Decision Support Systems 57 (2014) 454–462

Contents lists available at ScienceDirect

Decision Support Systems

journal homepage: www.elsevier.com/locate/dss

Quality of health-related online search results

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ARTICLE INFO

Available online 6 November 2012

Keywords:
Health search
Online information quality
Online medical information
Health website quality
Search quality

ABSTRACT

Consumers are increasingly searching for health information online and using that information to inform their decisions and behavior. Because the negative consequences of basing decisions on inaccurate or untrustworthy health information may be particularly serious, it is important to understand the quality of online health information. This study empirically investigates the quality of health information that is returned by popular search engines when queried using a large, comprehensive set of health-related search terms. Findings indicate that a majority of such information returned by popular search engines is of a high quality but quality levels vary across different health topic areas. In particular, searches for terms related to preventive health and social health issues tend to produce lower quality results than terms related to diagnosis and treatment of physical disease or injury. While the overall prevalence of high quality information is greater than that of low quality, the observed variance across health-related terms has important implications for consumers, policy makers, health information providers, and search engines.

1. Introduction

Online search for health information has become nearly ubiquitous as people increasingly use the Internet as a substitute or supplement to traditional sources of health care guidance, creating a significant need to understand the quality of online health information. Health consumers' search tends to focus on information about diseases, medical problems, treatments, and procedures [12], and "on any given day, more people are posing health questions to Google than posing health questions to their doctors" [6]. If this behavior often leads consumers to high quality information, we can expect that people will be more informed and make better decisions about their health. On the other hand, if these searches commonly lead to inaccurate or unsubstantiated health information, there is cause for concern about the effect on people's health beliefs and decisions. Therefore, it is important to know if typical information search behavior leads consumers to accurate and credible health information.

Sixty-one percent of U.S. adults seek health information online, and six out of ten members of this group report that their most recent search influenced their health-related decisions [13]. Moreover, 65% of people who obtain health information online begin their inquiry through popular search engines, in contrast to 27% who begin at a health-related website [11], suggesting that search engine results may play an important role in influencing people's health-related decisions. Inaccurate or misleading results could lead people to ignore important symptoms and delay or even refuse recommended health care. Low quality results could also lead people to seek unnecessary health care or implement unproven or potentially harmful at-home treatments. While online health information seeking has the potential to create informed consumers who engage more actively with their health care providers, 46% of people who have retrieved health information online report that they never discuss this information with their physician [21]. This exacerbates the potential for a negative impact from poor quality online search results.

First-page results returned in a search engine query for the word "health" include well-known health care providers such as the Mayo Clinic (www.mayoclinic.com), a federal government health portal (www.health.gov), commercial health information providers such as WebMD (www.webmd.com), and the health news section of the New York Times website (www.nytimes.com/pages/health).[1] However, the same search also returns the Wikipedia entry for the word "health" and the Yahoo! Directory for health, each of which may be more likely to contain or link directly to less accurate or less trustworthy health information. Similarly, a query on the term "newborn vaccines" returned six (out of ten) first-page results that linked to blog postings or community forum discussions about delaying or refusing medically recommended pediatric vaccinations. This search returned only one result from a well-known scientific, healthcare, or news organization — a Nature news article (www.nature.com/news/2006/060425/full/news060424-3.html).

These examples highlight the importance of systematically characterizing the quality of results when typical health-related queries are performed using popular search engines. To our knowledge, the information systems literature has not comprehensively studied the relationships between search engine results rankings and health information quality.

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[1] All sample query results described were generated using a general Google search with default search settings performed on April 12, 2011.

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http://dx.doi.org/10.1016/j.dss.2012.10.050

This study contributes to the literature by assessing this relationship generally for a large corpus of health-related query terms and also across specific health term categories.

1.1. Assessing online information quality

Much of the information systems research on website quality has focused on user-perceived quality attributes and their relationship to behavioral use intentions rather than more objective measures of information accuracy [22,25–27,42]. For example, perceived usefulness, ease of use, hedonic quality, and visual attractiveness have been shown to be independently perceived by users and contribute to their intentions to use a website [29]. These behavioral attributes may be related to objective measures of information accuracy. For instance, insofar as information accuracy can be perceived by lay users, people may rate websites with more accurate information higher on attributes such as usefulness and ease of use. However, for policy purposes, it is valuable to study website information accuracy directly. This is especially important in technical and popular search domains such as health care in which laypeople may not be able to reliably assess information accuracy and may base important decisions on the information they find [13].

In 2004, Fricke and Fallis [14] raised concern about the accuracy of information found on the Internet due to the lack of "editorial controls of more traditional sources of information." In terms of health information quality, Eysenbach and colleagues' review of 79 studies shows that the methods and rigor which have been used to study the quality of online information vary [8]. The studies they review have widely differing conclusions, although almost 70% conclude that there is a problem with the quality of health information on the Internet. Subsequent studies on specific health topics also find that the reliability and accuracy of online heath information vary widely [1,2,20,34,36].

