept, where specific predictors may be more relevant for some topics than others. Similarly, information sources may be perceived to be more competent or have more knowledge for topics in which there is a perceived medical consensus (e.g., conventional tobacco products) than for topics that are relatively novel or controversial (e.g., electronic cigarettes).

Outside of sociodemographic predictors of trust, there is some evidence to suggest that the degree to which an individual feels confident that she can locate and access information to make health decisions is related to trust in information sources and channels [24]. Related work has suggested a positive relationship between composite measures of health literacy and trust in information from government health agencies [24]. In another qualitative study among low health-literate parents, participants reported frustration with their health information searches, and sometimes relied on heuristics (e.g., search engine result placement) to determine information credibility [25]. The same participants also reported avoiding all ".gov" websites in their health information seeking, as they both perceived the information to be too complex and had concerns about perceived influence of corporations

on government-provided information. This suggests that low confidence in information seeking may be associated with decreased trust in national sources of health information, much of which is accessed online, but this has yet to be assessed at a population level.

Previous work has focused on trust in channels of health information (e.g., Internet, radio) [26] or trust examined in relation to a specific source (e.g., FDA [17]). However, there have been few empirical studies that have simultaneously examined trust in several health domains to analyze the degree to which predictors of trust differ across contexts, and no studies looking at contextual differences in trust in government health agencies or health organizations. Such work is necessary to better understand if there are characteristics that consistently explain low trust across multiple health topics, and if the public perceives government health agencies and nongovernment health organizations similarly. Furthermore, most research examining trust in national health organizations has focused either on emergency public health situations [4–6] or vaccination uptake [8,9]. Whether predictors of trust differ for topics focused on lifestyle behaviors, such as tobacco use, has yet to be examined.

To address these research gaps, this study analyzes two recent iterations of a nationally representative survey to identify and compare factors associated with trust in national health organizations across three distinct health topics: (a) general/health medical topics, (b) health effects of tobacco, and (c) the health effects of electronic cigarettes. Levels and predictors of trust in national health information sources—namely, government health agencies and health organizations—will be analyzed and compared.

METHODS

Data from two cycles of the National Cancer Institute's Health Information National Trends Survey, fielded in collaboration with the US Food and Drug Administration (HINTS-FDA), were merged and analyzed for this study (n = 5,500). HINTS-FDA-2015 was fielded May–September 2015, and HINTS-FDA-2017 was fielded January–May 2017. These cycles of HINTS were selected for analysis as they were recently fielded and are the only cycles that assess trust in sources of health information across multiple health contexts.

Both surveys utilized a self-administered paper survey mailed to a noninstitutionalized adult population in the USA. Response rates were comparable to other mailed surveys: 33.04% for HINTS-FDA 2015, and 34.05% for HINTS-FDA-2017. Efforts were made in both surveys to increase the number of current tobacco users by oversampling counties with high and medium-high smoking rates. Details about sampling strategy and study methodology can be found elsewhere [27].

Measures

Trust in National Health Organizations

Participants' level of trust was assessed using three items. The first asked "In general, how much would you trust information about health or medical topics from each of the following?" The second item queried: "In general, how much would you trust information about the health effects of using tobacco from each of the following?" The final item asked: "In general, how much would you trust information about the health effects of electronic cigarettes from each of the following?"

We analyzed data for two of the health sources included in each of these items: first, "government health agencies (e.g., the Food and Drug Administration (FDA), National Institutes of Health (NIH), or Centers for Disease Control and Prevention (CDC)" and second, "health organizations or groups (such as the American Cancer Society, American Lung Association, or others)." Respondents indicated their trust using a 4-point ordinal scale (1 *a lot,* 2 *some,* 3 *a little,* or 4 *not at all*). Consistent with previous analyses using this item (e.g., [28]), high source trust was dichotomized as "a lot" as opposed to all other responses (*some*, *a little*, or *not at all*). This dichotomized split at "a lot" was also chosen to understand the differences between those who have high levels of trust in national sources of health information compared to those who report some hesitancy to instill trust in these sources. Individuals with less than high trust likely still have some doubt, skepticism, or mistrust that may preclude them from taking health actions recommended by these national health sources.

