The pipeline of online participation inequalities: the case of Wikipedia editing

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Abstract: Digital inequalities undermine the democratizing potential of the Internet. While many people engage in public discourse through participatory media, knowledge gaps limit engagement in the networked public sphere. Participatory web platforms have unique potential to facilitate a more equitable production of knowledge. This paper conceptualizes a pipeline of online participation and models the awareness and behaviors necessary to become a contributor to the networked public sphere. We test the theory with the case of Wikipedia editing, relying on survey data from a diverse, national sample of U.S. adults. Our findings underscore the multidimensionality of digital inequalities and suggest new pathways toward closing knowledge gaps by highlighting the importance of education and Internet skills for online stratification processes.

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"I Went Home to Google": How Users Assess the Credibility of Online Health Information

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CHAPTER 1

"I WENT HOME TO GOOGLE": HOW USERS ASSESS THE CREDIBILITY OF ONLINE HEALTH INFORMATION

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ABSTRACT

Purpose: *Many Internet users search for health information but they struggle with assessing the quality of the information they find. By drawing on a multi-modal approach to data collection, this study aims to understand further the nuanced cognitive processes that people utilize as they acquire and evaluate online health information.*

Design: *We used a mixed-methods approach that includes surveys, interviews, and observations of 76 diverse adults of all ages in the Chicago area completing various health information-seeking tasks.*

Findings: *Most participants begin their information-seeking process on search engines. We identified the most popular credibility-assessment strategies used on the search engine results' pages (SERP) as well as on*

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websites. We also explored how the process of executing such strategies reveals greater and lesser savvy among users.

Research Limitations: *While the sample size and methods limit its generalizability, this study included a larger and more diverse group of participants than most observational work, which results in data about a wider range of behaviors than is typical of such research.*

Social Implications: Our *findings showed that most of our participants could use additional education regarding credibility assessment of online health information. Additionally, since a great deal of credibility assessment occurs on SERP, search companies bear a particular responsibility for ensuring the quality of the information their results highlight.*

Keywords: Health; credibility assessment; information seeking; search engines; search process; health search

INTRODUCTION

The majority of Americans turn to the Internet every day, seeking information on a variety of topics (Horrigan, 2016; Purcell, Brenner, & Rainie, 2012). While the abundance of information that is available online provides many opportunities and discoveries for everyday users, it also presents unprecedented challenges when it comes to considering and evaluating the credibility of information people encounter (Sundar, 2008). Although a strong foundation of research regarding online credibility assessment exists, it is crucial that scholarship continues to refine its understanding of how users with greater and lesser know-how assess the credibility of online information in light of the ever-changing digital landscape. This is particularly imperative in the domain of health information, given that so many turn to the Internet for critical information regarding medical decision making (Horrigan, 2016; Fox & Duggan, 2013).

In this study, we explore how users differ in their ability to assess the credibility of online health information. With the wealth of information available online, what are the most common strategies that people use to assess health-information credibility and what are the most informed strategies people employ? While much related research tends to set boundaries on the types of online sources users may consult (e.g., specific search engines, social question-asking sites, and other particular sites), our research design is much more encompassing in that it did not impose a priori constraints on where participants could search for answers to the questions we posed to them.

Accordingly, we can address questions such as whether the strategies people use on a website differ from those they use while viewing a search engine's results page. Taking on Metzger's (2007) call for "a greater variety of research methods, on a greater variety of Internet users, performing a greater variety of search tasks than has been done to date" (p. 2086), this unique mixed-methods study on a diverse group of adults adds important insights into how credibility assessment is currently understood.

Credibility Assessment Online

Scholars have long studied how people evaluate the credibility or "believability" of information both in online and offline contexts (Tseng & Fogg, 1999). Credibility assessment "refers to any attempt to ascertain truthfulness" (Yuille, 1989, p. VII). Such cognitive evaluations are critical because they influence how people come to understand and use the information they encounter (Hovland & Weiss, 1951; McCroskey & Young, 1981; Menchen-Trevino & Hargittai, 2011). While credibility assessment has long been discussed as a necessary skill by educators and researchers (Hargittai, 2007; Jenkins, Clinton, Purushotma, Robison, & Weigel, 2006; Metzger, 2005), the vast amount of information on the web combined with the ability for anyone to add to the existing material has made credibility evaluation online even more complex and challenging than in traditionally mediated contexts (Sundar, 2008).

Scholars have proposed several different theoretical models to describe how people make sense of information online (Fogg, 2003; Fritch & Cromwell, 2001; Jessen & Jorgensen, 2012; Lucassen & Schraagen, 2012; Metzger, Flanagin, & Medders, 2010; Wathen & Burkell, 2002). For example, Prominence-Interpretation Theory (Fogg, 2003; Wathen & Burkell, 2002) suggests that when people approach a site, they notice and begin to judge its "prominent" elements, such as its images. They iteratively assess a variety of features until they form an "overall assessment of credibility" (Fogg, 2003, p. 722). Wathen and Burkell (2002) proposed that when people get to a site, they first assess the site's "surface credibility" based on factors like the site's appearance, usability, and organization, and then they move on to evaluate the site's message based on factors like its source and relevance.

However, additional research suggests that credibility assessment can be much less systematic. Assessing an abundance of information often conflicts with users' lack of skills and/or time (Klawitter & Hargittai, in press; Taraborelli, 2008), therefore many people rely on cognitive heuristics, "short cuts, rules-of-thumb, or guidelines that reduce cognitive load during

information processing and decision-making" (Metzger et al., 2010, p. 417). This is perhaps why much research focuses on heuristic cues, such as a site's layout and design (Flanagin & Metzger, 2007; Fogg et al., 2003; Gasser, Cortesi, Malik, & Lee, 2012; Hove, Paek, & Isaacson, 2011; Sundar, 2008; Tombros, Ruthven, & Jose, 2005; Wathen & Burkell, 2002), or brand or sponsor (Hargittai, Fullerton, Menchen-Trevino, & Thomas, 2010; Hove et al., 2011; Westerwick, 2013). Additionally, as web pages increasingly incorporate user-generated features, such as comments and reviews, research suggests that users rely on social feedback for their evaluations (Flanagin & Metzger, 2013; Flanagin, Metzger, Pure, & Markov, 2011; Jessen & Jorgensen, 2012; Metzger & Flanagin, 2011; Metzger et al., 2010; Sundar, 2008; Walther, Liang, Ganster, Wohn, & Emington, 2012), adding a layer of complexity.

