

**ENVIRONMENTAL HEALTH INFORMATION ON THE INTERNET: DEVELOPMENT OF AN
APPROPRIATE WEBSITE EVALUATION TOOL**

by

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Purpose

This research aimed to determine how health communication, risk communication, and website evaluation criteria could be utilized to evaluate environmental health information on the Internet.

Public Health Significance

Concerns exist about the quality of health information on the Internet. Environmental health plays a considerable role in public health but can be difficult to communicate effectively, especially in a dynamic and diverse system like the Internet. An evaluation tool tailored specifically for environmental public health messages on the Internet should be developed to assess the quality of those sites.

Methods

A literature review identified previous website evaluation tools and general health and risk communication techniques. Using those tools as a framework, a website evaluation tool tailored for assessing environmental health information on the Internet was developed. In order to pilot test this tool, five government websites and one emerging environmental health issue, particulate matter (PM), were selected and evaluated.

Results

The key criteria identified in the literature review and incorporated into the website evaluation tool included: Basic Website Information, Content (with subsections: Scope, Accuracy, Risk Communication, Authority, Up-to-Date, Links, and Writing Quality), Appearance/Layout, Purpose/Audience, and Access/Use.

The website evaluation tool showed considerable practicality and ease of use in identifying the strengths and weaknesses of the five websites during the pilot testing. The Environmental Protection Agency's website received the highest overall score and in the content section. The Kansas Department of Health and the Environment's website received the lowest scores in most of the evaluation categories and overall. None of the websites passed the tool's readability criteria.

Conclusions

Consensus exists regarding the need for evidence-based and validated website evaluation tools. A tool developed by consolidating communication recommendations from varying fields of study provides researchers throughout the interdisciplinary field of public health with a research base and evaluation framework for future Internet-based environmental health communication projects. Additionally, the organizations responsible for the pilot-tested websites can use the individualized results from the evaluations to improve and guide their online environmental health communication efforts.

PREFACE

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1.0 INTRODUCTION

1.1 SIGNIFICANCE

More Americans are accessing the Internet every year, with an estimated 130% growth in use from 2000 to 2008 (Internet World Stats, 2008). Of those individuals, more people are accessing health information online, as well; in 2007, 56 percent of American adults researched health issues on the Internet, which is a substantial increase from 38 percent in 2001 (Tu & Cohen, 2008).

As more people seek health information online, concerns have been raised about the quality of information being provided (Berland et al., 2001; Eysenbach, Powell, Kuss, & Sa, 2002b; Hoffman-Goetz & Clarke, 2000; Kiley, 2000; McLeod, 1998; Science Panel on Interactive Communication and Health [SPICH], 1999; Silberg, Lundberg, & Musaccio, 1997). Assessing the quality of the websites that present this type of information and the messages themselves is of vital importance; the target audience is vast and diverse, supplying the potential for causing considerable influence or even harm (U.S. Department of Health and Human Services [U.S. DHHS], 2000).

The quality of environmental health information on government websites was the focus of this project; government sites are generally more trusted by the public than organization-run or personal websites (National Institute on Aging, 2007). Poor health communication and risk communication could cause the general public to seek health information from less credible sources, however. Even though government websites are more likely to be accurate due to their review processes and guidelines, it is still important to evaluate the content and presentation on those websites.

1.2 PURPOSE

This project aimed to determine how health communication, risk communication, and website evaluation criteria can be utilized to evaluate the presentation of environmental health information on the Internet. The specific aims of this research are:

- **Specific Aim 1:** Develop an environmental health website evaluation tool that assesses the key quality criteria identified by the health communication, risk communication, and website evaluation fields.
- **Specific Aim 2:** Pilot test the evaluation tool on five environmental health-focused government websites.

The process first involved gathering guidelines on health communication, risk communication, and website evaluations from online and peer-reviewed sources. Using these guidelines as a framework, a website evaluation tool tailored to assess environmental health information on the Internet was developed. This tool was then pilot tested on five government websites that ranked highly by the four most popular search engines in the U.S. To increase comparability between the results, the communication of one environmental health issue, particulate matter (PM), was chosen to be the focus of the pilot testing.

2.0 BACKGROUND

This section provides background information about the socio-ecological model, as well as the topics of environmental health, health communication, risk communication, and the communication of health on the Internet.

2.1 SOCIO-ECOLOGICAL MODEL

The socio-ecological theory of health promotion suggests that health behaviors are affected on multiple levels of influence – individual, interpersonal, organizational, community, and public policy (McLeroy, 1988). See Figure 1.



Figure 1. Visual representation of the socio-ecological theory of health promotion.

This model or framework has been used by public health officials to examine how health behaviors are affected by the outside world, such as community norms, to determine where interventions can be implemented most effectively. Ideally, the most effective approach would be to create an intervention that affects behavior through multiple levels, but this is not always feasible with the resources at-hand. This perspective served as the foundation of this project – why a website

evaluation that examines the multiple facets of online environmental health information should be developed.

The field of environmental health takes a similar approach to disease prevention and health promotion, acknowledging that humans are constantly affecting and being affected by the world around them.

2.2 ENVIRONMENTAL HEALTH

The U.S. DHHS cited the best definition of “environmental health” to have originated in 1993 from the World Health Organization (WHO):

Environmental health comprises of those aspects of human health, including quality of life, that are determined by physical, chemical, biological, social, and psychosocial factors in the environment. It also refers to the theory and practice of assessing, correcting, controlling, and preventing those factors in the environment that can potentially affect adversely the health of present and future generations. (U.S. DHHS, Environmental Health Policy Committee, 1998)

In other words, ‘environmental health’ is the study of how the environment affects human health and how factors in the environment can be altered to improve health or reduce risk. Numerous studies demonstrate the degree to which the environment affects human health (CANCER AND THE ENVIRONMENT, 2003; Corvalán, Kjellström, & Smith, 1999; U.S. Environmental Protection Agency [U.S. EPA], 2000). WHO estimates that approximately 13 million people die annually because their environment is unhealthy (2008). In the U.S. and other developed countries, WHO proposes that healthier environments could reduce the incidence and prevalence of chronic diseases (2008), such as heart disease and cancer, the top two causes of death in the U.S. 2006 (Heron et al., 2009).

Considering the global impact of environmental health, one of the concerns that exists is how such a complex issue can be communicated to the general public without evoking fear, especially considering the multiple factors that influence health and health behavior. Health

communication and risk communication are key fields of study that help organizations and individuals to successfully reduce risk through proper communication to the general public.

2.3 HEALTH COMMUNICATION

In the national health planning document, Healthy People 2010 (HP2010), health communication was defined in the following way:

Health communication encompasses the study and use of communication strategies to inform and influence individual and community decisions that enhance health. It links the domains of communication and health and is increasingly recognized as a necessary element of efforts to improve personal and public health. (U.S. DHHS, 2000)

Health communication includes the communication involved in preventing disease, promoting health, improving the policy and business of health care, and enhancing quality of life and community health (Ratzan, 1994). Health communication has been identified by Healthy People 2010 as a major objective to improve the state of health of American citizens (U.S. DHHS, 2000) and must employ the most effective strategies for reaching populations and changing health behaviors (Institute of Medicine [IOM] & National Academy of the Sciences, 2005; IOM, 2002).

The field of health communication employs various theories and models; one of which, the Health Belief Model (HBM), is very similar to the risk communication paradigm from the environmental health field that is discussed in the next section. HBM attempts to explain and predict behaviors that affect health. This theory asserts that people will adopt a recommended health behavior if they believe that:

- 1) *an issue is avoidable* (such as mesothelioma, a cancer of the chest and abdominal lining often caused by exposure to asbestos (U.S. EPA, 2008a));
- 2) *taking a recommended action will result in prevention of the health issue* (wearing a mask while doing construction in buildings that may contain asbestos insulation), and;
- 3) *they can adequately partake in the recommended action* (possess knowledge and skill to properly purchase, wear, and remove the mask). (Rosenstock, Strecher, & Becker, 1988)

Health communication theories and its criteria for appropriate communication were incorporated in this study because of the potential reach of the results – improved education, advocacy for policies or programs, technological advances, for example – and because of the complex nature of communicating complex environmental health messages (US DHHS, 2000).

2.4 RISK COMMUNICATION

Another facet of health communication that aids in the effective communication of environmental health issues is risk communication. Risk communication is defined by the U.S. National Research Council (NRC) as:

... an interactive process of exchange of information among individuals, groups, and institutions that raises the level of understanding of relevant issues or actions for those involved and satisfies them that they are adequately informed within the limits of available knowledge. (1989)

Risk communication, commonly the form of communication utilized in the environmental health field, is one of three major components of the risk analysis model. The figure below shows that while risk assessment, risk management, and risk communication are separate entities in the risk analysis structure, they overlap and affect each other in various ways (Food and Agricultural Organization [FAO], 1997). Shown in Figure 2:



Figure 2. Risk analysis structure (FAO, 1997).

To effectively explain the dynamics of risk communication, risk must first be defined; according to Sandman (1993), risk is determined by the hazard and the outrage associated with the situation, or:

Risk = Hazard + Outrage

- Hazard = (Magnitude * Probability)
- Outrage = Response to the risk

A situation's hazard is calculated by multiplying how detrimental/severe the result would be if the risk occurred (magnitude) by how likely it is to happen (probability), or "Hazard = Magnitude * Probability." Outrage is the behavioral response to the threat of or result of the risk. Once the risk is calculated, either internally or officially, this risk is compared to the benefits of the situation or exposure (Sandman, 1993).

Originally it was believed that risk communication simply involved providing the public with information about a risk. When it became obvious that more needed to be done to reduce fear, marketing/persuasion was added to the techniques involved in risk communication. This technique utilizes marketing and advertising strategies to reduce the focus on the risk itself. Though that technique was somewhat successful, the most commonly accepted perspective to-date is that taking into account the beliefs and viewpoints of stakeholders is the most effective way to reduce fear (Powell & Leiss, 1997; Webler, 1995). This feature is one of the reasons that risk communication was added as a theory to be researched in this project; risk communication involves more than adequately reaching the audience or packaging the information in an attractive manner. The risks versus the benefits of a situation or environmental exposure must be considered when presenting environmental health information on the Internet (Cox, 2005).

2.5 COMMUNICATION OF HEALTH ON THE INTERNET

The Internet introduces dynamics to health communication and risk communication that may not be present in more traditional venues (Institute of Medicine (IOM), 2002; Rice & Katz, 2001; SPICH, 1999; Reuters Health, 1999); health communication can take many forms on the Internet, including pop-up ads, banners, graphics, podcasts, and websites. Additionally, most organizations possess and promote their own websites. Therefore, the average Internet user expects that every large entity will have a website that can be visited for further information (National Coalition for STD Directors (NCSD), 2008). The online experience of any visitor varies widely because the Internet is constantly changing and provides large amounts of [invalidated, non-reviewed, and perhaps dangerous] health information. These features of the Internet are only some of the reasons why evaluating content on the Internet is vitally important (Wolcott et al., 2001).

Another characteristic of the Internet that changes the dynamics of communication is the reliance on its visual presentation. Research has shown that more effective websites should be:

- up-to-date or display when they were last reviewed for accuracy;
- present information in a clear, concise, and organized manner;
- visually attractive though not distracting away from the information;
- utilize search-promoting activities on search engines (NCSD, 2008); and
- present the most important information on the page in an 'F' – shaped manner (place the key points in the page's top header, left-aligned navigation bar, and in the page title) (Jakob Nielsen's Alertbox, 2006).

Therefore, the criteria used to evaluate websites that provide health information should include the appearance and access to the information, in addition to the quality of the content. Single-faceted evaluations are not sufficient (McLeod, 1998).

The Internet has been recognized by several studies and organizations as a beneficial venue for improved health communication (SPICH, 1999; Harris, 1995; IOM, 2002). Despite its traditional use as a form of mass communication, the Internet also incorporates interactive tools that resemble interpersonal communication to its users – thus, improving the Internet's potential to persuade users to change health behaviors and reduce risk (Cassell, Jackson, & Chevront, 1998).

2.6 GAPS IN RESEARCH

The unique characteristics of the Internet, combined with the intricate techniques involved in health communication and risk communication, make providing quality environmental health information on the Internet a complex issue. To-date, no website evaluation tools have been developed specifically for environmental health information. Previous studies focused on one or two characteristics of the issue: either health communication and the Internet (NCSD, 2008; Rice & Katz, 2001), risk communication (Covello & Allen, 1998; Donovan & Covello, 1989; U.S NRC, 1989; U.S. Presidential/Congressional Commission on Risk Assessment and Risk Management, 1997), or website evaluations (SPICH, 1999).

While each perspective is important separately, evaluating the ways in which environmental health is communicated online require an approach that takes into account multiple perspectives. Why is environmental health information so different since many risks are already effectively communicated online through health communication techniques? Environmental health risks are ubiquitous by the air we breathe and the water we drink, and that can be a challenging communication barrier for health communication to face alone, especially on such a capricious medium.

The previously mentioned gaps provided the rationale for researching how environmental health should be and is currently being communicated on the Internet. Specific Aim 1 will address the health communication, risk communication, and Internet evaluation criteria that exist in order to develop an evaluation tool tailored for environmental health information on the Internet. Specific Aim 2 pilot tested the evaluation on five government websites that are ranked highly by popular search engines.

3.0 METHODS

This section will introduce the methods used to conduct this research; as part of Specific Aim 1, a literature review and Internet searches identified previous website evaluation tools and general health communication and risk communication techniques. Using those techniques as a framework, an environmental health website evaluation tool was developed as part of Specific Aim 2.

3.1 SPECIFIC AIM 1: LITERATURE REVIEW - CONSOLIDATING COMMUNICATION CRITERIA

The literature review and searches conducted on the Internet identified previous website evaluation tools and general health and risk communication techniques. Instead of building an evaluation tool from scratch, these criteria and techniques were used as a framework to develop an environmental health website evaluation tool.