Cigarette smoking status

An individual's smoking status was classified based on their responses to two items: "Have you smoked at least 100 cigarettes in your entire life?" *(yes, no)* and "Do you now smoke cigarettes every day, some days, or not at all?" The following criteria were applied to define three categories: *never smokers* who had not smoked 100 cigarettes in their lifetime; *former smokers* who had smoked at least 100 lifetime cigarettes but do not currently smoke; and *current smokers* who have smoked at least 100 cigarettes and currently smoke either every day or some days.

Confidence in obtaining health information

Confidence in obtaining health information about tobacco was assessed using one item: "Overall, how confident are you that you could get *health* information about tobacco products if you needed it?" Response options ranged from 1 *Completely confident* to 5 *Not confident at all*. The item was recoded so

that a higher value indicated higher confidence in obtaining health information about tobacco.

Sociodemographic variables

We included sociodemographic variables, including education, race, ethnicity, age, sex, and rural designation using the 2013 USDA Rural-Urban Continuum Codes [29].

Statistical analysis

Analyses were conducted with SAS 9.3 using replicate weights. To account for the complex study design and allow for generalizable, nationally representative data, jackknife replicate weights were applied to all analyses. First, descriptive statistics were conducted to determine prevalence of trust across topics and sources. Next, we conducted a series of dependent sample *t*-tests to assess if there were significant differences in the proportion of respondents who reported "a lot" of trust between health organizations and government health agencies for each health context. Finally, a series of weighted multivariable logistic regression models calculated odds of high trust in each health domain for government health agencies and health organizations individually. Tests of statistical significance were calculated at $p < .05$. Complete case analysis with listwise deletion was utilized for all regression models.

RESULTS

Participant characteristics

A total of 5,474 participants were included in the full survey sample. More than half of participants were female (51.20%), non-Hispanic White (64.70%), and lived in an urban area (85.31%). About a quarter of participants (24.45%) were former smokers, and fewer (14.69%) were current smokers. More than half of participants (60.86%) had no smoking history. Full sample characteristics are provided in Table 1.

Levels of trust across organizations and topics

Table 2 displays unadjusted frequencies and weighted percentages of participants' level of trust in government health agencies and health organizations across three health contexts: general health and medical topics, health effects of tobacco, and health effects of electronic cigarettes. We next turned specifically to those reporting high ("a lot") of trust in these organizations across the contexts. The bolded row in Table 2 summarizes the weighted percentage of the public with high trust in government health agencies and health organizations across the three health topics. In each health domain, significantly more Americans reported high trust in health organizations than government health agencies. Specifically, dependent *t*-tests using weighted percentages were significant for general health information ($t = 3.96$, $p < .001$), information about tobacco ($t = 5.17$, $p < .001$), and information about electronic cigarettes ($t = 5.59$, $p < .001$).

Regression analyses

We next conducted a series of multivariable logistic regression models, modeling predictors of high trust in each source separately across three health domains (Table 2). We found that those who reported less confidence in their ability to obtain tobacco health information consistently had lower odds of high trust in both government health agencies and nongovernment organizations, as compared to those who reported being "completely" confident in their ability. Specifically, individuals who reported being "not confident at all" in obtaining health information had the lowest odds of trust in government health agencies for general health and medical topics (odds ratio [OR] = 0.30, confidence interval [CI]: 0.18–0.50), health effects of tobacco (OR = 0.26, CI: 0.16–0.48), and health effects of electronic cigarettes (OR = 0.18, CI: 0.10–0.31). Results followed the same pattern for trust in nongovernment health organizations across the same contexts: general health and medical topics (OR = 0.31, CI: 0.19–0.50), health effects of tobacco (OR = 0.30, CI: 0.19–0.48), and health effects of electronic cigarettes (OR = 0.25, CI: 0.15–0.41). We saw a fine gradation of effect, wherein those with differing levels of confidence in information seeking were significantly less likely to report high trust in national health information sources than those who reported the highest level of confidence in health information seeking (Table 3).