In order to control for context, which may impact the credibility-assessment process (Eastin, 2001; Flanagin & Metzger, 2000; O'Keefe, 2002), this study focuses on the health domain. The Internet has played an important role in people's everyday health queries (Cotten & Gupta, 2004; Fox & Fallows, 2003; Fox & Rainie, 2002; Horrigan, 2016; van Deursen, 2012), and is sometimes an even more important source of information than traditional sources, including medical professionals (Dobransky & Hargittai, 2011; Escoffery et al., 2005; Percheski & Hargittai, 2011). People actively search for answers to health-related queries. Information they retrieve can have significant consequences. For example, a British newspaper reported that one family tried to treat a gunshot wound using information from WebMD.com (Daily Mail Reporter, 2013). The mother waited seven hours before seeking medical attention for her son, choosing to rely on online sources rather than immediately seeking professional help. As a Pew Research Center report noted:

> a great many health seekers say the resources they find on the Web have a direct effect on the decisions they make about their health care and on their interactions with doctors. (Fox & Rainie, 2000)

In 2012, nearly two-thirds of online adults said they had searched for health-related information on the web and more than a third reported that they had turned to the Internet when trying to figure out a health issue (Fox & Duggan, 2013). In 2016, 41% of US adults said they had searched for health information online for themselves or family members in the 30 days prior to completing the survey (Horrigan, 2016).

While people rely on online information to make important health-related decisions, research also suggests that they struggle to assess the credibility of the information they find (Manafò & Wong, 2012; Miller & Bell, 2011). Several studies document the lack of confidence people have about finding health

information online (Fox, 2006; Knapp, Madden, Wang, Sloyer, & Shenkman, 2011). For example, a study of American adults found that only 15% of health information seekers reported that they always check both the source and the date of an article, while a quarter of individuals felt "overwhelmed" because of the overabundance of information. Additionally, research shows that individuals often demonstrate difficulty in evaluating online health information (Feufel & Stahl, 2012; van der Vaart, Drossaert, de Heus, Taal, & van de Laar, 2013). Notably, an observational study of 15 adult women with rheumatic illness, who completed a variety of health information-seeking assignments, showed that nearly all of them demonstrated difficulty in constructing a search query as well as evaluating the sources of information they found (van der Vaart et al., 2013).

CREDIBILITY ASSESSMENT OF SEARCH RESULTS VERSUS CREDIBILITY ASSESSMENT OF SITES

Although the credibility-assessment literature richly documents the cognitive processes and cues people employ to evaluate information, most scholarship regarding online credibility assessment has focused on how people evaluate information once they have already found it, or been given it, on a site. That is, most credibility research neglects the potential evaluations that occur before an individual reaches a source. However, other bodies of literature show that when people go online to find information, they typically use search engines to begin (Eysenbach & Kohler, 2002; Julien & Barker, 2009; Mager, 2009; Pan et al., 2007; Purcell et al., 2012; Sanz & Stancik, 2013). Framed another way, the search engine is often a "central actor" in people's information-seeking and credibility evaluations (Mager, 2009, p. 1134) and should be included in studies of credibility assessment.

For example, experimental research on undergraduate students found that a site's search engine ranking indirectly influenced how a person evaluated a site by impacting how credible a user perceived the site's associated brand (Westerwick, 2013). Another study, evaluating high school students' information literacy skills through a task-based approach, found that participants often used the terms "Google" and "the Internet" interchangeably when searching for scientific information (Julien & Barker, 2009). It also found that Google was the primary tool students used when looking for information related to their academic and home lives. Such findings suggest that a credibility-assessment process happens as much on a search engine's results page as when one arrives on a site (Hargittai et al., 2010). If this is the case, what are the

heuristic strategies that users enact to assess credibility in the health domain, and how are they similar or different on search engines versus sites?

User Savvy in Credibility Assessment

Although credibility assessment is often theorized as a unified process in which all individuals engage similarly, some research suggests that users vary in their credibility-assessment ability, based on factors like their motivation, prior knowledge, and frequency of Internet/social media use (e.g., Flanagin & Metzger, 2013). For example, an observational study of 88 adults in the Netherlands focused on health, found that a third of participants relied on information from an "unreliable" website (van Deursen, 2012). The study concluded that, overall, study participants lacked basic online skills, defined as the ability to bookmark sites, define search queries, navigate between sites, and synthesize information. An observation study of 22 German-speaking adults that focused on health-related tasks found that less-skilled users relied on their prior beliefs (Feufel & Stahl, 2012), using the confirmation-bias heuristic (Klawitter & Hargittai, in press; Metzger et al., 2010) to seek responses that affirmed their opinions, while skilled users sought new information and filtered searches effectively to find relevant data sources.

Differences in information retrieval strategies may be closely coupled with differences in credibility assessment (Eshet-Alkalai & Amichai-Hamburger, 2004), which may have important consequences for users in the health domain. Indeed, credibility assessment and information retrieval likely co-occur as part of the process that users follow as they assess each piece of information they find while moving from page to page clicking links. If users rely on heuristic strategies to evaluate health information, do they vary in the process they use for applying such strategies? For example, a savvy user may find an advertisement in the search results, and thus doubt its credibility, but still review the item because it *could* be the best source. In comparison, a less savvy user may either trust all ads, or conversely, apply the heuristic that all advertisement results lack credibility and, therefore should not be trusted.

Research Questions

This study takes a more holistic approach than most prior studies in an attempt to understand the credibility-assessment process in the domain of health information-seeking. It analyzes a diverse group of adults' actions

by exploring the process from start (the beginning of people's information-seeking process) to finish (when they find their answer) and focuses on variation in people's approaches, exploring the following questions:

RQ1. What role do search engines play in the credibility-assessment process of online health information?

RQ2. What are the most popular strategies people employ on a search engine to evaluate its list of search results?