The literature review was conducted by searching electronically and manually for English-language published studies. Publication time periods were not limited, but preference was given to research conducted since 1950. The electronic search was performed on the PubMed, Google Scholar, and University of Pittsburgh PittCat library databases and the HP2010 query system using keywords related to risk communication, health communication, -- techniques, -- recommendations, --frameworks, -- guidelines, website evaluation tools, Internet analysis tools, and online quality assessment. Once sources were located, explicit criteria and evaluation questions were copied in a spreadsheet or a text document depending on the format of the criteria or source. Both peer-reviewed publications and publically-accessible websites were considered within these searches. Once the key guidelines were saved, the researcher extracted criteria from the recommendations by sorting, summarizing, and categorizing them in a way that the criteria

assessed multiple levels of quality indicators without requiring too many questions or categories. (See Table 6.)

The following information discusses the general recommendations found during the literature review regarding health communication, risk communication, and Internet evaluation criteria. The specific evaluation components and their sources will be elaborated upon in the Results section where the website evaluation tool that resulted from the searches is discussed in detail.

3.1.1 Health Communication Criteria

Health communication's importance and key elements have been studied thoroughly by several governmental and individual sources; one of the most comprehensive and supported across several organizations is the health communication guidelines set forth by the U.S. DHHS (2000, Ch. 11) in Healthy People 2010. There, the U.S. DHHS identified what its researchers felt were the key determinants to properly communicate health. These include:

- *Accuracy* (content is without error, unbiased)
- *Availability* (information delivered where audience can access it)
- *Balance* (recognizing the different perspectives present in the issue, or the risks vs. benefits)
- *Consistency* (in content and application)
- *Cultural competence* (understanding and behaving in a way that attempts to accept and understand the differences that exist in cross-cultural situations (Cross, et al., 1989))
- *Evidence base* (information backed with scientific evidence)
- *Reach* (information reaches largest proportion of target population)
- *Reliability* (source is credible, content up-to-date)
- *Repetition* (information repeated over time and in different places to reinforce the impact with a given audience and to reach new generations)
- *Timeliness* (information provided when needed); and
- *Understandability* (language level and format are appropriate for the specific audience).

Other sources emphasize the importance of having a clearly defined/identified target audience, as well as a way to evaluate the content and presentation of health information by pre-

testing the message on focus groups, distributing online surveys, or conducting regular reviews of the content, for example (Doak & Doak, 2004; Eng et al., 1999; NCSD, 2008).

3.1.2 Risk Communication Criteria

Jardine et al. (2003) analyzed several environmental health risk communication frameworks in existence such as the *Framework for Environmental Health Risk Management* (U.S.

Presidential/Congressional Commission on Risk Assessment and Risk Management, 1997) and

Decision-Making Framework for Identifying, Assessing and Managing Health Risks (Health Canada,

2000). As a result, Jardine et al (2003) served as a guide to begin the development of the risk

communication component of the evaluation tool. This source also consolidated the components of good risk management and communication from the frameworks it analyzed. These characteristics

are summarized below:

- Properly *identify* and *define* the problem.
- Consider *surrounding circumstances*.
- *Balance* the multiple dimensions of the risk.
- Ensure high *reliability* for the management of risk.
- *Involve* other partners or affected parties.
- Communicate *honestly* and *openly*.
- *Evaluate* continuously.

An additional set of criteria for communicating risk according to the Covello and Allen of the U.S. EPA are the *Seven Cardinal Rules to Risk Communication*: “accept and involve the public as a partner, plan carefully and evaluate your efforts, listen to the public’s specific concerns, be honest, frank, and open, work with other credible sources, meet the needs of the media, and speak clearly and with compassion” (1998). The U.S. NRC also discussed the risks vs. benefits of an exposure and how such a risk is assessed (1989, pp. 33-34). This list helped to guide Questions 5-15 on the evaluation (See 4.1 SPECIFIC AIM 1). While the previously mentioned guidelines and risks vs. benefits were not intended to be the sole sources of information about risk communication, they do

help to identify and evaluate the most important elements of risk communication as identified by experts in the field.

3.1.3 Website Evaluation Criteria

Many website evaluation tools exist to determine the quality of the information provided (Berland et al., 2001; Jadad, & Gagliardi, 1998). Gagliardi and Jadad (2002) found that many are not complete, validated, or sustainable over time. The evaluation criteria included in the Health on the Net Foundation's Code of Conduct (HONcode) is one of the more widely accepted sets online, although one source (Breckons, Jones, Morris, & Richardson, 2008) suggests that the HONcode evaluates websites using different criteria than other evaluation tools. The HONcode's goal is to evaluate and certify health information presented on the Internet. In order for a website to receive the HONcode certification, it must fulfill the following elements:

- *Authoritative* (The website identifies the authors and their qualifications)
- *Complementarity* (The information provided should support, not replace, the doctor-patient relationship)
- *Privacy* (The website must respect the privacy and confidentiality of personal data submitted to the site by the visitor)
- *Attribution* (The website developers cite the source(s) of published information, date and medical and health pages)
- *Justifiability* (The website must back up claims relating to benefits and performance)
- *Transparency* (The presentation of the information is accessible and provides an accurate email contact)
- *Financial disclosure* (Developers must identify the funding sources for the website and the organization – if applicable)
- *Advertising policy* (Website designer should clearly distinguish the advertising from editorial content – if applicable) (Health on the Net Foundation, 1997)

Another set of website quality criteria was developed and supported by several government entities and incorporated into the nationwide project, Healthy People 2010 (HP2010). The main goal of these criteria is to allow people to accurately and easily judge the quality of websites,

especially health-related ones. As identified by the SPICH (1999) and cited in HP2010, websites should make available:

1. the identity of the developers and sponsors of the site (and how to contact them) and information about any potential conflicts of interest or biases;
2. the explicit purpose of the site, including any commercial purposes and advertising;
3. the original sources of the content on the site;
4. how the privacy and confidentiality of any personal information collected from users is protected;
5. how the site is evaluated; and
6. how the content is updated. An additional mark of quality that should be present in a Web site relates to the site's accessibility by all users. Contents of the site should be presented in a way that people with disabilities and with low-end technology can use it. (U.S. DHHS, 2000, Ch. 11)

Overall, the literature and online searches identified several website evaluation criteria and tools, but none that were tailored for environmental health messages on the Internet. The most often cited criteria for evaluating information on the Internet dealt with the content, appearance of the site, author qualifications and disclosure, how up to date the information was, and the ease with which the site could be accessed and used (Kim, Eng, & Deering, 1999). Though perhaps impossible to accomplish (Delamothe, 2000), the consensus among the many sources that have discussed and analyzed online evaluation tools is that a standard set of criteria is needed to be developed and sustained to ensure that the information people access on the Internet is of the highest quality (McLeod, 1998), as only some of the website evaluation tools have been evaluated for their effectiveness and quality (Eysenbach & Diepgen, 1998; Gagliardi & Jadad, 2002; Gray, 1998; Jadad & Gagliardi, 1998; Kim et al., 1999; U.S. DHHS, 2000).

3.2 SPECIFIC AIM 2: PILOT TESTING WEBSITE EVALUATION TOOL

To pilot test the website evaluation tool, five government websites that ranked highly on common U.S. search engines were identified. Government sites were chosen because they were more likely to contain the same level and type of environmental health information. An emerging

environmental health issue, PM, was chosen as the focus of the evaluation within those sites. The evaluation tool that was developed as part of Specific Aim 1 was then used to evaluate the five government websites in order to determine the quality of environmental health information presented there.

3.2.1 Government Website Identification

Many people use search engines to access health information online (Eysenbach & Köhler, 2002a). As of March 2009, the four most widely used Internet search engines in the U.S. were Google (1st), Yahoo! (2nd), Microsoft (MSN) (3rd), and Ask.com (4th) (comScore, Inc., 2009). These were the search engines the author of this study used to identify the five government websites that would rank the highest if a general user conducted an Internet search for environmental health information.

Many webpages are not displayed in search results, such as library catalogs (University of California Berkeley – Teaching Library Internet Workshops [UC Berkeley – TLIW], 2009b). Because this research focused on the website results that a typical user would find and be able to access after conducting an online search through a search engine, those ‘invisible pages’ were not included in the government website identification process.

Gaining entrée into the online community was not difficult, since the websites chosen for the evaluation were openly accessible by the general public instead of peer-reviewed journal websites where publications may be protected by logins or memberships. Internet access was obtained in localities where Internet access was free or inexpensive, such as coffee shops and open-access providers. These sites were chosen to replicate the experience of the general user who would be browsing the Internet without access to private or privileged information.

Prior to conducting each search, the computer's cache¹ and Internet browsing history were cleared to eliminate search bias, which could be caused because computers automatically "remember" users' favorite websites. The search terms and specifications used during the Internet searches were:

- "Environmental health",²
- Environmental health,
- Health AND environment,³ and
- Exposure AND health
- *With the specification that only ".gov" sites are displayed.*

These specific terms were used because they represent the most generic and important terms that someone might use to research environmental health information and how exposures could affect their health. The search terms: *environmental health*, *health AND environment*, and *exposure AND health*, were also offered by Google as related search options to the term "*environmental health*." Specifying that the search engine only websites with ".gov" at the end of their URL⁴ limited search results to websites run by federal, state, local or tribal government organizations within the United States (U.S. General Services Administration, 2009).

Sixteen searches were conducted in total, one for each of the four search terms using the four search engines. Because the ranking of websites within search-site results changes daily, the

¹ A cache is a collection of frequently accessed information that a computer stores to decrease the time it takes to find the data.

² Enclosing a phrase in quotes allows the user to access websites that list a specific combination of words, not the words separately.

³ Most search engines ignore commonly searched words such as "and," but if "AND" is used between two words or phrases, the search engine will only display websites that display both words or phrases, not just one or the other.

⁴ URL = (Uniform Resource Locator), or website address.

search results were copied into a spreadsheet and dated. (See B.1: INDIVIDUAL SEARCH ENGINE RESULTS). Only the first five valid website results from each search were copied into a spreadsheet because an Internet user is more likely to click on the links displayed on the first page of the search results (websites that rank higher in the search results) than on ones located on subsequent pages (websites that sit lower in the search results) (iProspect.com, Inc., 2008). Online journal websites were not included in this search process. They were excluded to replicate the experience of a general user who may have difficulty accessing an entire journal website and/or publications.

After collecting the websites displayed on all four search engines, the host organizations of the specific URL's were identified, allowing the surveyor to consolidate and tally the frequency that the base⁵ website URLs were displayed in the search results. (See B.2: COMBINED TALLY OF 4 SEARCH ENGINES' RESULTS). The five websites with the highest number of occurrences during the searches were chosen for the pilot test website evaluation. See Table 1.

Table 1. The five¹ most highly ranked U.S. government websites in Internet searches conducted using the four most popular U.S. search engines.

Host Organization	Base Website URL	Frequency
Centers for Disease Control and Prevention (CDC) ²	http://www.cdc.gov	21
U.S. Environmental Protection Agency (EPA)	http://www.epa.gov	9
Kansas Department of Health and Environment (Kansas)	http://www.kdheks.gov/	6
Massachusetts Office of Health and Human Services (Mass.)	http://www.mass.gov/	4
Healthy People 2010 (HP2010)	http://www.healthypeople.gov/	4

⁵ A base URL is typically the host organization's homepage. The base URL for the websites identified as <http://www.cdc.gov/environmental> and <http://www.cdc.gov/nceh>, for example, is <http://www.cdc.gov>.

Table 1 continued.

¹ Upon tallying the frequency of each website's presence in the search engine results, it was determined that the previous address for the National Institute for the Environmental Health Sciences (NIEHS) (<http://www.niehs.nih.gov>) no longer linked to NIEHS, but to a different organization. As of July 1, 2009, the National Institute of Health (the umbrella organization over NIEHS) had not provided an updated website address for the NIEHS, so the NIEHS website's evaluation was excluded from the pilot test evaluation even though it had appeared in the search results a total of eight times.

² The www.CDC.gov/environmental, www.CDC.gov/nceh, and www.atsdr.cdc.gov addresses were combined because they shared one host (www.cdc.gov), as well as many links and pages.

(For the full website identification process, see APPENDIX B.)

3.2.2 Topic Selection

A recent environmental health issue was chosen as the focus of the website evaluation based on the timeliness of the issue and whether all five websites presented information about the topic of interest. Of the three topics that all five websites shared (air quality, lead poisoning prevention, and radiation), air quality was chosen as the environmental health issue to evaluate. The proposed American Clean Energy And Security Act of 2009, which is intended to reduce America's greenhouse gas emissions 17 percent by 2020 (Waxman-Markey ACES Bill, 2009), and the federally imposed smoking restrictions to protect indoor air quality found in the Family Smoking Prevention and Tobacco Control Act (2009) both make air quality a timely environmental health issue.

A specific environmental health risk under the category of air quality, PM, chosen to increase comparability between website results, especially in the way that the websites communicated risk. Particulate matter consists of a number of very small particles of varying chemical consistencies and pollutes air, water, soil, and solid surfaces. These particles can be emitted from many sources, such as construction areas, fires, power plants, vehicles, as well as natural sources (U.S. EPA, 2009).