Demographic predictor variables were inconsistent as predictors of high trust across domains and sources. For example, females reported higher odds of trust for general health and medical topics for government health agencies (OR = 1.32, CI: 1.02–1.69) and health organizations (OR = 1.30 CI: 1.04–1.64), higher odds of trust *only* for government health agencies in the context of health effects of e-cigarettes (OR = 1.37, CI: 1.08–1.73), and no significant difference in either system for the health effects of tobacco. Additionally, education was a significant predictor only in the context of general health and medical topics, where respondents with less education reported significantly lower odds of trust than respondents with a college degree.

Turning specifically to predictors of trust in tobacco-related information, as compared to non-Hispanic Whites, non-Hispanic Black respondents reported significant higher odds of trust for health organizations in both tobacco-related contexts, and higher odds of trust in government health agencies for the health effects of tobacco (OR = 1.99, CI: 1.08–3.66). Smoking status was only a significant predictor in the context of health effects

Table 1 | Frequencies and weighted percentages of participants' sociodemographic characteristics (Health Information National Trends Survey, 2015 and 2017).

Variable	Full sample *N* = 5,474
Sex (*n* = 5,104)	
Male	2,171 (48.80%)
Female	2,933 (51.200%)
Race/Ethnicity (n=4,935)	
Non-Hispanic White	3,845 (64.70%)
Non-Hispanic Black	333 (11.24%)
Hispanic	374 (16.02%)
Other[a]	383 (8.05%)
Age (*n* = 5,184)	
18–34	712 (27.53%)
35–49	944 (27.20%)
50–64	1,658 (26.21%)
65 and older	1,870 (19.06%)
Education (*n* = 5,354)	
Less than high school	321 (8.40%)
High school graduate	1,054 (23.08%)
Some college/vocational training	1,580 (33.17%)
College graduate	2,399 (35.36%)
Smoking Status (*n* = 5,333)	
Current smoker	700 (14.69%)
Former smoker	1,629 (24.45%)
Never smoker	3,004 (60.86%)
Rural Designation[b] (*n* = 5,474)	
Urban	4,257 (85.31%)
Rural	1,217 (14.69%)
Confidence in Obtaining Health Information about Tobacco	
Not confident at all	479 (8.36%)
A little confident	375 (5.15%)
Somewhat confident	1,215 (22.61%)
Very confident	1,483 (27.07%)
Completely confident	1,681 (36.82%)

[a]Non-Hispanic "other race" combines low-frequency responses for American Indian/Alaska Native, Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, other Asian, Native Hawaiian, Guamanian or Chamorro, Samoan, and other Pacific Islander.
[b]Rural and urban designations were calculated using nonmetropolitan and metropolitan Rural Urban Continuum Codes (RUCC 2013).

of electronic cigarettes –as compared to never smokers, current (OR = 0.54, CI: 0.35–0.82) and former (OR = 0.64, 0.50–0.83) smokers reported lower odds of trust for government health agencies. Other sociodemographic predictors were inconsistently associated with trust—for example, individuals living in rural areas did not report lower trust in government health agencies and reported lower trust in health organizations only for information about tobacco (OR = 0.77, CI: 0.61–0.98) and general health (OR = 0.62, CI: 0.47–0.82).

DISCUSSION

This study compared levels and predictors of high trust in two national health information sources—government health agencies and nongovernment health organizations—across three topical domains. Overall, findings generally suggest a moderate amount of high public trust in government health agencies, ranging from 34% for general health and medical topics to 40.8% for the health effects of tobacco. More respondents reported high trust in nongovernment health organizations across all contexts, ranging from 40.61 to 44.6%. One potential explanation for fewer respondents reporting high trust in government health agencies as compared to health organizations may be that some individuals perceive that the regulatory authority of government excessively interferes or has undue influence on individual autonomy and choice [30]. Nongovernment health organizations may be immune from this negative perception and scrutiny.