RQ3. What are the most popular strategies people use to evaluate a site?

RQ4. Do people use the same credibility-assessment strategies during the evaluation of search results and the evaluation of sites?

RQ5. Do people differ in their level of savvy when it comes to assessing the credibility of online health information?

METHODS

We analyzed data collected from in-person observations, interviews, and surveys conducted with 76 diverse adults aged 18 and above from Chicago including its surrounding suburbs. Because the study comprised the collection of data from human subjects, we sought and received approval through our university's Institutional Review Board. We recruited participants through flyers posted in libraries, cafes, and stores. We also posted advertisements on Craigslist and Facebook during the summer of 2011. A criterion necessary in order to be included in the study was that respondents had to be Internet users. Each study session consisted of a brief initial survey, an observational period, a post-observation interview, and a demographic survey. We describe each phase of the study session below. Each session lasted approximately 90 minutes and participants were given $40 in cash upon its completion.

Study Procedure

All sessions took place in our research lab. After responding to survey questions about Internet use experiences, understanding of various Internet-related items as a measure of web-use skills, and health literacy, participants

sat at a network-connected computer to search for information in response to questions the researcher posed. We encouraged participants to be as realistic as possible in their behaviors, and in accordance with the Think Aloud Method (Eveland Jr. & Dunwoody, 2000), we continually reminded them to talk out loud and comment on their behaviors.

When participants first sat down at the computer, they were asked to open Internet Explorer and were asked several questions as an initial step to warm up. To help produce a more realistic environment, the participants set the browser's homepage to the homepage normally present on the computer they used the most (if participants could not set this up themselves, the researcher helped with the procedure). The participants then began the task performance portion of the study in which they were presented with nine health information-seeking tasks varying in their level of complexity (see Table 1 for the list of tasks). As participants completed the tasks, the researcher took notes with pen on paper for follow-up questions. Participants were given as much time as they needed until they felt they had completed each task.

After the observation session, we asked respondents to fill out a survey with demographic background information. Finally, during a post-observation interview, the researcher reviewed some of the participants' behaviors during the session with the participant. This interview gave study administrators the opportunity to elicit participants' explanations for actions not thoroughly explained while "thinking aloud" and to inquire about additional details regarding respondents' thought process, actions, and experience. By asking these questions after the sessions were completed, we sought to ascertain users' cognitive processes without affecting their natural completion of the tasks. While this study focuses on what we learned about credibility-assessment skill, we made no explicit mention of this construct during the study sessions.

We used the HyperCam screen recorder to create video recordings of actions on the screen and IE Capture for still screen shots of the pages respondents visited, including text information about these sites' web addresses. We recorded all oral comments by participants and transcribed these for analysis. We omit excessive use of terms like "um" and "like" for readability, unless they are particularly meaningful to the comment.

Sample Descriptives

Table 2 shows participants' background. We report percentages to indicate the proportionality of participants in the study, rather than to indicate generalizability of findings. Participants ranged in age from 19 to 75 (M=38.5, SD=14.0). Slightly more than half of the sample was male. The sample was

Table 1. Task List.

1	Think of a health question you recently came across. How did you search for the answer? What led you to begin this search, and did you find the information you needed? Try to replicate the search online. If you have not recently come across a health question, formulate one now, and search for the answer using the Internet.
2	Suddenly you notice a red spot on your eyeball. You have no idea what it is. How do you figure it out, and what is it?
3	Your cousin is concerned about her health and wants to get an HIV test. She is not a student at any school, but lives in Chicago. Can you help her find a place to get such a test? Where is the location of such a place, and at what times are they open for this service?
4	[SHOW RESPONDENT TOOTH MOLD.] Your tooth hurts and you call your dentist to tell her about it. This is the tooth. [POINT TO TOOTH.] You don't know what it's called. What is the name of the tooth?
5	A friend of yours is concerned that he might be overweight. What information do you need from him to find out if he is overweight? [IF RESPONDENT ASKS, GIVE WEIGHT AS 205 LBS (93 kg), HEIGHT AS 6'2" (1.88 m).] Based on this information, can you say whether he is overweight or not?
6	Your pregnant friend decides to have a glass of wine. Should this be a concern? Why or why not?
7	You are at home in the middle of the summer. A friend calls you frantically on Friday at midnight. The condom broke while she was with her boyfriend. What can she do to prevent pregnancy? She lives in South Bend, Indiana.
8	A friend has just called you from the Southern United States where she is on a hiking trip. She tells you that she has just stepped into an anthill of small red ants and has a large number of painful bites on her leg. She wants to know what species of ants they are likely to be, how dangerous they are, and what she can do about the bites. What will you tell her? (Adapted from Gwizdka, 2008.)
9	Your doctor prescribes a two-week antibiotic for an infection that you have. He insists that you finish taking the entire bottle, even if the infection subsides before the two weeks are up. Why is this? [WAIT FOR RESPONDENT TO RESPOND.] What can happen when patients stop taking antibiotics before they are finished?

diverse in terms of race and ethnicity, with roughly two-thirds identifying as white, a fifth as black, approximately one in ten as Asian, and one in ten as Hispanic. The group was more educated than the average American with nearly three-quarters of the sample having attended college or more. Since education tends to correlate with user skill (Hargittai & Hinnant, 2008), this suggests that our findings are likely to be conservative when it comes to variation in people's ability to assess the credibility of online health information. Had we had an even more diverse sample, we would have likely observed an even broader range of abilities.

On average, participants had been using the Internet for 13 years, used it for about 20 hours per week, and had access to it at 6.5 locations. Participants

Table 2. Participant Background Based on Survey Responses.

	N	%
Women	35	46.0
Men	41	53.9
Age (mean with standard deviation in parentheses)	38 (14)	
Race and ethnicity		
African American, non-Hispanic	14	18.4
Asian American, non-Hispanic	7	9.2
Hispanic	6	7.9
White, non-Hispanic	49	64.4
Highest level of education		
Without college degree	21	27.6
College degree	40	52.6
Graduate degree	15	19.7
Health status		
Excellent	19	25.0
Very good	36	47.4
Good	18	23.7
Fair	3	3.9

completed a 10-item knowledge-based measure of general Internet skill (Hargittai, 2010). They averaged 3.4 on a 1–5 scale with considerable variation across the group.