Many instruments have been proposed for rating the quality of health-related websites [15], and five general approaches to assessing their quality have been defined: codes of conduct, quality labels, user guides, filters, and third party certification [41]. Codes of conduct are criteria applied during the development of websites to help ensure quality. Quality labels are logos or symbols displayed by websites to communicate their commitment to abide by a code of conduct. These labels may or may not be assigned by a third party, which in effect certifies websites against codes of conduct. Filters are gateways which may be used to present only websites that meet some set of quality criteria. Finally, user guides are tools that may be published by third parties to assist users themselves in judging websites' quality. Among these approaches, there is no consensus on a single best method for ensuring that consumers consistently obtain high quality information from health-related websites. However, common among all approaches is an emphasis on the accuracy and trustworthiness of a website's health information. For the remainder of this paper, we conceptualize quality as a website's information accuracy and trustworthiness.

The five general approaches described above have been combined by well-known organizations as tools for evaluating or certifying health-related websites. The not-for-profit Health On the Net Foundation (HON) established the Health On the Net Code of Conduct "for the provision of authoritative, trustworthy Web-based medical information." HON certifies websites against this code upon request, which allows certified websites to display a quality label [18]. Over 7200 websites were certified by HON as of June 2010. Certification criteria include the authority of included information, attribution to sources of information, justifiability of claims, a clear distinction of advertisements and website content, and transparency. HON certification is free of charge, and certified websites are reviewed on an annual basis. HON was founded by representatives from the World Health Organization, the European Commission, and the US National Library of Medicine.

MedlinePlus is "the National Institutes of Health's Web site for patients and their families and friends" [30]. Among other resources, MedlinePlus hosts a health information search page that filters results to present only those from trusted sources. Instead of certifying websites, MedlinePlus chooses and links to a limited number of websites that are judged to provide authoritative but not redundant health information. MedlinePlus' inclusion criteria include the quality, authority, and accuracy of the health content; differentiation between content and advertising; and reliability of the other websites to which the evaluated website has links.

1.2. Search engine ranking and information quality

Despite the existence of HON, MedlinePlus, and other websites that consumers can use as direct portals to high quality health information, the vast majority of online health information is gathered through general search engines, such as Google [7]. One risk of these general search engines is that they may return and order web page results in a way that is unrelated to the accuracy or trustworthiness of information they contain. Furthermore, the ranking of general search engine results is important because people tend to limit their attention to the first page (or even the first few) results [7], and traffic to ranked results diminishes rapidly with decreasing rank [10]. Therefore, if search engines generally, or for specific categories of searches (such as "newborn vaccines"), rank low quality results highly, there is an increased likelihood that consumers will receive inaccurate information, which may negatively affect their health knowledge, behavior, and decisions.

In the context of health information, it is unclear whether general search engines return and rank results in a way that correlates with information accuracy and trustworthiness. While the ranking mechanisms of general search engines are proprietary, it is known that they are based on measures of relevance, comprehensiveness, freshness, and speed [39], which do not necessarily align with quality in terms of information accuracy and trustworthiness. Google's PageRank algorithm [5], which formed the basis of its original search engine, ranks individual websites within search results by estimating their importance as determined by the number of links to the website and the importance of those websites that link to it. The ranking algorithm has evolved over time, but PageRank is still an important component [39]. Bing and Yahoo!, two other popular search engines, share a search algorithm [35], and its results are thought to be similar to Google's [32]. Thus, the importance of a website as determined by the number and strengths of referring links is key to its search ranking across most popular search engines.

1.3. Research objective and conceptual model

The objective of this study is to assess whether search engines, when queried using common health-related terms, tend to rank websites with high quality information higher in their results than websites with low quality information.

Fig. 1 provides a conceptual overview of the relationships being studied. As described previously, it is known that the number and strength of referring links are significant factors in a website's search engine results rank or importance. In this study, we have conceptualized website quality as a measure of information accuracy and trustworthiness, which, as often assessed by third-party certifiers, are a product of websites' authoritativeness, use of source attribution, justifiability of claims, distinction between advertising and actual health content, and transparency. The primary relationship of interest in this study is that between website quality and website importance. If quality is positively related to website importance, a majority of first-page search results will contain high quality information.

One way for a website to achieve high ranking results is by providing accurate and trustworthy information that is deemed useful by consumers and other online information providers. This should lead to an increased number of referring links that are created by or for the use of these interested parties. Assuming that high quality information can be judged and is valued by consumers, the importance of high quality websites will increase as these links are created. Consider well known websites that were returned in our sample query above for the term