The resource used as the “gold standard” for the information that should be available about PM during the pilot test originated from the U.S. EPA. After researching information about the topic, the U.S. EPA’s “Fast Facts” webpage appeared to incorporate all of the necessary information about PM, while leaving out unnecessary wording and excessive details. These “Fast Facts” are shown in Figure 3 below:

U.S. EPA's
Particulate
Matter: Fast
Facts

- Particles that are less than 2.5 micrometers in diameter are known as "fine" particles; those larger than 2.5 micrometers, but less than 10 micrometers, are known as "coarse" particles.
- Fine particles are easily inhaled deep into the lungs where they may accumulate, react, be cleared or absorbed.
- Scientific studies have linked particle pollution, especially fine particles, with a series of significant health problems, including:
 - increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing, for example; decreased lung function; aggravated asthma; development of chronic bronchitis; irregular heartbeat; nonfatal heart attacks; and premature death in people with heart or lung disease.
- Particle pollution can cause coughing, wheezing, and decreased lung function even in otherwise healthy children and adults.
- Studies estimate that thousands of elderly people die prematurely each year from exposure to fine particles.
- The average adult breathes 3,000 gallons of air per day.
- According to the American Academy of Pediatrics, children and infants are among the most susceptible to many air pollutants. Children have increased exposure compared with adults because of higher minute ventilation and higher levels of physical activity.
- Fine particles can remain suspended in the air and travel long distances. For example, a puff of exhaust from a diesel truck in Los Angeles can end up over the Grand Canyon.
- Some of the pollutants that form haze have also been linked to serious health problems and environmental damage.
- Particle pollution settles on soil and water and harms the environment by changing the nutrient and chemical balance.
- Particle pollution, unlike ozone, can occur year-round.
- People can reduce their exposure to air pollution by checking their daily air quality forecast and adjusting strenuous outdoor activities when an unhealthy AQI is forecast.

Figure 3. U.S. EPA's particulate matter: fast facts (2008b).

Even though the “gold standard” used to compare the content during the pilot test website evaluation was authored by one of the organization under review (the U.S. EPA), the evaluation tool

took into account other variables when assessing the communication quality of the U.S. EPA website so as not to artificially inflate its overall score.

Once a topic was chosen, the base websites from Table 1 were searched for pages that contained information about PM. The specific webpages and their hosts identified for the pilot test evaluation are listed below:

Specific Webpages Chosen for Pilot Test Evaluation:

- Agency for Toxic Substances & Disease Registry of the CDC (ATSDR/CDC)
www.atsdr.cdc.gov/general/theair.html
(ATSDR, 2009)
- U.S. EPA
www.epa.gov/particles/
(U.S. EPA, 2009)
- Healthy People 2010
www.healthypeople.gov/Document/HTML/Volume1/08Environmental.htm
(U.S. DHHS, 2000)
- Kansas
www.kdheks.gov/bar/air-monitor/pollutants.html
(Kansas Department of Health and the Environment, n.d.)
- Mass.
www.mass.gov/dep/air/aq/aq_pm.htm
(Commonwealth of Massachusetts, n.d.)

3.2.3 Rating Process

Each website was evaluated separately; the surveyor filled out the evaluation for one website before evaluating another website, as opposed to answering one question for all five sites before moving on to the next question. Once points were awarded for all of the questions for the websites, the surveyor returned to the evaluation scores originally awarded for each question to verify the score's accuracy. The surveyor limited the time spent on each website's evaluation to three to five consecutive hours; sites varied in the ease of navigation, which determined how long it took to evaluate the site properly. In regards to question 50, "Can the website be accessed reliably (vs.

often being busy or offline)?”, the surveyor browsed the websites two separate times – morning and evening – to determine the reliability of the websites’ servers during different times of the day.

3.2.4 Readability

It is generally accepted that information aimed at the general public should be written at the U.S. eighth-grade level or below, especially health-related information (Doak, Doak, & Root, 1996). The Flesch Reading Ease (score range 0 to 100) and Flesch-Kincaid Reading Level (score range 0 to 12) are two of the most commonly used and accepted ways of measuring a document’s readability (Flesch, 1948; Kincaid, Fishburne, Robers, & Chissom, 1975). Despite concerns that the scores provided in Microsoft Word are artificially low (Doak & Doak, 2004), both the Flesch Reading Ease and Flesch-Kincaid scores can be determined using this common software program’s standard readability tool. When text is entered into Word’s tool, the higher the Flesch Reading Ease score the less difficult the passage is to read. Receiving a score between 60 and 70 is considered a standard reading level for a high school student, and was used as the cutoff for ‘ease in readability’ on the evaluation tool. Similarly, a Flesch-Kincaid score of 8 (the U.S. grade level) or below was considered acceptable on the evaluation tool.

To determine the readability of a website’s presentation of PM information, the surveyor arbitrarily picked 500 words related to the topic of PM on each website to analyze in Microsoft Word. Copying the text into a Word document and running the Spell Check tool allowed the surveyor to determine if spelling and grammar were used appropriately on the websites, as well.

4.0 RESULTS

The following section will present the results from this study. The results from Specific Aim 1 (development of the environmental health website evaluation tool) will be discussed first, followed by the results of Specific Aim 2 (website evaluation tool pilot test).

4.1 SPECIFIC AIM 1

The key criteria identified during the literature review and incorporated into the website evaluation tool were: Basic Website Information, Content (consisting of the subsections: Scope, Accuracy, Risk Communication, Authority, Up-to-Date, Links, Writing Quality), Appearance/Layout, Purpose/Audience, and Access/Use. See Figure 4 for the category layout of the website evaluation tool.

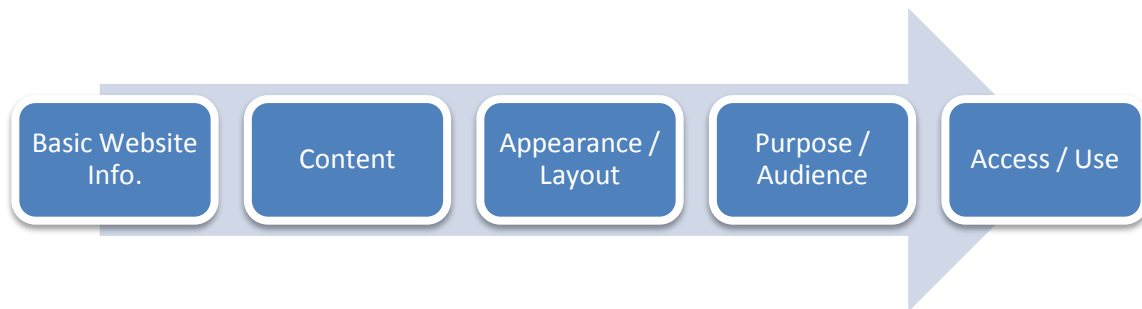


Figure 4. Criteria categories of the environmental health website evaluation tool

Within those categories and subsections are questions related to the topic followed by either a “yes”, “no”, or “not applicable” options for the surveyor to choose. Depending on the response, a point value on an ordinal scale is awarded: either 2, 0, or -2 points for the most important features that should be present on a website, or 1 to -1 for the lesser important criteria. The higher the website score at the end, the better that website has performed on the evaluation.

The following sections describe each major component of the website evaluation tool and the rationale behind including them as evaluation criteria. See Table 7 to view the entire website evaluation tool template.

4.1.1 Evaluation Section 1: Basic Website Information

The first section of the environmental health website evaluation tool includes solely descriptive and identifier information, a feature commonly found in website evaluation tools (Anderson, 2001; St. Croix, 2005). See Table 2 below.

Table 2. Section 1 of environmental health website evaluation template.

Evaluation Title	
Topic Page Address (URL):	Date Evaluated:
webpage Title:	Evaluator:
Host Organization & URL:	
Host Organization's Mission:	Final Website Score (on scale from -68 to +68):
Sources: Anderson, 2001; St. Croix, 2005.	

Description of terms (top to bottom, left to right in Table 2)

- **Evaluation Title** – What website is being evaluated and why?
- **Topic Page Address (URL)** – The webpage that contains information about the topic of interest, not the organization’s homepage; homepages typically do not go into detail about any one topic in particular.
- **webpage Title** – Title of the webpage within the website that contains information about the topic of interest.
- **Host Organization & URL** – Use this to identify the homepage of the organization overseeing the content (one of the five identified in the website search). This is important because some questions in the evaluation require the surveyor to examine pages other than the topic page.
- **Date Evaluated** – The date the evaluation is conducted. Websites change often, some daily, so it is important to include the date that an evaluation occurred. This will also be used by readers of the evaluation to determine if the evaluation and its results are timely.

- **Evaluator** – The person(s) who conducts the evaluation. Contact information can be included if relevant to the research.
- **Final Website Score** – This is the total score the website will receive on the evaluation, which is determined by adding up the raw points awarded on the individual questions that follow the first section.

4.1.2 Evaluation Section 2: Content

The next major section of the evaluation tool examines the quality of the content on the websites being evaluated.

Scope: The first sub-section of the content portion of the evaluation tool is concerned with the scope of the content. (See Table 7 for the entire website evaluation tool template.) The two questions asked in this section are: “Does the website cover all areas of the topic?”, which requires the surveyor to examine the breadth of the information, and “Does the website go into adequate detail to encourage appropriate knowledge acquisition and decision-making?,” which measures the depth of the content. Both breadth and depth are important when evaluating content quality (Anderson, 2001). For example, if the health effects of airborne PM are excluded from the webpage where the exposure is discussed, then the website has not adequately covered all areas of the topic and will require the Internet user to seek information elsewhere or the user will possess incomplete knowledge about PM.

Accuracy: Accuracy is the next sub-section, which asks the questions, “Is the information provided on the website accurate and free of bias?” and “If applicable, is advertising clearly differentiated from the informational content?”. While perhaps self-explanatory, the need for accurate information was cited by numerous publications as pinnacle to the evaluation process (Anderson, 2001; ATSDR, 1994; Chess, Hance, & Sandman, 1988; Covello & Allen, 1988; Doak & Doak, 2004; Donovan & Covello, 1989; Jardine et al., 2003; MedlinePlus, 2006; National Cancer Institute [NCI], 2009; NRC, 1989; Reynolds et al., 2002; UC Berkeley - TLIW, 2009a; U.S. DHHS, 2000). For example,

if a website has underlying financial ties to a pharmaceutical drug company and recommends on its website that people consume the company's products as a remedy for an ailment, then the site may be considered biased, even if it is accurate.

Risk Communication: The next sub-section focuses on the websites' ability to properly communicate risk. The list below describes the questions (with corresponding question numbers) included in this part of the evaluation, and a description of the issue the questions address:

5. *Are the hazards/risks stated clearly?* – A hazard (the exposure or situation of concern) should be stated and described in a way the target audience can understand.
6. *Is the probability of the exposure/risk stated clearly?* – Same as the above rationale, but letting the reader know what the likelihood is that he/she could be exposed or put at risk.
7. *Is the probability of harm resulting from exposure clearly provided?* – How likely is it that the exposure will cause harm to the reader?
8. *Does the site list vulnerable populations to the risk in question?*– Vulnerable populations, such as children or the elderly, should be listed. Often users are researching how an exposure (such as lead) affects people differently (lead exposure is more dangerous to developing children).
9. *Does the website adequately explain how this exposure/risk interacts with others?* – A user should be lead to understand how the risk functions as part of daily life. Where does it originate? How does it interact with other forces? For example, high ozone levels are more likely to occur on hot, sunny days.
10. *Does the site adequately explain the characteristics of the hazard?* – Characteristics may include such descriptions as the size of the particles or their elemental makeup.
11. *Is the total population at risk clearly stated?* – Even though vulnerable populations may be described, does the information specify that anyone is at risk, or only women of childbearing age, for example?
12. *If applicable, are benefits associated with the exposure/hazard provided and described?* – At times, exposures may include benefits and these should also be mentioned in the risk's description. For instance, small amounts of sun exposure are good for proper vitamin D levels, but too much could cause a sunburn or cancer over time (Office of Dietary Supplements, 2008).
13. *Are alternatives to the exposure/risk provided?* – If a risk can be avoided, what measures should people take?
14. *Is the effectiveness of the alterative(s) provided?* – Does avoiding cigarette smoke indoors sufficient to reduce the risk of lung disease, for example?
15. *Does the site explain the risks vs. benefits of choosing the alternative(s) or of failing to act entirely?* – The information should include some discussion of the risks vs. the benefits if available.
16. *If uncertainties exist about the level of risk or about the amount or certainty of research available, is this made clear by the organization?* – At times, research about and

environmental concern is in its early stages. Organizations should make this clear to the reader.

17. *Does the website appear to have taken stakeholders' perspectives or situations into account (perhaps during the development of risk management choices or when determining the level of risk)?* – Does the information appear (or is it made clear) that the people most likely to be affected are represented in the information's development and/or presentation?

Sources: ATSDR, 1994; Chess et al., 1988; Covello & Allen, 1988; Doak & Doak, 2004; Jardine et al., 2003; Reynolds et al., 2002; U.S. DHHS, 2000; U.S. NRC, 1989.

As previously mentioned the bulk of the questions in the risk communication section were adapted from the U.S. NRC's list (1989). Although questions 5 through 15 (shown in the list above) do not address the type of personal risk communication that the public may search for occasionally (U.S. NRC, 1989, pg. 78), such as "How easy is it to remove red meat from my diet?", they do provide general education guidelines on the dimensions of risk that should be communicated.

Questions 16 and 17 were added to the risk communication section due to the stress that some sources, including reviews of several risk management frameworks, placed on incorporating stakeholder and community perspectives in the decision-making and outreach that occurs during the risk management process (Chess et al., 1988; Jardine et al., 2003; Reynolds et al., 2002).

Authority: Authority, or the credibility and trustworthiness of a source, was identified by several sources as central to website evaluations, as well as within risk communication, because any organization or individual can post information on the Internet (Adelhard & Obst, 1999; Anderson, 2001; ATSDR, 1994; Covello & Allen, 1988; Lamp & Howard, 1999; MedlinePlus, 2006; NCI, 2009; Reynolds et al., 2002; St. Croix, 2005; Silberg et al., 1997; UC Berkeley - TLIW, 2009a; U.S. DHHS, 2000). If a website was not developed by an accredited institution and/or personal and the scientific evidence behind the information provided is lacking or non-existent, the quality of the website is significantly decreased.

All of the questions in the authority section aim to help the surveyor/user determine the credibility of the organization that presents the information and the source of that information. See Table 3, below.

Table 3. Authority section of environmental health website evaluation tool.