Data

We collected audio, image, video, and text (URL) data from each individual session as well as survey responses from each participant. The main task section lasted for 34 minutes on average, resulting in more than 6,300 screenshots, more than 40 hours of audio and video during the sessions, and more than six-and-a-half hours of audio from the post-observation interviews. On average, each participant visited more than 60 websites during his or her individual session. To each audio transcription, we added supplemental information when context was needed such as the participants' tone of voice, the keywords they used, or the website they were currently viewing. In the end, we had 1,148 pages of transcription with more than 352,600 words.

Coding and Analysis

A team of four researchers analyzed more than 850 strategies mentioned in 662 unique quotes constituting a corpus of nearly 55,000 words. See Fig. 1

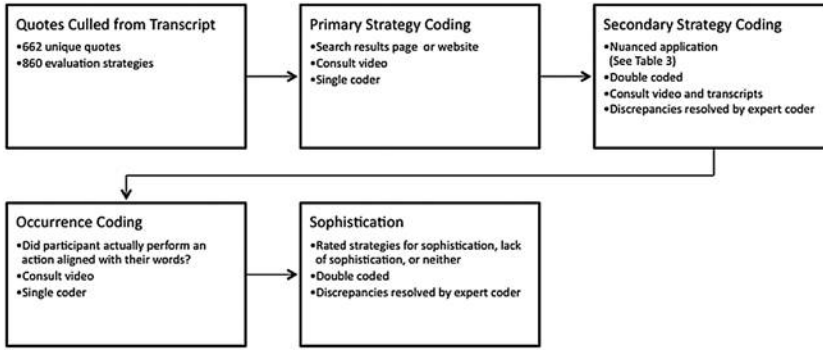

Fig. 1. Illustration of Coding Process.

for an illustration of the coding process we followed. We coded each strategy quote inductively for the following categories: primary strategy, secondary strategy, occurrence, and level of savvy regarding credibility assessment (see Table 3). The primary subcategories comprised "credibility-related strategies on a search engine page" and "credibility-related strategies on a site." The secondary strategy category captured the nuances of activities on search engine results' pages (SERP) and websites.

Due of the variety of data, we used several methods to ensure the reliability and validity of our coding. Two undergraduate research assistants used transcriptions and video captures to determine whether participants' actions took place on a search engine page or website. Having screenshots of participants' actions play alongside the transcriptions allowed us to triangulate our codes for the transcriptions of the qualitative think-aloud data with the actual behaviors of participants. In terms of determining more nuanced activities captured by what we call "secondary strategy" codes (see Table 3), individual undergraduate research assistants coded the transcribed quotes and then compared them. Expert graduate student raters then went back to the transcriptions and video capture to resolve discrepancies in the research assistants' codes. Finally, we determined whether participants performed the strategies they mentioned when thinking aloud. By consulting our screen-capture data in conjunction with transcriptions of participants' words, we were able to code whether the person who mentioned a particular strategy performed it or simply talked about doing so. This was an important step since research has shown that the hypothetical mention of an action often does not correspond to actions undertaken by users. For that reason, we limited the analysis for this study to quotes in which participants described the strategies they actually used.

Table 3. Codebook for Health Credibility Evaluations.

Strategy	Definition of Strategy	Where?
Name of site	Relies on the name of a site to assess credibility	Search, Site
Ad recognition	Asserts credibility based on associations with advertisements	Search, Site
Prior site experience	Attributes credibility because of familiarity with a site	Search, Site
User-generated content	Evaluates credibility based on user-generated cues such as comments and ratings	Search, Site
Author credibility	Attributes credibility because of something connected to author's professional background or personal experiences	Search, Site
Date	Assesses credibility based on the date of the site or article	Search, Site
Prior knowledge/ experiences	Relies on one's own prior knowledge or personal experience during credibility evaluation	Search, Site
Brand credibility	Assesses credibility based on source's sponsor or brand (i.e., magazine, hospital, government agency, etc.)	Search, Site
Health jargon	Bases credibility evaluation off of source's use of medical terms and/or health jargon	Search, Site
Cross-reference sources	Attributes credibility because multiple (unrelated) sources (results and/or sites) state the same thing	Search, Site
Popularity	Gives credibility because individual believes many people use it or also find it credible	Search, Site
Location	Assesses credibility based on the organization's physical location	Search, Site
Domain name	Evaluates credibility based on domain name (.edu, .org, etc.)	Search
Reads results	Assesses credibility based on reading a source's blurb/ description	Search
Search rank	Evaluates credibility based on a source's search ranking	Search
Search term familiarity	Bases credibility assessment on how familiar a source's word choice is to the respondent's search terms	Search
National origin	Assesses credibility based on the site's national origin	Search
Appearance/ aesthetics	Basis credibility evaluation on aspects of the information's appearance and design (e.g., layout)	Site
Background check/ verifications	Gives credibility to something because it cites a credible source	Site

One of this study's main findings is that credibility-assessment strategies differ in the level of savvy regarding online health information they reveal. While previous scholarship has identified the strategies people use, little research has sought to capture the differences in the processes users follow. To address this gap in the literature, we inductively coded for savvy and less-savvy assessments of online health through an in vivo evaluation of each independent quote – the unit of analysis. By coding users' cognitive processes

in conjunction with their behaviors, we determined whether their process of executing a particular strategy revealed them to be (1) savvy at evaluating online health information, (2) not an indicator of level of savvy, or (3) less savvy. We defined savvy approaches as a combination of being well informed and shrewd regarding credibility assessments. We defined less savvy as applying rules-of-thumb, without awareness or articulation of the reason behind the decision. While we coded for all three types so that all quotes could be classified, here we focus on discussing the quotes that fall into groups 1 (savvy) and 3 (less savvy). We elaborate on these findings, which respond to *RQ5*, in the final section of the following results.

While we draw on much qualitative material to answer our questions, we applied descriptive quantitative methods to our data by counting the number of participants who used each strategy. We were then able to rank the most popular strategies for credibility assessment on both a SERP and on a site. Most existing research that considers online credibility assessment skips this step, making it hard to know how representative the discussed examples are.