When comparing levels of trust in the two tobacco contexts, our findings are consistent with conceptualizing perceived expertise as a major dimension of trust. More respondents reported high trust in

Table 2 | Unadjusted frequencies and weighted percentages of trust in government health agencies and health organizations across three health contexts (Health Information National Trends Survey, 2015 and 2017)

Amount of reported trust	General health and medical topics		Health effects of tobacco		Health effects of electronic cigarettes	
	Government health agencies (n = 5,296)[a]	Health organizations (n = 5,281)[b]	Government health agencies (n = 5,219)	Health organizations (n = 5,212)	Government health agencies (n = 5,222)	Health organizations (n = 5,205)
A lot	**1,769 (34.54)**	**1,937 (40.61)**	**2,031 (40.78)**	**2,206 (44.60)**	**1,843 (36.79)**	**2,022 (41.93)**
Some	2,289 (40.91)	2,295 (39.16)	1,960 (36.23)	1,854 (34.47)	1,900 (35.36)	1,825 (33.04)
A little	942 (19.06)	826 (16.02)	794 (14.92)	757 (13.97)	902 (16.80)	861 (15.88)
None	296 (5.49)	223 (4.21)	434 (8.07)	395 (6.96)	577 (11.06)	497 (9.15)

The "a lot" line is bolded in the table as the multivariable logistic regression models in Table 3 specifically examine predictors of "a lot" of trust as compared to the three other response options.
[a]Defined as "government health agencies (e.g., the Food and Drug Administration (FDA), National Institutes of Health (NIH), or Centers for Disease Control and Prevention (CDC)."
[b]Defined as "health organizations or groups (such as the American Cancer Society, American Lung Association, or others)."

information about tobacco than information about e-cigarettes for both sources (government health agencies and health organizations). While over 50 years of medical research have generated sufficient evidence to infer a causal relationship between conventional tobacco use and severe health consequences [31], the long-term health consequences of electronic cigarettes are not yet fully understood by medical and scientific communities [32]. Individuals may be less likely to trust information about electronic cigarettes that come from medical or scientific sources due to perception of low knowledge about the devices among national health information sources.

When analyzing individual-level predictors of high trust, those who had low levels of confidence in health information seeking consistently had significantly lower odds of high trust across all topics and both sources. This finding is consistent with a systematic review of 38 articles, which concluded in part that individuals who had low confidence related to finding and evaluating online health information to were less likely to trust online health information generally [33]. Given the large amount of medical research about the health effects of tobacco [31], it is likely that low confidence in health information seeking is not a result of a lack of available information, but rather due to a perceived inability to effectively locate and use available information. While causality cannot be determined in this cross-sectional survey analysis, it is possible that lower trust may occur when individuals have difficulty finding, evaluating, and distinguishing between expert and nonexpert resources for health information. An alternative explanation is that individuals who do not trust national health information sources may find it difficult to access evidence-based health information from other sources. Either way, the strong association between trust and confidence in information seeking indicates that individuals who may benefit the most from the dissemination of health information from national health information sources are also the individuals that are *least* likely to trust these sources.

Outside of confidence in information seeking, few other consistent sociodemographic predictors emerged across the three health topics. These results suggest that an individual's high trust in national health information sources is not unconditional; that is, predictors of high trust in one topic does not necessarily translate into high trust in another topic. These results can help explain inconsistent predictors of trust in health national health information sources from previous studies.