#	Question	Choice	Scoring
18	Was the website created by a reputable organization and/or experts?	Y / N / NA	Y=2, N=-2, NA=0
19	Does the site list references for the content?	Y / N / NA	Y=2, N=-2, NA=0
20	If so, are the references from peer-reviewed or official government sources?	Y / N / NA	Y=2, N=-2, NA=0
21	Can the author(s) of the content (if applicable) be contacted for more information?	Y / N / NA	Y=1, N=-1, NA=0
22	Is it clear what organization is responsible for the contents of the page and is this information available on every webpage?	Y / N	Y=1, N=-1
23	Is there a link to a page describing the goals of the organization?	Y / N	Y=1, N=-1
24	Can the legitimacy of this organization be verified? (Site provides more than just an email address, e.g. phone number or address)	Y / N	Y=1, N=-1
Sources: Adelhard & Obst, 1999; Anderson, 2001; ATSDR, 1994; Covello & Allen, 1988; Lamp & Howard, 1999; MedlinePlus, 2006; NCI, 2009; Reynolds et al., 2002; Silberg et al., 1997; St. Croix, 2005; UC Berkeley - TLIW, 2009a; U.S. DHHS, 2000.			

Up-To-Date, Links, and Writing Quality: The next three sub-sections in the content portion of the evaluation are “Up-to-Date,” “Links,” and “Writing Quality.” The questions and their rationale for inclusion in the website evaluation tool are listed below:

- *Has the webpage been updated/reviewed in the last year?* – This helps to determine if the information provided is up-to-date (and therefore less likely to be inaccurate).
- *Are page updates and information upload dates clearly visible to the user? (usually located at the bottom of every page)* – Often websites fail to include the date the page was uploaded or updated, making it difficult for users to determine if the information is up-to-date.
- *Are links to other resources appropriate and have they been kept up-to-date?* – The external webpages that are linked to on a site may change over time, requiring the webmaster to occasionally check on their URL's accuracy. This is another sign that the webpage is up-to-date.
- *Are links to outside sources distinguished between internal ones?* – A disclaimer telling the user that the link they are about to click on will take them away from the current website helps Internet users understand that the legitimacy or accuracy of the information provided there cannot be vouched for by the current organization.
- *If applicable, does it appear that the organization requested permission to reproduce information from other sources?* – Another sign that the information is properly referenced and the link approved.
- *Is the text well written? (smooth, clear, well organized)* – Not only does poor writing impair the user's ability to understand the information presented, poor writing is a sign that the organization responsible for the content may not be reputable and/or competent.
- *Do the authors use grammar and spelling appropriately?* – Same rationale as the above question.

Sources: Adelhard & Obst, 1999; Doak & Doak, 2004; MedlinePlus, 2006; NCI, 2009; U.S. NRC, 1989; Reynolds et al., 2002; Silberg et al., 1997; UC Berkeley - TLIW, 2009a; U.S. DHHS, 2000.

4.1.3 Evaluation Section 3: Appearance / Layout

The next major section of the evaluation addresses the visual appearance and layout of the entire website, not just the webpage(s) of interest. While this part of environmental health communication may not seem to be important enough to include in the evaluation, sources suggest that inadequate or confusing webpages can discourage users from staying on the website and engaging with the information, while proper visuals can enhance knowledge acquisition (Anderson, 2001; ATSDR, 1994; Doak & Doak, 2004; St. Croix, 2005). Some sources even suggest that as long as webpages are visually appealing and well-organized, Internet users will trust the information provided there above the content presented on credible but less attractive and understandable

websites (Eysenbach & Köhler, 2002a). The questions from this section, along with explanations, are listed below:

- *Is the website visually appealing? (good use of colors, no flashing text, appropriate text font and size) – ‘Appealing’ refers to avoiding the use of small font, poor contrast, cluttered pages, blinking text, awkward spacing, and large amount of words in one paragraph, etc. – anything that would make the information difficult to read.*
- *Do the visuals distract the user rather than contributing to the site's content? Visually appealing websites might still distract the user from the content.*
- *Do the graphics (images, Adobe flashplayer, or videos) include content? (e.g. A photo that helps demonstrate a health statistic) – This helps users understand the purpose of the graphic, instead of simply adding visuals to a page.*
- *Are the most important information and links located at the top or near the top of the page?*

Sources: Anderson, 2001; ATSDR, 1994; Doak & Doak, 2004; Donovan & Covello, 1989; Health on the Net Foundation, 1997; St. Croix, 2005.

4.1.4 Evaluation Section 4: Purpose / Audience

The next major section of the evaluation tool focuses on the purpose of the information and the website’s target audience. The questions that make up this section include:

- *Is the purpose of the website or page clearly stated? – To prevent the website from misleading users, the purpose of the website or webpage should be made clear, either through a mission statement or a leading objective sentence.*
- *Does the content match/fulfill the purpose that was provided? – Making sure that the purpose was not placed on the page to draw users in and then provide information that is unrelated.*
- *Is the intended audience made clear to the user? – While this may be difficult to assess, statements that identify the target audience might be formatted like the following statements: “The general public should be concerned...” or “Environmental health resources for public health officials...”*
- *Is the information presented in a way that is accessible to the intended audience? (Subjective evaluation, if technical terms are used they are defined?)*
 - *Determine Flesch-Kincaid Grade Level & Flesch Reading Ease Score - Is the grade level at 8 or below and the ease score 60 or above?*

Sources: Adelhard & Obst, 1999; ATSDR, 1994; Chess et al., 1988; Covello & Allen, 1988; Doak & Doak, 2004; Donovan & Covello, 1989; Flesch, 1948; Kincaid et al., 1975; MedlinePlus, 2006; NCI, 2009; Reynolds et al., 2002; St. Croix, 2005; U.S. DHHS, 2000.

4.1.5 Evaluation Section 5: Access / Use

Aimed at leveling the playing field between disabled Internet users and non-disabled users, Section 508 was passed by Congress in 1998 (IT Accessibility & Workforce Division [IAWD], 2008). This law requires that whenever a federally regulated website is developed or maintained, the sites must fulfill the set forth requirements. An example of one of these requirements is that any multimedia presentations must include text for situations when non-text is involved in the online presentation (IAWD, 2008). These requirements recognize that access and ease of use can significantly affect an Internet user's experience of a website. Table 4, below, demonstrates the questions chosen to assess those qualities:

Table 4. Access / Use section of website evaluation tool.

#	Question	Choice	Scoring
40	Does the site let the user know if special programs are needed to properly view the site?	Y / N / NA	Y=1, N=-1, NA=0
41	Is help available to users if needed?	Y / N	Y=1, N=-1
42	Is the website viewable using more than one browser or computer system (PC vs. MAC)?	Y / N	Y=1, N=-1
43	Is the website accessible by people who are using visually impaired browsers?	Y / N	Y=1, N=-1
44	Can urgent information be obtained on the homepage?	Y / N / NA	Y=1, N=-1, NA=0
45	Can information be effectively retrieved from the website through moderate searching?	Y / N	Y=1, N=-1
46	Does the website utilize a table of contents, site map, or search engine to improve searchability?	Y / N	Y=1, N=-1

Table 4 continued.			
47	If applicable, does the search engine allow the user to access the whole website during the search?	Y / N / NA	Y=1, N=-1, NA=0
48	Does the site provide a link for more information about the organization responsible for its content? (A link such as "About Organization X," "Background," "Mission", etc.)	Y / N	Y=1, N=-1
49	Is the website organized in a logical manner to allow for ease in browsing?	Y / N	Y=1, N=-1
50	If applicable, do interactive forms (such as surveys) add to the value of the site?	Y / N / NA	Y=1, N=-1, NA=0
51	Can the website be accessed reliably (vs. often being busy or offline)?	Y / N	Y=1, N=-1
Sources: Adelhard & Obst, 1999; Anderson, 2001; MedlinePlus, 2006; NCI, 2009; Silberg et al., 1997; St. Croix, 2005; UC Berkeley - TLIW, 2009a; U.S. DHHS, 2000.			

4.1.6 Rating Process

Once the development of the website evaluation tool was complete and pilot testing for Specific Aim 2 began, adjustments were made to ensure the tool adequately addressed the quality of the websites. The points awarded to question 4, "Y=1, N=-1, NA=1," were originally "Y=1, N=-1, NA=0" until the beneficial nature of limiting the amount of external advertising was considered. In question 33, "Do the visuals distract the user rather than contributing to the site's content?", the points awarded for "Yes" vs. "No" were switched when the question's wording changed, making "No" a sign of higher quality than "Yes." Although this could cause inaccuracies in the rating system due to the scoring being different than the rest of the questions, if the wording of the question was "Do the visuals contribute to the site's content, vs. taking away from it?", then the evaluation would penalize websites twice (questions 32 and 33) for lacking visuals. And finally, question 51 was

changed from, "Can the website be address reliably, or is it often busy or offline?" to "Can the website be accessed reliably (vs. often being busy or offline)?" so that the response would not be open ended.

4.2 SPECIFIC AIM 2

The next section presents the data that resulted from pilot testing the environmental health website evaluation tool developed in Specific Aim 1 on the five selected government websites.

This tool showed considerable practicality and ease of use in identifying the strengths and weaknesses of the five websites. The U.S. EPA website (<http://www.epa.gov/particles/>) received the highest scores in the content section and in total points. The Kansas Department of Health and the Environment's site (<http://www.kdheks.gov/bar/air-monitor/pollutants.html>) received the lowest scores in most of the evaluation categories and overall. None of the evaluated websites passed the readability criteria.

The raw points received by each of the five government websites on the evaluation tool, both in the overall score and the distribution of points throughout the evaluation categories, are shown in Figure 5 and Figure 6, below:

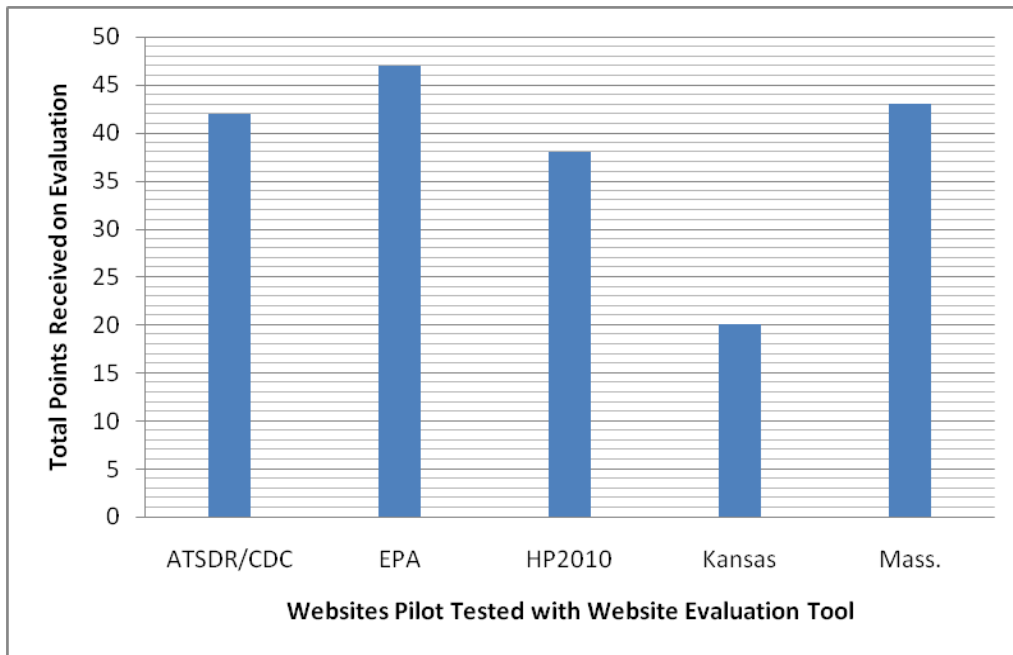


Figure 5. Total raw points that websites received on evaluation tool.

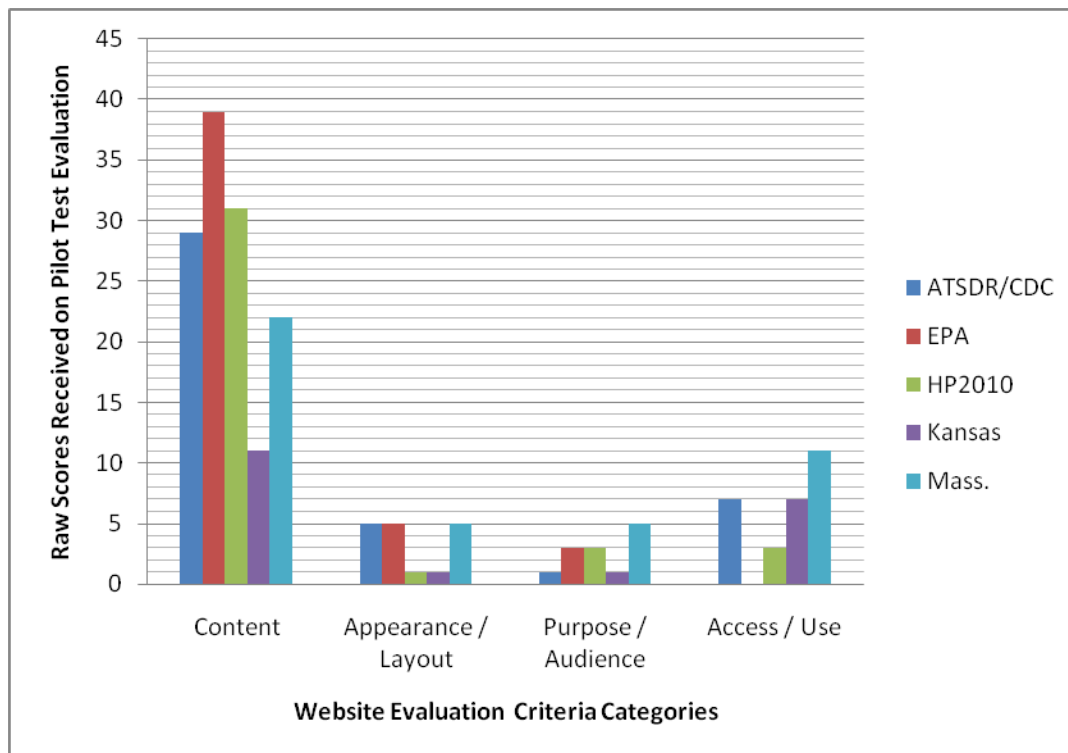


Figure 6. Distribution of raw points by category that websites received on evaluation tool.