THE ROLE OF SEARCH ENGINE RESULTS IN THE CREDIBILITY-ASSESSMENT PROCESS

By observing participants' information-seeking practices from beginning to end, our data responded to *RQ1* and revealed that the credibility-assessment process happens at two distinct points: (1) on a SERP and (2) on individual sites. Overwhelmingly, participants turned to Google (73 out of the 76 participants), however, some used other search engines including AOL, Ask, Yahoo!, and Dogpile. In response to *RQ1*, these findings suggest that the search process itself factors greatly into people's overall credibility assessments. People used search engines as gatekeepers, which helped them access what they believed would be the most relevant sources. As we discuss below, and consistent with findings from other studies, users put great trust in what search engines provided (Hargittai et al., 2010; Pan et al., 2007). For example, in a post-observation interview, the researcher asked a 52-year-old, Asian, college-educated, female sales representative about use of the autocomplete feature on Google. She said, "This [referring to the autocomplete results] gives me the certainty that they may have something on that particular topic since it brought up that search criteria [*sic.*]." When asked how the feature works, the participant replied:

> I know they've got some kind of algorithm, it's their secret sauce. I find it to be very intuitive as far as what I'm looking for, whether it's medical or something related to work.

While many users were content clicking on the top result, some assessed credibility to decide *which* result to click. After participants clicked on their choice, they engaged in a second credibility-assessment process where they determined whether to stay on a website and trust that particular source or look for another. More than 40% of the credibility-assessment strategies analyzed in this study concerned the credibility-assessment process on the SERP. While we describe the process as a linear one (search results assessment → site assessment), some participants iterated their search; they started off evaluating the SERP, went to a site, returned to the search results page to select another site, and so on.

POPULAR CREDIBILITY-ASSESSMENT STRATEGIES FOR SERP

To address *RQ2*, we identified the most salient strategies that participants used to evaluate the credibility of a search results page. These included evaluating a site's brand, its name, its search ranking, and the user's familiarity with it based on their prior personal experiences with it. In this section, we offer a few examples of each elaborating on the strategies later when we discuss more or less savvy approaches (Table 4).

Strategy 1: Brand Credibility

The most popular credibility strategy that participants used on the SERP regarded evaluating a source's brand credibility, with slightly more than half of the participants relying on brand credibility. While looking over the results, and before clicking a link, participants commented on whether to follow that link. They decided based on the source's brand, which they inferred from the search results blurb. Execution of this strategy does not refer to specific authorial credibility (instances of which we placed in a different category), but rather focused on institutional brands, such as specific hospitals (e.g., Mayo Clinic), websites (e.g., Wikipedia), and government entities (e.g., Centers for Disease Control and Prevention). For example, in response to the task regarding obtaining an HIV test, a 27-year-old white, college-educated, female research coordinator said, "I'm gonna pick Planned Parenthood, because I know that's a good place."

Table 4. Popular Strategies for Evaluating Search Results by Level of Savvy.

Strategy	Level of Savvy	Representative Quotes
Brand credibility	Less Savvy	"Okay, well I saw a commercial about WebMD, so I was like, I should probably go to this."
	Savvy	"I guess I will look at the FDA. Cause the ones that are news like MSNBC, ABC, I don't think I'm gonna feel comfortable about either of those exactly. And then there's some newspapers that I don't – haven't heard of – and then there's a Cancer about and the about. com. I don't know who writes those, so I think I'll just try the FDA."
Name of site	Less Savvy	"I'm gonna go here and go to, let's see here: www.drugs. com. Sounds legit."
	Savvy	"Okay, eMedicineHealth.com. I haven't. I don't know. I've never been to that website. But it, you know, since it was the first one that came up and it says bleeding in the eye causes symptoms, and eMedicineHealth.com sounds like a website that might be quality."
Search rank	Less Savvy	"I just clicked the first one I saw."
	Savvy	"I don't necessarily go to the first one. Although more often than not, it can be right. Um, what I do is, I also look at where the source is coming from."
Prior site experience	Less Savvy	"I am going to go to WebMD. I guess I don't know how reliable that is, but I always go here."
	Savvy	"Obviously I would trust more Mayo Clinic knowing that is a reputable clinic [...] versus websites or articles that I [am] not necessarily familiar with."

Strategy 2: Name of Site

The second most popular strategy for evaluating search results was relying on a website's name, regardless of its brand or author. More than a third of the participants (28 of them) relied on this strategy while on the SERP. Often, participants selected a link solely because they liked its name. For example, during a task in which participants searched for information on antibiotics, a 21-year-old black male who works as a campaign worker commented, "I'm gonna go here and go to, let's see here: www.drugs.com. Sounds legit." Similarly, a 52-year-old white, college-educated, female art therapist said,

Table 5. Popular Strategies for Evaluating Websites by Level of Savvy.

Strategy	Level of Savvy	Representative Quotes
User-generated content	Less Savvy	"It's like run by like everyone, so like you can come in and change it and stuff, but I think generally the people who like are in charge of it make sure that a lot of people don't like go crazy also. But also I don't think that a lot of people would like to put in false information. Actually they probably would. I'm not really sure. I just trust and then if I get screwed over it's fine."
	Savvy	"I'll probably think, okay, no, not everyone's always right on Yahoo! Answers, so maybe I'll double check to make sure, so maybe I'll go to this news website, because it seems like a good source."
Brand credibility	Less Savvy	"WikiAnswers. So this isn't that legit."
	Savvy	"I know the university. Again I'm always looking on websites for reputable versus non reputable. I mean as you know you can put anything that you want out there. It's hard to know who's sponsoring a site, it's hard to know if there's some drug company sponsoring it, this is all health stuff so I'm even more specific. I'm looking for stuff that hopefully comes from independently verified sources versus it's coming from a sponsored site, generally."
Appearance	Less Savvy	"But yeah, I think like the layout seems really legit, so I would trust it."
	Savvy	"I mean there's a lot going on in terms of layout and a lot of ads and stuff like that. I mean when you encounter stuff like that on the Internet, that kind of says something more about the site. Just because sites that have more ads and are cluttered [pauses] don't seem like they're functioning as well as the other sites. And they're trying to make money off of these ads, so it seems like they're not, they don't have their business together or something [Yet, overcoming her superficial judgment of the layout, the participant continued: …] The article itself was laid out nicely. It seems like common sense kind of stuff that was easy to understand, so it made sense to me. So, I would trust it."
Author credibility	Less Savvy	"Sometimes for medical questions and stuff like that I go to WebMD, because it seems like you get answers from doctors. I would trust opinions a little bit more on WebMD about medical issues."
	Savvy	"It says the response is by a doctor, there's no guarantees. [..] It sounds fair. I'd have to go and click around to find out exactly what I really think it is."