As an example, we found that African Americans have higher trust than their Non-Hispanic White counterparts in national health information sources regarding tobacco-related health issues, but not for general health. Concerted educational efforts have

Table 3 | Weighted multivariable logistic regression models displaying predictors of high trust[a] across contexts and sources (Health Information National Trends Survey 2015 and 2017, *N* = 4,228)

Variable	General health and medical topics		Health effects of tobacco		Health effects of electronic cigarettes	
	Government health agencies[c] (OR, 95% CI)	Health organizations[d]	Government health agencies	Health organizations	Government health agencies	Health organizations
Sex						
Female	1.32 (1.02–1.69)*	1.30 (1.04–1.64)*	1.17 (0.92–1.48)	1.22 (0.99–1.52)	1.37 (1.08–1.73)*	1.21 (0.97–1.50)
Male (ref)	Ref	Ref	Ref	Ref	Ref	Ref
Race/Ethnicity						
Non-Hispanic Black	1.05 (0.60–1.84)	1.44 (0.77–2.70)	1.99 (1.08–3.66)*	2.01 (1.18–3.45)*	1.68 (0.94–2.99)	2.19 (1.30–3.71)*
Hispanic	1.07 (0.66–1.75)	1.16 (0.78–1.73)	1.11 (0.77–1.59)	1.26 (0.86–1.83)	1.15 (0.73–1.83)	1.28 (0.87–1.88)
Non-Hispanic Other[b]	1.52 (1.03–2.25)*	1.18 (0.77–1.80)	1.23 (0.82–1.84)	1.18 (0.79–1.76)	1.29 (0.84–1.99)	1.13 (0.74–1.73)
Non-Hispanic White (ref)	Ref	Ref	Ref	Ref	Ref	Ref
Age						
18–34	1.06 (0.77–1.44)	1.29 (0.95–1.75)	0.81 (0.58–1.13)	0.84 (0.61–1.15)	0.75 (0.56–1.02)	0.83 (0.62–1.13)
35–49	0.75 (0.55–1.02)	1.15 (0.84–1.57)	0.79 (0.56–1.10)	0.99 (0.74–1.32)	0.77 (0.57–1.05)	0.79 (0.60–1.05)
50–64	0.97 (0.75–1.27)	1.00 (0.79–1.29)	0.73 (0.56–0.94)*	0.83 (0.64–1.08)	0.73 (0.57–0.94)*	0.71 (0.56–0.91)*
65+ (ref)	Ref	Ref	Ref	Ref	Ref	Ref
Education						
Less than high school	0.48 (0.28–0.83)*	0.94 (0.53–1.68)	0.94 (0.53–1.66)	1.50 (0.89–2.51)	0.93 (0.53–1.66)	1.26 (0.72–2.18)
High school graduate	0.72 (0.52–0.99)*	0.88 (0.63–1.21)	1.06 (0.75–1.51)	1.20 (0.85–1.70)	0.92 (0.66–1.30)	1.22 (0.85–1.77)
Some college/vocational training	0.56 (0.43–0.74)*	0.85 (0.61–1.19)	0.81 (0.61–1.09)	0.93 (0.72–1.21)	0.86 (0.64–1.15)	1.06 (0.80–1.41)
College graduate (ref)	Ref	Ref	Ref	Ref	Ref	Ref
Smoking Status						
Current smoker	1.04 (0.71–1.52)	1.27 (0.90–1.78)	0.75 (0.51–1.11)	0.97 (0.67–1.39)	0.54 (0.35–0.82)*	0.82 (0.53–1.28)
Former smoker	0.78 (0.60–1.02)	0.88 (0.68–1.14)	0.81 (0.63–1.04)	0.89 (0.68–1.16)	0.64 (0.50–0.83)*	0.77 (0.59–1.00)
Never smoker (ref)	Ref	Ref	Ref	Ref	Ref	Ref
Rural Designation						
Rural	0.88 (0.65–1.17)	0.62 (0.47–0.82)*	0.84 (0.64–1.12)	0.77 (0.61–0.98)*	0.84 (0.63–1.13)	0.82 (0.62–1.09)
Urban (ref)	Ref	Ref	Ref	Ref	Ref	Ref
Confidence in Obtaining Health Information about Tobacco						