Figure 5 & Figure 6 Key:

Website Acronyms

ATSDR/CDC = <http://www.atsdr.cdc.gov/general/theair.html>EPA = <http://www.epa.gov/particles/>HP2010 = <http://www.healthypeople.gov/Document/HTML/Volume1/08Environmental.htm>Kansas = <http://www.kdheks.gov/bar/air-monitor/pollutants.html>Mass. = http://www.mass.gov/dep/air/aq/aq_pm.htm

As demonstrated in Figure 5 and Figure 6, considerable differences between the five sites were found among the content, appearance, and access scores. The U.S. EPA website scored the highest number of points overall and in the content section of the evaluation, but the lowest on the access portion. The website run by the Commonwealth of Massachusetts (Mass.) scored much higher on the access/use criteria than the other websites and scored consistently well throughout the evaluation categories. The Kansas site received the lowest scores in most sections and overall, except in the access/use portion. (The data from the overall evaluation results can be found in Table 18.)

The following sections present the results from the pilot test on each of the main evaluation sections (Content, Appearance, Purpose, and Access).

4.2.1 Content Category Results

The quality of the content and risk communication of PM varied more than the surveyor expected between the websites. The website that received the highest number of points (39) in the content section of the evaluation, the U.S. EPA (<http://www.epa.gov/particles/>), fulfilled most of the risk communication requirements during the pilot test. (See Table 14 for the U.S. EPA's specific scores on the entire evaluation). For example, the first two paragraphs on the EPA's PM webpage, which link to additional pages, are quoted below:

"Particulate matter," also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

The size of particles is directly linked to their potential for causing health problems. EPA is concerned about particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. (U.S. EPA, 2009)

The U.S. EPA successfully communicated risk in five relatively simple sentences; PM (the hazard) and its constituents were first defined. Then, the authors explained why PM, especially that which is smaller than 10 micrometers in diameter, is a health concern (the risk involved with exposure to the hazard). For people interested in finding information about PM quickly, the two short paragraphs located at the very top of the page would provide them with the necessary information immediately. Because the risk communication questions were weighted more on the evaluation than the other sets of questions, it is not surprising that the U.S. EPA website scored well overall.

In contrast, the Kansas Department of Health and the Environment's webpage, (Kansas) (<http://www.kdheks.gov/bar/air-monitor/pollutants.html>), received the lowest score of 11 points on the content portion of the pilot test evaluation. The following quote is an excerpt of the first five sentences of the PM information:

Particulate matter is a broad classification of non-gaseous pollutants that consist of very fine solid particles and liquid droplets or aerosols. Examples of these solid particles can include dust, dirt, soot, and particles in smoke. Some particles are directly emitted into the air from sources such as vehicles, factories, construction sites, tilled fields, unpaved roads, stone crushing, and burning of wood. Other particles may be formed in the air when gases from burning fuels react with sunlight and water vapor such as fuel combustion in motor vehicles or at power plants. Particles can be suspended in the air for long periods of time and vary in size. (Kansas, n.d.)

While the information provided in the first five sentences of Kansas' PM paragraph accurately describes the hazard and its origin, Kansas did not state a purpose for the information provided on the webpage, the information does not explain the health effects associated with the exposure near the beginning of the discussion (they are located at the very end of the PM section), and nowhere on the website did Kansas communicate the relationship between PM's particle size (smaller than 10 micrometers in diameter) and an increased health risk.

Although not explicitly measured in the evaluation tool, it should be noted that the number and length of webpages may affect a website's performance on the tool. For example the U.S. EPA site, which did well in the content section, dedicated 13+ pages to educating visitors on PM, while the Kansas site, which scored poorly there, only dedicated a 6 pages to the topic (5 of which were not official HTML webpages, but PDF's⁶).

4.2.2 Appearance / Layout Category Results

The CDC/ATSDR (<http://www.atsdr.cdc.gov/general/theair.html>), U.S. EPA, and Commonwealth of Massachusetts (Mass.) (http://www.mass.gov/dep/air/aq/aq_pm.htm) websites all received the highest number of points possible in the appearance section of the evaluation. The sites were visually appealing, the content-relevant visuals were not distracting, and the most important information could be found at or near the top of the page. See Figure 7 to view an example of one of the sites that scored well on the appearance portion of the evaluation, the Mass. PM webpage:

⁶ "Hypertext Mark-up Language," or HTML, is the 'language' used by webmasters to write and design webpages. PDF's, or "Portable Document Format," are essentially Adobe files that have been made accessible to users on the Internet.



Figure 7. Commonwealth of Massachusetts PM screen shot.

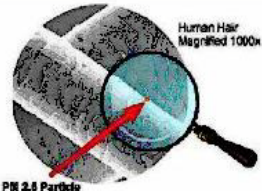
In the Mass. webpage screen shot in Figure 7, notice the proportion of white space in relation to the text, the links that draw the user's interest down the page for more information, and the good use of graphics, color, and font size that do not draw attention away from the content. These characteristics are the primary reasons the Mass. website scored well on the appearance section of the evaluation.

The Kansas and Healthy People 2010 (HP2010) (<http://www.healthypeople.gov/Document/HTML/Volume1/08Environmental.htm>), websites both scored poorly on the appearance portion (each receiving only one point). See Figure 8 and Figure 9 for screen shots of the HP2010 and Kansas webpages where PM information was presented:

<p>Nonattainment area: A locality where air pollution levels persistently exceed EPA's National Ambient Air Quality Standards.</p> <p>Nonpoint source: The source of runoff water coming from an area such as a yard, parking lot, pasture, or other urban or agricultural area.</p> <p>Ozone: Ozone occurs naturally in the stratosphere and provides a protective layer high above the earth. At ground-level, however, ambient smog. Ambient ozone refers to ozone in the troposphere—the air that people breathe—which is different from ozone in the stratosphere, though. Ozone is not emitted directly into the air but is formed readily in the atmosphere, usually during hot summer weather, from volatile organic compounds, vehicles, chemical plants, refineries, factories, consumer and commercial products, other industrial sources, and trees and from nitrogen dioxide. Vehicles, power plants, and other sources of combustion. Changing weather patterns contribute to yearly differences in ozone concentrations.</p> <p>Particulate matter: General term used for a mixture of solid particles and liquid droplets found in the air. These particles, which come in a variety of sizes, are from "built" and natural sources. Fine particles (PM2.5) result from fuel combustion from motor vehicles, power generation, and industrial facilities, residential fireplaces and wood stoves. Coarse particles (PM10) generally are emitted from other sources, such as vehicles traveling on unpaved roads, and crushing and grinding operations, as well as windblown dust.</p> <p>Per capita water use: The average amount of water used per person during a standard period, generally per day. In the United States, this is about 80 gallons per day.</p> <p>Persistent chemicals: Chemicals, such as organochlorine compounds, that remain in the environment for a long time and can accumulate in the bodies of animals exposed to them.</p> <p>Photosynthesis: Formation of carbohydrates from carbon dioxide and a source of hydrogen (as water) in the chlorophyll-containing tissues of plants.</p> <p>Point source: The source of water coming from a specific location, such as a drain pipe from a wastewater treatment plant or an industrial facility.</p>
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Figure 8. HP2010 PM screen shot.

Particulate matter is a broad classification of non-gaseous pollutants that consist of very fine solid particles and liquid droplets or aerosols. Examples of these solid particles can include dust, dirt, soot, and particles in smoke. Some particles are directly emitted into the air from sources such as vehicles, factories, construction sites, tilled fields, unpaved roads, stone crushing, and burning of wood. Other particles may be formed in the air when gases from burning fuels react with sunlight and water vapor such as fuel combustion in motor vehicles or at power plants. Particles can be suspended in the air for long periods of time and vary in size.



Some particles are large or dark enough to be seen as soot or smoke. Others are so small that they can only be detected with an electron microscope. The photo above shows a particle with an aerodynamic diameter of less than or equal to 2.5 microns, also called PM2.5. Particulate matter can be transported great distances in the atmosphere. Particulate matter with an aerodynamic diameter of less than or equal to 10 microns is designated as PM10. Burning of wood, diesel and other fuels, and open burning contribute particulate matter to the atmosphere, generally in the form of smoke. In addition, dust from agricultural operations, unpaved roads, and dust storms contain a significant proportion of PM10. Some areas within the state of Kansas experience occasional severe episodes of blowing dust or dust storms. In the 1930s, dust clouds originating in Kansas and neighboring states were observed on the East Coast of the United States.

Figure 9. Kansas PM screen shot.

As shown in Figure 8 and Figure 9, the low appearance scores received by the HP2010 and Kansas websites were due to lack of visual interest on the website, often displaying large, wordy

paragraphs that would lose the general reader's interest due to a lack of white space, color, or interaction. The graphics on both the webpages did contain content-relevant information, however.

It should be considered, that the purpose of the HP2010 website differs significantly from that of the other websites, and so may have affected HP2010's evaluation scores in the appearance section. While sites like www.atsdr.cdc.gov and www.epa.gov are intended to educate and provide resources about health and how general Internet users can reduce their risk of disease, www.healthypeople.gov is an online representation of a planning document used by public health organizations and officials with the goal of improving the health of American citizens by the year 2010. The individuals who manage the website may not be as concerned about the appearance of the site, only the information and action tools provided on it. HP2010's simple visual presentation, for example, decreases the time it takes to load and browse through the pages and requires less upkeep by webmasters.

It is also of note that the majority of common users of www.healthypeople.gov fall into the age group of 55-64, significantly older than those accessing the other four websites (Alexa Internet, Inc., 2009). (See Table 19 in the Appendix for the pilot-tested websites' user demographics). While the appearance of the website may not have been attractive to this surveyor, another reviewer may have awarded more points regarding the HP2010 website's simple design and appearance.

4.2.3 Purpose / Audience Category Results

The websites that scored the lowest on the purpose/audience portion of the website evaluation tool were the ATSDR/CDC and Kansas sites, each scoring only one point. The main reason these sites scored worse than the others is due to one question, "Is the intended audience made clear to the user?". Neither the ATSDR/CDC nor the Kansas site adequately described the target audience. The other reason the those sites received low points in the purpose/audience section is because they

did not pass the Flesch Reading Ease test or the Flesch-Kincaid Reading Level test. Interestingly, none of the websites passed either of these standards for readability during the pilot test. The readability scores of each website are presented in Table 5, below:

Table 5. Readability scores using Flesch Reading Ease and Flesch-Kincaid Grade Level tools.

Website	Reading Ease ¹	Grade Level ²	Pass Evaluation Criteria ³
ATSDR/CDC	53.4	10.4	Neither
EPA	41.2	11.8	Neither
HP2010	26.3	12 ⁴	Neither
Kansas	43.2	11	Neither
Mass.	43.4	10.8	Neither
ATSDR/CDC = http://www.atsdr.cdc.gov/general/theair.html ; EPA = http://www.epa.gov/particles/ ; HP2010 = http://www.healthypeople.gov/Document/HTML/Volume1/08Environmental.htm ; Kansas = http://www.kdheks.gov/bar/air-monitor/pollutants.html ; Mass. = http://www.mass.gov/dep/air/aq/aq_pm.htm			
¹ The Flesch Reading Ease score ranges from 0 to 100 (100 being the best, or most simple text).			
² The Flesch-Kincaid Reading Level score ranges from 0 to 12, correlated with the U.S. education grade levels.			
³ Evaluation criteria: Is the grade level at 8 or below? Is the reading ease score 60 or above?			
⁴ The Flesch-Kincaid Grade Level scoring range is from 0 to 12, so it is possible the HP2010 website would have received a higher grade level score (which reflects negatively on the readability criteria) than is represented on this chart.			

As noted in the Table 5, the Healthy People 2010 website received the poorest scores on both the Reading Ease and Grade Level tools out of all of the pilot-tested websites. This result could have occurred because the HP2010 project’s target audience is public health officials and other highly trained professionals in fields specifically related to the project’s goals. To allow for the general Internet user to understand the goals and progress of the HP2010 project, however, the readability of the website should be improved.

4.2.4 Access / Use Category Results

Notable differences on the websites identified during the pilot test dealt with user access to the information. This is more important than it may at first seem; if a user cannot access or navigate a website properly, it does not matter how well the information provided on that site is communicated.

The website that scored the least amount of points in this section was the U.S. EPA site with a score of 0, a stark difference from the Mass. site that received 11 points. Part of the reason why the U.S. EPA site performed so poorly on this portion was due to difficulty that browsers for the visually impaired would have had when accessing the site. In order to determine the accessibility of the websites on the evaluation, the five government websites' URLs were entered into an online accessibility tool that evaluates barriers that might be encountered on a specific webpage (such as hidden links or pictures without alternative text to explain what they demonstrate). Any online accessibility tool would guide the surveyor through this process, but the Web Accessibility Evaluation Tool (WAVE) (2009) was used to conduct this part of the research. While the other pilot-tested websites and their homepages contained only one or two accessibility errors, the U.S. EPA homepage and PM pages contained 9+. (For a screen shot of the accessibility errors encountered on the U.S. EPA homepage, see Figure 10 in the Appendix).

Even though the CDC/ATSDR website scored moderately well in the access section of the evaluation tool, it is of note that the navigational layout of the CDC website is very intricate and poorly defined. Prior to arriving at the specific "Air" webpage (<http://www.atsdr.cdc.gov/general/theair.html>), the user must navigate through the several pages

of the CDC website.⁷ It takes five clicks to arrive at the desired location from the CDC homepage. Upon first arrival, the layout/design of the ATSDR PM webpage could confuse the user as it is very similar to the CDC's homepage (<http://www.cdc.gov>). This is because that while the page is still considered part of the CDC's domain, the main organization responsible (under the umbrella of the CDC) is the ATSDR. The overlap that occurs between the links and webpages could easily confuse the user, as it did the surveyor in this study.