"There was one called 'American Ophthalmological Society.' I'll go with this one, it sounds official and it probably has a site for the general public." It is worth noting that in the majority of these cases, participants often selected a search result because of the attractiveness of its name without obtaining more information about the author or site.

Strategy 3: Search Rank

The third most common strategy for evaluating search results was assessment of search rank, which more than a quarter (21 participants) used to guide decision making. In all such cases, users viewed higher results as more credible, and many referenced trust in the search engine ranking, making comments similar to those from two white, college-educated males in their mid-twenties. One said, "It was the first hit that came up, so I trusted Google to get me to my answer" and the other said, "So I went home to Google […] I looked for the first non-advertised result."

Strategy 4: Prior Site Experience

The fourth most popular strategy, which a quarter of participants used to evaluate search results, involved their reliance on memories of their prior experience with a site. Typically, participants' familiarity with a particular site positively influenced their credibility assessment of a result. For example, in his post-observation interview, a 62-year-old, white, college-educated, currently unemployed male said, "Probably I went to the Wikipedia article because I use Wikipedia a lot."

In addition to the aforementioned strategies, participants employed others, albeit less frequently. For example, only 11 individuals mentioned relying on a search result's URL to evaluate its credibility, and few mentioned the author as a factor. While user-generated content played an important role once users got to a site, only 10 individuals mentioned its relevance during the results' selection process. Other uncommon strategies included the evaluation of a search result's date and the geographic location from which results originated, including particular regions in the USA or countries outside it.

POPULAR CREDIBILITY-ASSESSMENT STRATEGIES FOR WEBSITES

Next, we describe how participants determined whether to trust a site's information or move onto another source once they arrived on a site. The most commonly used strategies included evaluating user-generated content, the site's brand, its appearance, and its author credibility (Table 5).

Strategy 1: User-Generated Content

While participants rarely mentioned user-generated content during their evaluations on the SERP, they often referred to it when evaluating content on a site. Nearly two-thirds of the sample (49 people) discussed user-generated content and its impact on their interpretation of the source and its information. The most popular user-generated sites' participants visited were Wikipedia and Yahoo! Answers; more than two-thirds visited Wikipedia during the study, and 30 out of the 76 participants went to Yahoo! Answers at some point during their session.

Strategy 2: Brand Credibility

As we discussed in the previous section, the strategy of brand credibility refers to evaluating a site's information based on the credibility of its brand. For example, during one task, participants had to locate a local facility that provides HIV testing. While many participants searched broadly using a search engine, they often ended up attributing credibility to sites run by nonprofit organizations (e.g., AIDS Chicago), which they knew and trusted offline. This was also true of sites that people were familiar with from radio, television, and newspapers (e.g., ABC News and *New York Times*).

Strategy 3: Appearance

The third most popular cue participants used to evaluate a website's credibility was its appearance. This result echoes findings regarding the importance of a site's design and layout to credibility assessment (Flanagin & Metzger, 2007; Fogg et al., 2003; Gasser et al., 2012; Hove et al., 2011; Sundar, 2008; Tombros et al., 2005; Wathen & Burkell, 2002). Once participants clicked

through to a page, close to half of them (33 people) at one point or another used the site's appearance as a credibility cue. For example, participants compared their assessment of a site's appearance to the way they judge people based on first impressions. Some recognized that by doing so, they missed out on potentially relevant information.

Strategy 4: Author Credibility

The fourth most popular strategy that participants used to evaluate information on a site was author credibility. Nearly half of participants referenced the author's standing during the process of assessing content. The majority of the time participants favorably assessed an author's professional attributes (e.g., doctors and researchers). For example, if the content on a page suggested that the author had the condition of interest (e.g., a red spot on the eyeball), and it turned out to be nothing to worry about, participants perceived her testimony to be credible. Notably, more than half of the sample never referenced the site's author as influential to their credibility assessment.

In addition to these four most common strategies, approximately a quarter of participants relied on their personal experiences and prior knowledge when evaluating a site's credibility. Just over a fifth actually cross-referenced the information they read with an independent source. Roughly a fifth of participants questioned the motives of a site, and more than one in ten said that advertisements impacted a site's credibility while less than 5% mentioned a site's financial sponsorship.

SEARCH RESULTS PAGE VERSUS SITE CREDIBILITY ASSESSMENT

Table 3 shows the credibility strategies that participants used during the processes of searching for information and evaluating information on individual sites. The table also lists where the strategies were implemented (whether people used them on the SERP, individual sites, or both). Regarding *RQ4*, our findings show that users implement many of the same strategies in both contexts, although some are unique to the evaluation of either the SERP or a website. These distinctions are at least, in part, likely due to differences in affordances. For example, evaluating a result's search engine ranking is most

likely to occur on an SERP and so it is in that realm that it is an important approach.

As prior studies have suggested, search engines play an important role in people's information-seeking habits (Eysenbach & Kohler, 2002; Hargittai et al., 2010; Mager, 2009; Pan et al., 2007; Purcell et al., 2012; Sanz & Stancik, 2013; Westerwick, 2013). Although people do not use the same credibility-assessment strategies on SERPs as on websites, our findings reveal the dynamics of the processes participants execute as they move between SERP and individual sites.

MORE AND LESS SAVVY STRATEGIES FOR CREDIBILITY ASSESSMENT

In response to *RQ5*, the following discussion elaborates on the relative savvy of the thought processes participants used as they applied heuristic strategies to the evaluation of online health information. We begin by describing how participants evaluated brand credibility, the name of a site, search rank, and prior site experience on an SERP. We then move to showing how they assessed user-generated content, brand credibility, appearance, and author credibility on a website they visited.