Table 3 | Continued

Variable	General health and medical topics		Health effects of tobacco		Health effects of electronic cigarettes	
	Government health agencies[c] (OR, 95% CI)	Health organizations[d]	Government health agencies	Health organizations	Government health agencies	Health organizations
Not confident at all	0.30 (0.18–0.50)*	0.31 (0.19–0.50)*	0.26 (0.16–0.42)*	0.30 (0.19–0.48)*	0.18 (0.10–0.31)*	0.25 (0.15–0.41)*
A little confident	0.41 (0.26–0.66)*	0.49 (0.31–0.78)*	0.28 (0.15–0.50)*	0.33 (0.19–0.57)*	0.18 (0.11–0.31)*	0.35 (0.20–0.59)*
Somewhat confident	0.49 (0.34–0.69)*	0.45 (0.31–0.66)*	0.33 (0.23–0.48)*	0.32 (0.23–0.46)*	0.33 (0.23–0.47)*	0.41 (0.29–0.59)*
Very confident	0.73 (0.54–0.99)*	0.65 (0.47–0.89)*	0.64 (0.48–0.85)*	0.65 (0.49–0.87)*	0.55 (0.41–0.74)*	0.63 (0.46–0.85)*
Completely confident (ref)	Ref	Ref	Ref	Ref	Ref	Ref

CI Confidence interval; *OR* Odds ratio.
[a]High trust is defined as reporting "a lot" of trust in the source for the specific health topic.
[b]Non-Hispanic "other race" combines low-frequency responses for American Indian/Alaska Native, Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, other Asian, Native Hawaiian, Guamanian or Chamorro, Samoan, and other Pacific Islander.
[c]Defined as "government health agencies (e.g., the Food and Drug Administration (FDA), National Institutes of Health (NIH), or Centers for Disease Control and Prevention (CDC)."
[d]Defined as "health organizations or groups (such as the American Cancer Society, American Lung Association, or others)."
*$p < .05$.

been taken to address the disproportionate toll that tobacco use takes on African Americans [34,35]. It is possible that these targeted efforts have contributed to increased trust in national health information sources among African Americans for tobacco-related information, but the data do not suggest a trust "spillover effect" to general health issues, perhaps due to long-standing medical mistrust generally in this population [36].

Additionally, we found that individuals with a smoking history had lower odds of high trust in electronic cigarette information provided by government health agencies. This finding can be understood in the context of the regulatory climate for e-cigarette advertising and promotion. Only recently have federal regulations been put in place that regulate e-cigarette marketing and require advertisements to display a warning about the addictive nature of nicotine [37]. Previously, e-cigarette advertisements have frequently made comparative claims to cigarettes, implying that e-cigarettes are a safer alternative to combustible cigarettes [38], and are absent of addiction consequences [39]. This industry messaging may have been particularly effective for those with a smoking history, thus contradictory health information coming from government health agencies may have prompted reactance and source derogation.

Finally, we found that individuals with less formal education had lower odds of high trust in government health agencies for general health and medical topics. This association may be due to limited knowledge of how the government works. Previous scholars have suggested that formal education teaches individuals to distinguish between various components of federal agencies and better understand the organization and functioning of public services, thus fostering trust [40]. In contrast to the significant finding found in the first model, education was not a significant predictor in any of the other five models. More research on the nuanced role of education on trust in national health information sources is needed.

Recommendations for practice

Overall, we found a moderate level of trust in government health agencies and health organizations. However, a large proportion of the U.S. population still report at least some degree of skepticism or hesitancy regarding health information provided by both government health agencies and health organizations. To improve trust, health organizations and agencies should employ communication strategies that are clear, transparent, and at appropriate health literacy levels for the target audience, while avoiding oversimplification, which can fuel controversy and undermine long-term credibility as the science evolves [41]. This tension may be particularly relevant to health information about electronic cigarettes, for which much of the research on risk and

benefits is ongoing, and some of the public health recommendations remain unclear.