4.2.5 Pilot Testing Conclusion

Even though additional research would help to validate the evaluation tool developed in Specific Aim 1, in its current form the tool successfully identified the major strengths and weakness of the five government websites. Caution should be taken when judging a website's quality by its total points, as this would disregard rich information available in the category scores. Overall, the tool was easy to use, addressed all of the key communication criteria identified during the literature review and online searches, and produced specific results data that the pilot-tested websites could use to improve their environmental health communication and websites' effectiveness.

⁷ -- except if the search engine's results brought the user directly to the webpage of interest, or if the user enters the term "particulate matter" into the search engine.

5.0 DISCUSSION

This study has demonstrated that evaluation tools tailored for environmental health messages can be developed by consolidating communication recommendations across the fields on health communication, risk communication, and Internet evaluation. Although not validated, this tool helped to identify the strengths and weaknesses of the government websites analyzed in the pilot test. This analysis also indicates all websites should be evaluated for all of the main components of the evaluation tool: content, appearance/layout, purpose/audience, and access/use, regardless of the site's scholarly level or authority; judgments made based on the overall score can mask the strengths and weaknesses of each website

It is plausible that the scores in the different categories indicate an intentional focus on one criteria (such as authority) than another; the low scores received in the appearance criteria by a well-respected government-run project's website, HP2010, could have represented the project's focus on providing planning and action tools to improve the nation's health, not just educational information. The HP2010 website exists solely so that people who desire to access the project's goals and guidelines can do so from anywhere in the world. Future research should consider the potential confounding effect of a website's purpose or purposes (online information resource vs. action toolkit) on the scores of website evaluations. Additionally, the evaluated websites should focus their online efforts on adjusting the areas where they need the most improvement as identified by the pilot test, such as the U.S. EPA's access capabilities.

5.1 STRENGTHS AND LIMITATIONS

Several possible limitations should be considered in interpreting the website evaluation tool and the data that resulted from its pilot testing.

5.1.1 Trust in Government Sources of Health Information

One of the assumptions of this project was that the general public trusts government sources of health information over other sources (National Institute on Aging, 2007), and so would be more likely to visit government websites to access that information. It should be considered that people under duress or in public health emergencies, such as natural disasters or acts of bioterrorism, sometimes rely on peripheral cues (simple messages, visual appeal, and availability) instead of central cues (accurate content and trustworthy sources) (Petty & Cacioppo, 1986). Due to the difficult nature of accessing and possibly in understanding the complex PM information identified during the pilot test (See 4.2.3 Purpose / Audience), it is possible the general user who is very concerned about possible PM exposure would defer to websites written by the general public, such as Wikipedia (Eysenbach & Köhler, 2002a).

5.1.2 Website Identification and Search Process

Despite clearing the computer's cache and any information automatically stored in the public computer that will be used to identify the five most used government websites, a drawback to the research methodology is that a website's search ranking (whether it shows up near the beginning of a search) is highly dependent upon the time the search occurred (based on other websites' current search promotion strategies, funding, popular topics, etc.). This means that if another search was conducted at a different time or location using the same search terms, the top government websites may differ from the ones displayed in the original website identification searches.

An additional issue regarding the website identification process is the potential that searching for terms specifically related to PM would have changed the government websites chosen to pilot test the evaluation tool. Environmental health communication was the focus of this research, not PM specifically, so this method actually served to strengthen the search process; if the search criteria had been defined too narrowly, e.g. using search terms such as “particulate matter” and “particulates,” the website identification process may have potentially missed the broader websites that provide environmental health information, such as www.mass.gov and www.healthypeople.gov.

5.1.3 Rater Reliability

An additional limitation to this project is related to rater reliability; interobserver variation is likely when evaluating websites, but only one researcher identified and evaluated the websites. This could result in a positive rating being given for the appearance of one site, for example, where another surveyor would have given it a poor rating. This being said, because the results of the evaluation tool combine to provide one overall score, the interobserver variability combined with interevaluation variability (due to several criteria being assessed at once) increase the likelihood that the tool would produce consistent results among surveyors across websites.

5.1.4 Generalizing the Results

Furthermore, the results of the websites’ evaluations cannot be generalized to the entire population of websites that provide environmental health information because the sample size is too small (n = 5), and the tool has not been tested for reliability or validity. While a small sample size is a drawback to some research methods, it serves as a strength in this case because the study attempted to gather rich data about the feasibility and functionality of an environmental health website evaluation tool. Little information is available at the present time about how environmental

health information is and should be presented on the Internet. Therefore, pilot testing the evaluation tool on five websites provided resonant data that can be used to guide future research, especially for researchers interested in combining communication techniques across different fields (genetic susceptibility, risk communication, and reproductive health, for example).

5.2 PUBLIC HEALTH IMPLICATIONS

5.2.1 Applying Theory to Practice

The field of public health encourages researchers and students to apply research to practice – to the world outside of academia (Graduate School of public health, 2006). This project, and others like it, helps to make possible the application of theories to Internet-based, public health practice; the evaluation developed through this research can be used for future environmental health evaluation research that occurs online. The results of Specific Aim 2 can be adapted by agencies that provide environmental health information on the Internet so that they can improve their websites' level of risk communication and the online experience of visitors on those sites. Additionally, the website evaluation and its development process could be developed into an online tutorial. This would allow general Internet users a guide for determining the quality of the environmental health information they encounter online, and to provide a venue for the importance of public health and environmental health to be discussed.

5.2.2 Identifying Inconsistencies in Health Information

In relation to the socio-ecological model, future studies should take into account the effect that websites that provide varying or opposing public health information might have on knowledge acquisition. For example, one site might advise people to eat soybeans as a good source of omega-3 polyunsaturated fat (CDC, 2008), while another equally credible website might warn of the dangers of consuming soybeans due to their estrogenic potential – a risk for women prone to estrogen

receptor-positive breast cancer (Suzuki et al., 2008). The current website evaluation can be adapted to identify and understand how inconsistencies between credible sources of information on the Internet affect knowledge acquisition and health behaviors.

5.2.3 Combining Automated and Human-guided Evaluation Tools

Although the topic is outside of the scope of this project, automated website evaluation tools (ones conducted by a computer using solely objective criteria) allow for more websites to be evaluated and tracked over time. These computer-guided tools lack the human component, whereas human-guided evaluations like the one developed in this project can help to illustrate and evaluate an Internet user's online experience and the context in which the websites exists (Ivory, 2003). Just as health behaviors are affected on multiple levels of influence (McLeroy, 1988), so too are the behaviors of research and evaluation; as previously mentioned, the current political climate is placing importance on clean air policies and that could affect users' perceptions of website quality. For example, Internet users searching for clean air information regarding the current legislation might find a credible source inadequate because it lacks an explanation of the proposed American Clean Energy And Security Act of 2009 (Waxman-Markey ACES Bill, 2009) and/or the Family Smoking Prevention and Tobacco Control Act (2009). Where a computer-guided evaluation tool would have missed this political context, the human-guided one may be able to take it into account and update the evaluation tool to include it. Future public health research opportunities exist that would combine both the computer-guided online tool and human-guided evaluation tool to determine consistencies, gaps in one or the other, and the benefits and drawbacks of using both to assess website quality.

5.2.4 Preparing Public Health to Adapt to Dynamic Systems

Because environmental health and the Internet are constantly changing, public health professionals and organizations must be ready to adapt to shifting technologies. The development of the evaluation tool in Specific Aim 1 was recorded and described in detail. This will help to guide future evaluation research by providing a rationale for the criteria and questions included in the evaluation. It may also improve the efficiency that public health can adapt to changing technologies and public health situations because background research has already been conducted. Perhaps in the future validated and comprehensive environmental health website evaluation tools can help to link online public health efforts to health promotion and disease prevention outcomes.

6.0 CONCLUSIONS

This study is one of the first to examine how environmental health issues are and should be communicated and evaluated on the Internet. It aimed to research and consolidate recommendations across the fields of health communication, risk communication, and Internet evaluations to develop a website evaluation that was tailored specifically for environmental health websites and topics. Consistent with other findings (Berland et al., 2001; Gagliardi & Jadad, 2002; Jadad, & Gagliardi, 1998), this research found varying degrees of consistency among and between previous evaluations and demonstrated the importance of establishing a set of standard website evaluation criteria (McLeod, 1998), and that relying on an overall evaluation score could mask individual strengths and weaknesses

In conclusion, there exists a body of literature providing evaluation criteria for websites, and those criteria should be validated and adapted to fit the topic of interest. This research provides the skeletal framework for such a task; the development (and pilot testing) of a tailored website evaluation tool provides a research base and evaluation framework for future environmental health communication projects. Specific Aim 1 contributes to additional evaluation development and validation, even outside the realm of environmental health. Specific Aim 2's results can provide the websites that were part of the website evaluation tool's pilot test, and possibly other related ones, with a basis for improving their sites' content, appearance, audience, and access capabilities.

Because the link between the environment and health is not clear to many people, public health practitioners have the responsibility to communicate this link accurately, effectively, and safely – in every possible venue. Recognizing that multiple factors affect health and health

behaviors, additional research should examine how the lack of peer-review and dynamic quality of the Internet affect the quality of environmental health information online, as well as the resulting health effects of that information.

APPENDIX A

EVALUATION TOOL DEVELOPEMENT

A.1: SOURCES USED TO DEVELOP WEBSITE EVALUATION TOOL

Table 6. Literature resources used to compile environmental health website evaluation tool.

SOURCE		CONTRIBUTION TO EVALUATION					
		(Content)					
	Website Identifier & Eval. Layout	Scope, Accuracy, Timeliness, Links, Writing Quality	Risk Communication	Authority	Appearance/ Layout	Purpose/ Audience	Access/ Use
Adelhard & Obst, 1999		Information is up-to-date & free of bias (disclosure statement).		Identify author credentials & qualifications. Provide references.		Site purpose & audience identified, & matched by content.	Information presented in organized manner.
Anderson, 2001	Descriptive information + general evaluation layout	Scope. Unbiased & accurate		Are sources referenced? Is contact information provided?	Good use of color & graphics. Important info/links near top of page.		Site map, help button, speed, reliable access.

Table 6 continued.

	Website Identifier & Eval. Layout	Scope, Accuracy, Timeliness, Links, Writing Quality	Risk Communication	Authority	Appearance/ Layout	Purpose/ Audience	Access/ Use
ATSDR, 1994		Sites <i>Covello & Allen, 1988</i> . Be honest.	Be clear about the risks.	Establish rapport (related to trust & credibility).	Use visuals to emphasize points.	Know your audience. Define technical terms.	
Chess et al., 1988		Be aware of personal/ organizational biases.	Involve the community in the decision-making process.			Know your audience.	
Covello & Allen, 1988		Be honest, frank, & open.	Speak clearly & with compassion.	Credibility is important to the public.		Speak clearly.	
Doak & Doak, 2004		Writing quality, accurate information, & defining scope are important.	Define the risk clearly.		Appropriate layout & visuals improve effectiveness.	Readability of the content is vital.	
Donovan & Covello, 1989		Be honest & accurate. Explain the subject & content.			State conclusions first, then provide supporting data.	Don't use jargon.	
Flesch, 1948; Kincaid et al., 1975						Readability tests	

Table 6 continued.

	Website Identifier & Eval. Layout	Scope, Accuracy, Timeliness, Links, Writing Quality	Risk Communication	Authority	Appearance/ Layout	Purpose/ Audience	Access/ Use
Health on the Net Foundation, 1997		Provide publishing date. Identify funding sources. Distinguish advertising from content. Provide email contact.		Indicate the qualifications of the authors. Provide references.			
Jardine et al., 2003		Commit to honest & open communication between all parties.	Explain all aspects of the risk management process. Involve stakeholders.				
Lamp & Howard, 1999				Identify author credentials & qualifications.			
MedlinePlus, 2006		Rely on research, not opinion. Check for currency, broken links, & bias. Label advertising.		Identify author & verify credibility of website. Rely on research, not opinion.		Purpose stated. Purpose matches content.	Provide "about us" link for more information.
NCI, 2009		Check for currency & how the site links to others.		Who runs & pays for site? Check credentials & references.		Purpose stated, & purpose matches content.	"about us" link for more information.

Table 6 continued.

	Website Identifier & Eval. Layout	Scope, Accuracy, Timeliness, Links, Writing Quality	Risk Communication	Authority	Appearance/ Layout	Purpose/ Audience	Access/ Use
Reynolds et al., 2002		<p><i>Sites Covello & Allen, 1988.</i></p> <p>Competency & honesty are important to the audience.</p>	<p>Explain probability of exposure / risk & harm, vulnerable populations, how exposure interacts w/others, characteristics of the hazard, total population, benefits, & alternatives. Acknowledge uncertainty. Involve stakeholders.</p>	<p>Establish credibility.</p>		<p>Consider your audience. Appropriate language / reading level. Avoid technical jargon / explain definition.</p>	
Silberg et al., 1997		<p>Information is up-to-date & free of bias (disclosure statement). Credible links are monitored.</p>		<p>Identify author & verify credibility of website. Can author be contacted? Provide references.</p>			<p>Can author be contacted? (help)</p>
St. Croix, 2005	<p>Identifier (part 1) + general layout & surveyor's notes section.</p>			<p>Identify author & verify credibility of website.</p>	<p>Visuals easy to read. Font size at least 10pt. Plain background (increases readability).</p>	<p>Purpose stated & matches content. Website is audience- & reading level-appropriate.</p>	<p>Help features available.</p>

Table 6 continued.

	Website Identifier & Eval. Layout	Scope, Accuracy, Timeliness, Links, Writing Quality	Risk Communication	Authority	Appearance/ Layout	Purpose/ Audience	Access/ Use
UC Berkeley - TLIW, 2009a		Is the page dated? Are links appropriate?		Provide credentials. Can the author be legitimized? References cited.			Provide link for more information about the host.
U.S. DHHS, 2000		Content is without error or bias, & is up-to-date.	Compares or balances risks vs. Benefits.	Information is evidence-based & referenced. Source is credible & can be contacted.		Purpose stated. Attempt to understand different audiences & cultures. Language level & format are audience appropriate.	Information delivered where audience can access it.
U.S. NRC, 1989		Information accurate & timely.	<i>Questions 5 – 15 on evaluation</i>				

A.2: WEBSITE EVALUATION TEMPLATE

Table 7. Environmental health website evaluation template.