SERP Evaluation

Brand credibility. In terms of assessing brand credibility, less savvy participants evaluated results based on their familiarity with the brand, regardless of whether the result was actually the best way to find the sought-after information. For example, a white 19-year-old male noted: "Okay, well I saw a commercial about WebMD, so I was like, I should probably go to this." Similarly, a 38-year-old, white, college-educated female who works in sales said, "I trust Wikipedia," yet she was not able to articulate her reasoning for choosing the result, even when asked "why" during the post-observation interview.

However, participants who took a savvier approach showcased more systematic thinking. While less savvy users justified clicking on a link because of the brand, savvier individuals sometimes chose *not* to click on a link because of its brand. They also tended to evaluate multiple results' brands prior to picking a source. For example, a 50-year-old, white, college-educated female who works as a marketing and communications manager said:

> I guess I will look at the FDA. Cause the ones that are news like MSNBC, ABC, I don't think I'm gonna feel comfortable about either of those exactly. And then there's some newspapers that I don't – haven't heard of – and then there's a Cancer-about at about.com. I don't know who writes those, so I think I'll just try the FDA.

Name of site. When evaluating the name of a site, a less savvy approach would consider a result credible because its name was "legit," "authoritative," or "reliable" even if the participant did not have the necessary experiences with it. A savvier approach based their assessment on the attractiveness or appropriateness of the name of the website listed in the search result, as well as other cues, including whether or not the other search results seemed appropriate. For example, in the post-observation interview regarding the open task, the researcher asked a 21-year-old, black, college-educated male employed as a campaign work why he chose to visit the fifth search result. He replied:

> I don't know it just seemed like [the other search results] were too focused on other diseases […] They both seemed pretty good but the one that I chose just seemed like it was right down to the point. What is it about this website? It was named after its own disease. Of course it would probably have a little bit more information most likely than the rest of them had.

Search rank. In terms of evaluating search rank, the less savvy approach assigned credibility solely based on result placement. For example, when asked during the post-observation interview why they had clicked on certain links, such participants often trusted that one of the top few results would be a good source, saying, "it just came up near the top of the search," or "I just clicked the first one I saw." They often did not mention knowing there was an algorithm determining the rank of their search results. A savvier approach to using search engine rank to assess credibility involved pairing search rank with one or more other indicators, such as the results blurb, URL, or name. As a 52-year-old, white male, quality engineer explained as he conducted a search during one of the tasks: "I don't necessarily go to the first one. Although more often than not, it can be right. What I do is, I also look at where the source is coming from."

Prior site experience. A less savvy approach to using prior experience as a signal of credibility relies simply on "usually," "frequently," or "always" going to the site without having much justification to do so. For example, a young white 26-year-old female participant who works as an administrator remarked, "I am going to go to WebMD. I guess I don't know how reliable that is, but I always go here." The savvier approach would look for cues beyond prior experience to assess credibility. For example, a 34-year-old,

white, male graduate student reflected on the search results page prior to clicking through:

> Okay, eMedicineHealth.com. I haven't- I don't know. I've never been to that website. [Pauses for 6 seconds and reads other search results] But it, you know, since it was the first one that, that came up and it says bleeding in the eye causes symptoms [reading the title and blurb] […] And eMedicineHealth.com sounds like a website that might be quality.

While this participant's comments reveal hesitation about his lack of prior experience, they also show recognition of the importance of additional cues, such as the description of the results, the name of a site, and its search rank.

Website Evaluations

User-generated content. Overall, participants said they liked reading information from "real people" or "actual people," and looked to user-generated content to help them resolve health dilemmas. A less savvy approach would simply entail the belief that people would not share inaccurate information or that site gatekeepers would remove inaccurate information. For instance, a 20-year-old, Asian, female college student said the following about her visit to Wikipedia:

> It's like run by everyone, so you can come in and change it and stuff, but I think generally the people who are in charge of it make sure that a lot of people don't go crazy also. But also I don't think that a lot of people would put in false information. Actually they probably would. I'm not really sure. I just trust and then if I get screwed over it's fine [slight laugh].

In addition to illustrating the point above, this quote also signals the participant's confusion over how Wikipedia works by referring to "people […] in charge of it." Often, such users were not even aware or fully confident about who contributed to user-generated sites where anyone can add information. For example, during the post-observation interview, the researcher asked a 49-year-old, black, female hostess about her experiences with Wikipedia, to which she replied, "they seem to have a good reputation for you know, having knowledge and facts," but when further prompted about who the authors of the site were, she did not know.

However, a healthy dose of skepticism was a key component of savvier approaches to evaluating user-generated content such as supplementing such

content with other sources. For example, a white female in her early thirties pursuing an advanced degree said:

> I love Wikipedia. I know that it's not always accurate and should never be used as a source in research, but it's a great source in general just to get some general information. You know, use it as a jumping board essentially.

As a 27-year-old, white, male account executive remarked, "It's a good site for general information […] it's a good stepping stone if you need to get more detailed information." Similarly, a 48-year-old college-educated white programmer commented about Yahoo! Answers:

> You have to take these things with a grain of salt because there's no guarantee with anyone that that's the right answer and that's what they're talking about. I mean anything like that which is public material, you take it at face value. It's information, it might be right, you have to keep looking.

Brand credibility. In ways similar to how users evaluated the brand credibility of search engine results, less savvy participants noted the "legitimacy" of websites, while more savvy participants positively assessed institutions that they knew and trusted from other contexts.

Appearance. A site's aesthetics influenced credibility evaluation in both positive and negative ways. Sites that were more organized, less cluttered, and contained fewer ads were deemed as more credible than those with pop-ups and ads, poor usability, and disorganized information. The less savvy approach mentioned that a site looked "legitimate," "professional," or "kosher," but could not explain why. Such assessments relied on layout alone, without a move beyond prominent features to evaluate the information itself, as Prominence-Interpretation Theory might suggest. For example, a 20-year-old Asian female college student stated the following about emedicine.medscape.com, "But yeah, I think like the layout seems really legit, so I would trust it." Similarly, a 22-year-old, Asian, female college student working as a marketing intern commented the following about a site she visited [rkm.com.au]: "My impression is not very good of it, there's no real images, [the] layout is kind of amateur."