Additionally, we found that sociodemographic predictors of trust were inconsistent across contexts and health organization type. In light of these findings, we put forward three additional recommendations for public health researchers and practitioners, each outlined in more detail below: (a) consider source credibility and trustworthiness in the formative development of campaigns and interventions, (b) partner with trusted community-based organizations and opinion leaders when appropriate, and (c) encourage and enable health information seeking.

First, a major finding from this study is that trust in national health information sources is heavily context-specific. Specific evaluation of trust in a specific source for a specific context with a target demographic should be carefully considered and evaluated during the formative research phase of health communication campaigns and interventions. This can be done as part of cognitive interviewing and formative focus group research [42]. Engaging in this important formative development step will help practitioners decide if a national health information source would be appropriate to disseminate public health information as part of a campaign or intervention.

Second, if the formative research suggests that trust in national health information sources is low for the health topic, researchers and practitioners should consider collaborating with community-based organizations that may be more familiar to the population and to whom they may have more trust. Community-based organizations, such as churches or existing safety net organizations, typically have an established history of trust with individuals. For example, in the *Body & Soul* project, a government health agency (NIH) and nongovernment health organization (American Cancer Society) successfully partnered with volunteers from African American churches to disseminate information about increasing fruit and vegetable intake [43] and increasing clinical trial enrollment [44] among churchgoers. Engaging in these collaborations to deliver health information when the target population's trust in national health information sources may be low can improve the reach and efficacy of targeted health communication campaigns.

Finally, our finding that confidence in health information seeking, closely related to information seeking self-efficacy, is consistently a significant predictor of trust in national health information sources suggests that efforts should be made to encourage and enable health information seeking. Confidence in information seeking is influenced by a complex web of literacy, socioeconomic, and cultural factors which may necessitate intervention at multiple levels [45]. For example, Science Cafés—informal lectures and discussions between academic researchers and community members—have been shown to significantly improve participants' confidence in obtaining and evaluating health information [46]. To complement these individual-focused interventions, other work has focused on improving the accessibility and readability of government and academic health information. For instance, some academic journals now require abstracts and summaries written specifically for a lay audience [47]. Our data suggest that the effectiveness of such interventions may additionally have a significant impact on the public's health information seeking confidence and their associated levels of trust toward national health information sources.

CONCLUSION

Better understanding key predictors of trust in national health information sources is essential to promote public health. The findings from this study first suggest that it may not be appropriate to assume that trust in health sources generally extend to specific health topics,as perceptions of dimensions underlying trust (e.g., competency, honesty) are likely context-dependent. Researchers and providers should also consider the unique social context of specific health topics (e.g., tobacco) when developing communication campaigns and interventions. However, confidence in health information seeking was consistently a significant predictor of trust across topics, suggesting that efforts in improving confidence in obtaining and discerning evidence-based health information should be a key priority for public health. This study also highlights the fact that demographic characteristics are inconsistent at predicting trust across multiple health domains. Future research on leveraging national health information sources to communicate health information and promote healthy behaviors should consider individuals' level of trust for a given topic and their perceived confidence in health information seeking.

One limitation of this study is the potential for participant nonresponse bias. The HINTS survey is explicitly identified as coming from the U.S. Department of Health and Human Services, and specifically, the National Institutes of Health [27]. Individuals who have the lowest levels of trust in government health agencies may be less likely to complete and return the survey. Additionally, this identification may have prompted a social desirability bias among completed responses, resulting in artificially high reporting of trust among participants. However, our findings on levels of trust are comparable to nongovernment-fielded surveys such as Pew [48], suggesting that the bias may be minimal. Additionally, HINTS is a cross-sectional study where causality can't be determined, and differences of trust levels among specific government

health agencies (e.g., NIH, CDC, FDA) and health organizations could not be ascertained. Finally, in this analysis, we were unable to adjust for other relevant constructs that may be associated with trust in these sources, such as electronic cigarette usage and perceived general health. Future research should continue to assess a range of predictors of source trust. Despite these limitations, this study is the first to compare predictors of trust across a range of health contexts and between two types of national health information sources. Further research analyzing both predictors and outcomes of trust in health information sources is warranted.

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