Evaluation Title					
Topic Page Address (URL):			Date Evaluated:		
webpage Title:			Evaluator:		
Host Organization & URL:					
Host Organization's Mission:			Final Website Score (on scale from -68 to +68):		
#	Sub-Type	Specific Question(s) Addressed	Response	Point System	Point(s) Received
Content					
1	Scope	Does the website cover all areas of the topic?	Y/N	Y=1, N=-1	
2		Does the website go into adequate detail to encourage appropriate knowledge acquisition and decision-making?	Y/N	Y=1, N=-1	
3	Accuracy	Is the information provided on the website accurate and free of bias?	Y/N	Y=2, N=-2	
4		If applicable, is advertising clearly differentiated from the informational content?	Y/N/NA	Y=1, N=-1, NA=1	

Table 7 continued.					
5	Risk Communication	Are the hazards/risks stated clearly?	Y/N	Y=2, N=-2	
6		Is the probability of the exposure/risk stated clearly?	Y/N	Y=2, N=-2	
7		Is the probability of harm resulting from exposure clearly provided?	Y/N	Y=2, N=-2	
8		Does the site list vulnerable populations to the risk in question?	Y/N	Y=2, N=-2	
9		Does the website adequately explain how this exposure/risk interacts with others?	Y/N	Y=2, N=-2	
10		Does the site adequately explain the characteristics of the hazard?	Y/N	Y=2, N=-2	
11		Is the total population at risk clearly stated?	Y/N	Y=2, N=-2	
12		If applicable, are benefits associated with the exposure/hazard provided and described?	Y / N / NA	Y=1, N=-1, NA=0	
13		Are alternatives to the exposure/risk provided?	Y / N / NA	Y=2, N=-2, NA=0	
14		Is the effectiveness of the alternative(s) provided?	Y / N / NA	Y=1, N=-1, NA=0	
15		Does the site explain the risks vs. benefits of choosing the alternative(s) or of failing to act entirely?	Y / N / NA	Y=1, N=-1, NA=0	
16		If uncertainties exist about the level of risk or about the amount or certainty of research available, is this made clear by the organization?	Y / N / NA	Y=2, N=-2, NA=0	
17		Does the website appear to have taken stakeholders' perspectives or situations into account (perhaps during the development of risk management choices or when determining the level of risk)?	Y / N / NA	Y=1, N=-1, NA=0	

Table 7 continued.					
18	Authority	Was the website created by a reputable organization and/or experts?	Y / N / NA	Y=2, N=-2, NA=0	
19		Does the site list references for the content?	Y / N / NA	Y=2, N=-2, NA=0	
20		If so, are the references from peer-reviewed or official government sources?	Y / N / NA	Y=2, N=-2, NA=0	
21		Can the author(s) of the content (if applicable) be contacted for more information?	Y / N / NA	Y=1, N=-1, NA=0	
22		Is it clear what organization is responsible for the contents of the page and is this information available on every webpage?	Y / N	Y=1, N=-1	
23		Is there a link to a page describing the goals of the organization?	Y / N	Y=1, N=-1	
24		Can the legitimacy of this organization be verified? (Site provides more than just an email address, e.g. phone number or address)	Y / N	Y=1, N=-1	
25	Up-to-Date	Has the webpage been updated / reviewed in the last year?	Y / N / NA	Y=1, N=-1, NA=0	
26		Are page updates and information upload dates clearly visible to the user? (usually located at the bottom of every page)	Y / N	Y=1, N=-1	
27	Links	Are links to other resources appropriate and have they been kept up-to-date?	Y / N	Y=1, N=-1, NA=0	
28		Are links to outside sources distinguished between internal ones?	Y / N	Y=1, N=-1, NA=0	

Table 7 continued.

29		If applicable, does it appear that the organization requested permission to reproduce information from other sources?	Y / N / NA	Y=1, N=-1, NA=0	
30	Writing Quality	Is the text well written? (smooth, clear, well organized)	Y / N	Y=1, N=-1	
31		Do the authors use grammar and spelling appropriately?	Y / N	Y=1, N=-1	
Appearance / Layout					
32		Is the website visually appealing? (good use of colors, no flashing text, appropriate text font and size)	Y / N	Y=2, N=-2	
33		Do the visuals distract the user rather than contributing to the site's content?	Y/N/NA	Y=-1, N=1, NA=0	
34		Do the graphics (images, Adobe flashplayer, or videos) include content? (e.g. A photo that helps demonstrate a health statistic)	Y/N/NA	Y=1, N=-1, NA=0	
35		Are the most important information and links located at the top or near the top of the page?	Y / N	Y=1, N=-1	
Purpose / Audience					
36		Is the purpose of the website or page clearly stated?	Y / N	Y=2, N=-2	
37		Does the content match/fulfill the purpose that was provided?	Y / N / NA	Y=2, N=-2, NA=0	

Table 7 continued.

38		Is the intended audience made clear to the user?	Y / N	Y=1, N=-1	
39		Is the information presented in a way that is accessible to the intended audience? (subjective evaluation, if technical terms are used they are defined?)	Y / N	Y=1, N=-1	
		* Determine Flesch-Kincaid Grade Level & Flesch Reading Ease Score - Is the grade level at 8 or below and the reading ease score 60 or above?	Both / 1 / None	Both=1, 1=0, None =-1	
Access / Use					
40		Does the site let the user know if special programs are needed to properly view the site?	Y / N / NA	Y=1, N=-1, NA=0	
41		Is help available to users if needed?	Y / N	Y=1, N=-1	
42		Is the website viewable using more than one browser or computer system (PC vs. MAC)?	Y / N	Y=1, N=-1	
43		Is the website accessible by people who are using visually impaired browsers?	Y / N	Y=1, N=-1	
44		Can urgent information be obtained on the homepage?	Y / N / NA	Y=1, N=-1, NA=0	
45		Can information be effectively retrieved from the website through moderate searching?	Y / N	Y=1, N=-1	
46		Does the website utilize a table of contents, site map, or search engine to improve searchability?	Y / N	Y=1, N=-1	

Table 7 continued.

47		If applicable, does the search engine allow the user to access the whole website during the search?	Y / N / NA	Y=1, N=-1, NA=0	
48		Does the site provide a link for more information about the organization responsible for its content? (A link such as "About Organization X," "Background," "Mission", etc.)	Y / N	Y=1, N=-1	
49		Is the website organized in a logical manner to allow for ease in browsing?	Y / N	Y=1, N=-1	
50		If applicable, do interactive forms (such as surveys) add to the value of the site?	Y / N / NA	Y=1, N=-1, NA=0	
51		Can the website be accessed reliably (vs. often being busy or offline)?	Y / N	Y=1, N=-1	
Basic Website Demographics (If Available)					
User home country	Main Users	Where people visit on the site	Average Load Time	Alexa.com Traffic Rank	
<i>Traffic rank is a measure of website popularity (by combining number of average daily visitors and page views). #1 is most popular website globally.</i>					
Evaluator Notes					
Evaluation Key: Y = Yes ; N = No ; NA = Not Applicable					

APPENDIX B

GOVERNMENT WEBSITE IDENTIFICATION

B.1: INDIVIDUAL SEARCH ENGINE RESULTS

Table 8. Google results: Top five websites displayed using four environmental health search terms.

Google			
Search term	Top 5 Websites Identified	Page Title	Government Source
environmental health	http://www.cdc.gov/Environmental/	Environmental Health	Centers for Disease Control and Prevention (CDC)
	http://www.cdc.gov/nceh/	National Center for Environmental Health	CDC
	http://publichealth.lacounty.gov/eh/	Environmental Health	Los Angeles County Department of public health Environmental Health
	http://www.healthypeople.gov/Document/HTML/Volume1/08Environmental.htm	Environmental Health	Healthy People 2010 (HP2010)
	http://www.niehs.nih.gov/	Your Environment. Your Health.	National Institute of Environmental Health Sciences (NIEHS)
Search term	Top 5 Websites Identified	Page Title	Government Source
"environmental health"	http://www.cdc.gov/Environmental/	Environmental Health	CDC

Table 8 continued.

	http://www.cdc.gov/nceh/	National Center for Environmental Health	CDC
	http://www.healthypeople.gov/Document/HTML/Volume1/08Environmental.htm	Environmental Health	HP2010
	http://www.niehs.nih.gov/	Your Environment. Your Health.	NIEHS
	http://health.minnesotagov/divs/eh/index.html	Environmental Health	Minnesota Department of public health
Search term	Top 5 Websites Identified	Page Title	Government Source
health AND environment	http://www.kdheks.gov/	<i>No title</i>	Kansas Department of Health and Environment
	www.epa.gov/particles/health.html	Health and Environment - Particulate Matter	U.S. Environmental Protection Agency (EPA)
	www.scdhec.gov/	Health & Environmental Topics	South Carolina Department of Health & Environmental Control
	http://www.niehs.nih.gov/	Your Environment. Your Health.	NIEHS
	http://www.colorado.gov/airquality/	Air Pollution Control Division	Colorado Department of public health and Environment
Note: 2 potential websites (http://web.health.gov/environment/ and http://www.health.gov/environment/DefinitionsofEnvHealth/ehdef2.htm) listed in the search results were excluded because they were either inactive (no longer relevant) or merely provided a definition of "environmental health."			
Search term	Top 5 Websites Identified	Page Title	Government Source

Table 8 continued.

exposure AND health	http://eetd.lbl.gov/r-indoor-pehr.html	Pollutant Exposure & Health Risk	University of California E.O. Lawrence Berkeley National Laboratory
	http://www.epa.gov/health/risk/projects/c2a_system_biology_linking.htm	Linking Exposure To Health Effects Using A Systems Biology Approach	U.S. EPA
	http://www.osti.gov/bidge/servlets/purl/15010149-OAVLy/native/15010149.pdf	Exposure-Based Health Issues Project Report: Phase I of High-Level Waste Tank Operations, Retrieval, Pretreatment, and Vitrification Exposure-Based Health Issues Analysis	U.S. Department of Energy, Office of Scientific and Technical Information (OSTI)
	http://www.santaclaracounty.ca.gov/portal/site/phd/agencychp?path=%2Fv7%2FPublic%20Health%20Department%20(DEP)%2FPublic%20Information%2FSmoke%20Exposure	Smoke Exposure	Santa Clara County California public health Department
	http://www.epa.gov/nrel/symposium/	EPA-CDC Air Pollution Exposure and Health Symposium	U.S. EPA
<p>Note: The Washington Department of Health Hanford Health Information Network (HHIN) website (http://www.doh.wa.gov/Hanford/publications/overview/genetic.html) was not included since it ended May 2000 and was provided for archive purposes only.</p>			
<p>The page "Pesticide Exposure and Health Status in North Carolina African American Male Farmers and Farm Workers" (http://clinicaltrials.gov/ct2/show/NCT00341965) was excluded since it was a call for clinical trial participants and not a website that provided information on the results.</p>			
<p>The National Institutes of Health NLM Gateway website (http://gateway.nlm.nih.gov/MeetingAbstracts/102249932.html) was excluded because the page only listed a presentation abstract for a previous conference.</p>			
<p>Date Researched: May 1, 2009</p>			

Table 9. Yahoo! Results: Top five websites displayed using four environmental health search terms.

Yahoo!			
Search term	Top 5 Websites identified	Page Title	Government Source
environmental health	http://www.cdc.gov/Environmental/	Environmental Health	Centers for Disease Control and Prevention (CDC)
	http://www.cdc.gov/nceh/	National Center for Environmental Health	CDC - National Center for Environmental Health (NCEH)
	http://www.kdheks.gov/	<i>No title</i>	Kansas Department of Health and Environment (KDHE)
	www.hawaii.gov/health	<i>No title</i>	Hawaii State Department of Health
	http://toxtown.nlm.nih.gov/	Tox Town	U.S. National Library of Medicine
Search term	Top 5 Websites identified	Page Title	Government Source
"environmental health"	http://www.cdc.gov/Environmental/	Environmental Health	CDC
	http://www.cdc.gov/nceh/	National Center for Environmental Health	CDC - NCEH
	http://www.kdheks.gov/	<i>No title</i>	KDHE
	www.hawaii.gov/health	<i>No title</i>	Hawaii State Department of Health
	www.scdhec.gov/	Health & Environmental Topics	South Carolina Department of Health & Environmental Control
Search term	Top 5 Sites identified	Page Title	Government Source
health AND environment	http://www.kdheks.gov/	<i>No title</i>	KDHE

Table 9 continued.

	http://www.cdc.gov/Environmental/	Environmental Health	CDC
	http://www.cdc.gov/nceh/	National Center for Environmental Health	CDC - NCEH
	http://www.epa.gov/	<i>No title</i>	U.S. EPA
	http://womenshealth.gov/faq/environment-womens-health.cfm	The Environment and Women's Health	The National Women's Health Information Center
Search term	Top 5 Websites identified	Page Title	Government Source
exposure AND health	www.cancer.gov/cancertopics/factsheet/Risk/asbestos	Asbestos Exposure and Cancer Risk	National Cancer Institute (NCI)
	www.cancer.gov/cancertopics/factsheet/Sites-Types/mesothelioma	Mesothelioma: Questions and Answers	NCI
	www.epa.gov/mercury/effects.htm	Health Effects Mercury	U.S. EPA
	http://www.epa.gov/radon/healthrisks.html	Health Effects Radon	U.S. EPA
	http://www.atsdr.cdc.gov/asbestos/asbestos/health_effects/index.html	Asbestos - Health Effects	Agency for Toxic Substances and Disease Registry (ATSDR)
<p>Note: Yahoo! Provides sponsored options at the top of the search results where applicable. The sponsored site were excluded from the website identification because the sites change each time a search is conducted and those organizations had paid Yahoo! to temporarily increase the likelihood a user would click on their website's link.</p>			
<p>Date Researched: May 1, 2009</p>			

Table 10. Ask.com results: Top five websites displayed using four environmental health search terms.