The savvier approach saw past low-quality designs to find important health information. A 22-year-old, white, female college student clicked on a site during the search process based on the name of the site and its description and then questioned its credibility:

> I mean, there's a lot going on in terms of layout and a lot of ads and stuff like that. I mean, when you encounter stuff like that on the Internet, that kind of says something more about the site. Just because sites that have more ads and are cluttered [pause] don't

> seem like they're functioning as well as the other sites. And they're trying to make money off of these ads, so it seems like they're not, they don't have their business together or something.

However, she continued to read, ultimately deciding:

> The article itself was laid out nicely. It seems like common sense kind of stuff that was easy to understand, so it made sense to me. So, I would trust it.

Author credibility. Users considered the author's background in their evaluation of information, and assigned more credibility to authors who said they were in possession of a medical degree. Author credibility assessment was particularly relevant for those on Yahoo! Answers. Some participants were hesitant when the author was not a doctor. For example, a 21-year-old black female student stated: "This [Yahoo! Answers user] who provided that information [on Yahoo! Answers] is not like a doctor or anything, so I'm not gonna trust that." However, other participants appreciated Yahoo! Answers because it includes information from "people who have been in the situation before."

While scholars have proposed many different theoretical approaches to explain how users approach credibility assessment (Fogg, 2003; Fritch & Cromwell, 2001; Jessen & Jorgensen, 2012; Lucassen & Schraagen, 2012; Metzger et al., 2010; Wathen & Burkell, 2002), some work has explicitly focused on the cognitive heuristics people use to evaluate information online (Klawitter & Hargittai, in press; Metzger et al., 2010; Taraborelli, 2008). Our study finds support for people relying upon various heuristic strategies. However, this study makes the novel contribution of recognizing and empirically showing that there are differences in how these strategies are deployed in the actual process of evaluating information (Feufel & Stahl, 2012; Hargittai et al., 2010; van Deursen, 2012).

While both savvy and less savvy approaches relied on shortcut strategies, savvier approaches tended to include more cognitive processing, and were more cognizant of the heuristic. For example, participants who demonstrated both styles of heuristic engagement said that advertisements had lower credibility than organic search results; however, those who displayed greater savvy still considered and evaluated the paid advertisements just in case they were relevant. The difference between levels of savvy was more pronounced for some strategies, such as evaluating author credibility, and less for others, such as reliance on prior site experience or evaluating a site's name. Savvy approaches included multiple strategies in tandem, rather than relying on only one, and drew on a wider variety of strategies throughout the study.

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

While the sample size and methods limit the generalizability of the findings, the study includes a larger and more diverse group of participants than most observational work, resulting in data about a wider range of behaviors than is usual from such projects. The strategies we outline here are likely to be representative of the variety of credibility-assessment strategies that users deploy in the health information-seeking realm. What is harder to ascertain is whether the popularity of the various strategies would be different depending on the population studied. And while we took great care in including participants with varying levels of Internet experiences and skills, it would be hard to generalize about the prevalence of savvy versus less savvy approaches across populations. The main contributions are at the level of identifying important processes that happen during health information-seeking rather than their exact distribution across the population.

One of the strengths of this project is that it did not impose specific sites or even search engines on participants for finding answers to queries. Nonetheless, the research design did impose use of the web in a study setting. When not in such a context, people may also turn to their networks for advice such as asking questions of their friends on social media (Fiesler & Bruckman, 2013; Morris, Teevan, & Panovich, 2010; Paul, Hong, & Chi, 2011). Our research design did not allow for surfacing such strategies but future work should do so. It is also important to acknowledge that information seeking does not happen in an online vacuum; people may consult other sources as well. Since our research focus was on identifying online health information processes, the research design matched our focus, but future work should not be limited to online actions only.

CONCLUSION

Using a unique multi-modal approach involving in-person observations and in-depth interviews with a diverse group of American adults, this study set out to explore what approaches people take to assessing credibility when they look for health information online. We find that there are two distinct credibility processes that take place: one on the SERP and one on the actual site(s) a person visits. Our findings highlight how

strategies differ on SERP versus sites, and which are the most popular in both of these contexts. We also identify differences in the level of savvy of the approaches.

While many individuals are loyal to the search engines they turn to first when they have a question (Google being by far the most popular), they are less certain about which site(s) to rely upon for finding answers. Our study shows that the majority of people start off their information quests on a search engine and engage in considerable credibility assessment already at that stage, prior to even ending up on a site. The evaluation of the SERP helps users *select* a source, while the credibility evaluation process on the individual sites aids users in *finalizing* their source, or determining whether to trust the information or move on to another source.

Overall, credibility assessment still appears to be an area in which most of our participants could use training (Manafò & Wong, 2012; Miller & Bell, 2011). The online environment presents many additional challenges to credibility assessment compared to traditionally mediated contexts (Sundar, 2008), and our results highlight several areas with which most users appear to struggle. Remarkably, only 12 of our 76 participants directly referenced credibility as exceptionally important in the health context. Few verified the information they ended up using during the study. Less than a quarter of them cross-referenced their sources to verify independently what they found on a site. More than a fifth attributed credibility to something simply because it reinforced what they already knew. Additionally, while participants used specialized searches such as image and map searches, they did not evaluate the results they found with such tools with the same rigor they evaluated the text-based information.

Although some of these findings are disconcerting regardless of context, some of the shortcuts our participants took while searching for health-related information are particularly troubling given that people increasingly turn to the Internet rather than medical professionals to resolve their concerns (Cotten & Gupta, 2004; Fox & Duggan, 2013; van Deursen, 2012). It is incumbent upon research in this domain to continue emphasizing the importance of careful evaluation of online health information and evaluating how people actually use the Internet to make health-related decisions. Given how much of the credibility evaluation happens on the SERP, search engine companies have an important role to play in ensuring that users find their way to scientifically accurate, trustworthy, and relevant information.

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