Ask.com			
Search term	Top 5 Websites identified	Page Title	Government Source
environmental health	http://www.cdc.gov/	<i>No title</i>	Centers for Disease Control and Prevention (CDC)
	http://www.cdc.gov/Environmental/	Environmental Health	CDC
	http://kids.niehs.nih.gov/	NIEHS Kids' Pages	National Institute for the Environmental Health Sciences (NIEHS)
	http://www.kingcounty.gov/healthservices/health.aspx	<i>No title</i>	public health - Seattle and King County
	http://sis.nlm.nih.gov/enviro.html	Environmental Health and Toxicology	U.S. National Library of Medicine
Note: The websites http://www.food.gov.uk/enforcement/lacontacts/enforcementlinks , www.direct.gov.uk/ , and http://www.defra.gov.uk/ were excluded because they are United Kingdom-based organizations.			
Note: The website http://web.health.gov/environment/ was excluded because the organization/group is inactive and advises as such on the website.			
Search term	Top 5 Websites identified	Page Title	Government Source
"environmental health"	http://www.cdc.gov/Environmental/	Environmental Health	CDC
	http://www.cdc.gov/nceh/	National Center for Environmental Health	CDC - National Center for Environmental Health (NCEH)
	http://www.nlm.nih.gov/medlineplus/environmentalhealth.html	Environmental Health	U.S. National Library of Medicine - MedLine Plus

Table 10 continued.

	http://health.minnesota.gov/divs/eh/index.html	Environmental Health	Minnesota Department of public health
	http://www.healthypeople.gov/Document/HTML/Volume1/08Environmental.htm	Environmental Health	Healthy People 2010 (HP2010)
Search term	Top 5 Websites identified	Page Title	Government Source
health AND environment	http://www.kdheks.gov/	<i>No title</i>	Kansas Department of Health and Environment (KDHE)
	www.epa.gov/particles/health.html	Health and Environment - Particulate Matter	U.S. EPA
	www.scdhec.gov/	Health & Environmental Topics	South Carolina Department of Health & Environmental Control
	http://www.niehs.nih.gov/	Your Environment. Your Health.	NIEHS
	http://www.colorado.gov/airquality/	Air Pollution Control Division	Colorado Department of public health and Environment
Search term	Top 5 Websites identified	Page Title	Government Source
exposure AND health	http://eetd.lbl.gov/r-indoor-pehr.html	Pollutant Exposure & Health Risk	University of California E.O. Lawrence Berkeley National Laboratory
	http://www.epa.gov/health/risk/projects/c2a_system_biology_linking.htm	Linking Exposure To Health Effects Using A Systems Biology Approach	U.S. EPA

Table 10 continued.

http://www.mass.gov/?pageID=eohhs2subtopic&L=5&L0=Home&L1=Consumer&L2=Community+Health+and+Safety&L3=Environmental+Health&L4=Environmental+Exposure+Topics&sid=Eeohhs2	Environmental Exposure Topics	Massachusetts Office of Health and Human Services
http://www.healthypeople.gov/Document/HTML/Volume1/08Environmental.htm	Environmental Health	Healthy People 2010 (HP2010)
http://www.osha.gov/Publications/osha3176.html	“Crystalline Silica Exposure” Health Hazard Information for General Industry Employees	U.S. Department of Labor Occupational Safety and Health Administration
Note: The Washington Department of Health Hanford Health Information Network (HHIN) website (http://www.doh.wa.gov/Hanford/publications/overview/genetic.html) was not included since the project ended May 2000 and was provided for archive purposes only.		
Note: The National Institutes of Health NLM Gateway website (http://gateway.nlm.nih.gov/MeetingAbstracts/102249932.html) was excluded because the page only listed a presentation abstract for a previous conference.		
Note: The page "Pesticide Exposure and Health Status in North Carolina African American Male Farmers and Farm Workers" (http://clinicaltrials.gov/ct2/show/NCT00341965) was excluded since it was a call for clinical trial participants and not a website that provided information on the results.		
Note: Ask.com provides sponsored options at the top of the search results where applicable. The sponsored site were excluded from the website identification because the sites change each time a search is conducted and those organizations had paid Ask.com to temporarily increase the likelihood a user would click on their website's link.		
Date Researched: May 1, 2009.		

Table 11. MSN/Bling results: Top five websites displayed using four environmental health search terms.

MSN/Bling			
Search term	Top 5 Websites identified	Page Title	Government Source
environmental health	http://www.cdc.gov/Environmental/	Environmental Health	Centers for Disease Control and Prevention (CDC)
	http://www.mass.gov/?pageID=eohhs2subtopic&L=4&L0=Home&L1=Consumer&L2=Community+Health+and+Safety&L3=Environmental+Health&sid=Eeohhs2	Environmental Health	Massachusetts Office of Health and Human Services
	http://www.epa.gov/highschool/health.htm	High School Environmental Center - Health and Safety	U.S. Environmental Protection Agency (EPA)
	http://www.niehs.nih.gov/research/resources/library/consumer/hazardous.cfm	Environmental Agents	National Institute of Environmental Health Sciences (NIEHS)
	http://kids.niehs.nih.gov/	NIEHS Kids' Pages	NIEHS
Note: The website, http://www.ehsc.ihs.gov/index.cfm?module=home , was not included because the Environmental Health Support Center sponsors training courses but does not provide health information online.			
Search term	Top 5 Websites identified	Page Title	Government Source
"environmental health"	http://www.cdc.gov/Environmental/	Environmental Health	CDC
	http://www.dehs.ihs.gov/	The Division of Environmental Health Services	Indian Health Service
	http://www.cdc.gov/nceh/	National Center for Environmental Health	CDC

Table 11 continued.

	http://www.mass.gov/?pageID=eohhs2subtopic&L=4&L0=Home&L1=Consumer&L2=Community+Health+and+Safety&L3=Environmental+Health&sid=Eeohhs2	Environmental Health	Massachusetts Office of Health and Human Services
	http://www.doh.wa.gov/ehp/oehas/default.htm	<i>No title</i>	Office of Environmental Health Assessments (EHA), Washington State Department of Health
Search term	Top 5 Websites identified	Page Title	Government Source
health AND environment	http://www.cdc.gov/Environmental/	Environmental Health	CDC
	http://womenshealth.gov/faq/environment-womens-health.cfm	The Environment and Women's Health	The National Women's Health Information Center
	http://www.kdheks.gov/health/index.html	Division of Health	KDHE
	http://www.health.ri.gov/environment/food/inspections.php	Food Safety Inspection Reports	Rhode Island Department of Health
	http://www.lbl.gov/ehs/	Environmental Health & Safety Division	Berkeley Lab, Lawrence Berkeley National Laboratory
Note: The website http://web.health.gov/environment/ was excluded because the organization/group is inactive.			
Search term	Top 5 Websites identified	Page Title	Government Source

Table 11 continued.

exposure AND health	http://www.mass.gov/?pageID=eohhs2terminal&L=6&L0=Home&L1=Provider&L2=Guidelines+and+Resources&L3=Guidelines+for+Clinical+Treatment&L4=Diseases+%26+Conditions&L5=HIV%26%2347%3BAIDS&sid=Eeohhs2&b=terminalcontent&f=dph_aids_c_pep&csid=Eeohhs2	Post-Exposure Prophylaxis (PEP)	Massachusetts Office of Health and Human Services
	http://www.atsdr.cdc.gov/asbestos/asbestos/index.html	Asbestos - Home	Agency for Toxic Substances and Disease Registry (ATSDR)
	http://www.atsdr.cdc.gov/asbestos/asbestos/health_effects/index.html	Asbestos - Health Effects	ATSDR
	http://www.osha.gov/SLTC/pel/index.html	Permissible Exposure Limits (PELs)	U.S. Department of Labor Occupational Safety and Health Administration
	http://www.sem.dol.gov/	EEOICP Site Exposure Matrices	U.S. Department of Labor
Date Researched: May 1, 2009.			

B.2: COMBINED TALLY OF 4 SEARCH ENGINES' RESULTS

Table 12. Combined tally of website results displayed by all four search engines, categorized by base website/host.

Host Organization	Websites Identified	Page Title	Tally
Centers for Disease Control & Prevention (CDC)	-		21
	http://www.cdc.gov/	Homepage	1
	http://www.cdc.gov/nceh/	National Center for Environmental Health	7
	http://www.cdc.gov/Environmental/	Environmental Health	10
	http://www.atsdr.cdc.gov/asbestos/asbestos/health_effects/index.html	Asbestos - Health Effects	1
	http://www.atsdr.cdc.gov/asbestos/asbestos/index.html	Asbestos - Home	1
	http://www.atsdr.cdc.gov/asbestos/asbestos/health_effects/index.html	Asbestos - Health Effects	1
Note: The www.CDC.gov/environmental , www.CDC.gov/nceh , & www.ATSDR.CDC.gov addresses were combined because many of the links on each site link to another.			
Colorado Department of public health & Environment	http://www.colorado.gov/airquality/	Air Pollution Control Division	2
Hawaii State Department of Health	http://www.hawaii.gov/health	Homepage	2
Healthy People 2010 (HP2010)	http://www.healthypeople.gov/Document/HTML/Volume1/08Environmental.htm	Environmental Health	4

Table 12 continued.			
Indian Health Service	http://www.dehs.ihs.gov/	The Division of Environmental Health Services	1
Kansas Department of Health & Environment	-		6
	http://www.kdheks.gov/	<i>No title</i>	5
	http://www.kdheks.gov/health/index.html	Division of Health	1
Los Angeles County Department of public health Environmental Health	http://publichealth.lacounty.gov/eh/	Environmental Health	1
Massachusetts Office of Health & Human Services	-		4
	http://www.mass.gov/?pageID=eohhs2subtopic&L=4&L0=Home&L1=Consumer&L2=Community+Health+and+Safety&L3=Environmental+Health&sid=Eeohhs2	Environmental Health	2
	http://www.mass.gov/?pageID=eohhs2subtopic&L=5&L0=Home&L1=Consumer&L2=Community+Health+and+Safety&L3=Environmental+Health&L4=Environmental+Exposure+Topics&sid=Eeohhs2	Environmental Exposure Topics	1
	http://www.mass.gov/?pageID=eohhs2terminal&L=6&L0=Home&L1=Provider&L2=Guidelines+and+Resources&L3=Guidelines+for+Clinical+Treatment&L4=Diseases+%26+Conditions&L5=HIV%26%2347%3BAIDS&sid=Eeohhs2&b=terminalcontent&f=dph_aids_c_pep&csid=Eeohhs2	Post-Exposure Prophylaxis (PEP)	1

Table 12 continued.

Minnesota Department of public health	http://health.minnesota.gov/divs/eh/index.html	Environmental Health	2
National Cancer Institute (NCI)	-		2
	http://www.cancer.gov/cancertopics/factsheet/Risk/asbestos	Asbestos Exposure & Cancer Risk	1
	http://www.cancer.gov/cancertopics/factsheet/Sites-Types/mesothelioma	Mesothelioma: Questions & Answers	1
National Institute for the Environmental Health Sciences (NIEHS)	-		5
	http://www.niehs.nih.gov/	Your Environment. Your Health.	4
	http://www.niehs.nih.gov/research/resources/library/consumer/hazardous.cfm	Environmental Agents	1
	http://kids.niehs.nih.gov/	NIEHS Kids' Pages	2
Office of Environmental Health Assessments, Washington State Department of Health	http://www.doh.wa.gov/ehp/oehas/default.htm	<i>Homepage</i>	1
public health - Seattle & King County	http://www.kingcounty.gov/healthservices/health.aspx	<i>Homepage</i>	1
Rhode Island Department of Health	http://www.health.ri.gov/environment/food/inspections.php	Food Safety Inspection Reports	1

Table 12 continued.

Santa Clara County California public health Department	http://www.santaclaracounty.ca.gov/portal/site/phd/agencychp?path=%2Fv7%2FPublic%20Health%20Department%20(DEP)%2FPublic%20Information%2FSmoke%20Exposure	Smoke Exposure	1
South Carolina Department of Health & Environmental Control	http://www.scdhec.gov/	Health & Environmental Topics	3
The National Women's Health Information Center	http://womenshealth.gov/faq/environment-womens-health.cfm	The Environment & Women's Health	2
U.S. Department of Energy, Office of Scientific & Technical Information (OSTI)	http://www.osti.gov/bridge/servlets/purl/15010149-OAVLyI/native/15010149.pdf	Exposure-Based Health Issues Project Report: Phase I of High-Level Waste Tank Operations, Retrieval, Pretreatment, & Vitrification Exposure- Based Health Issues Analysis	1
U.S. Department of Labor	http://www.sem.dol.gov/	EEOICP Site Exposure Matrices	1
U.S. Department of Labor Occupational Safety & Health Administration	-		2
	http://www.osha.gov/Publications/osha3176.html	"Crystalline Silica Exposure" Health Hazard Information for General Industry Employees	1

Table 12 continued.

	http://www.osha.gov/SLTC/pel/index.html	Permissible Exposure Limits (PELs)	1
U.S. Environmental Protection Agency (EPA)	-		9
	http://www.epa.gov/	Homepage	1
	http://www.epa.gov/heasd/risk/projects/c2a_system_biology_linking.htm	Linking Exposure To Health Effects Using A Systems Biology Approach	2
	http://www.epa.gov/highschool/health.htm	High School Environmental Center - Health & Safety	1
	http://www.epa.gov/mercury/effects.htm	Health Effects Mercury	1
	http://www.epa.gov/nerl/symposium/	EPA-CDC Air Pollution Exposure & Health Symposium	1
	http://www.epa.gov/particles/health.html	Health & Environment - Particulate Matter	2
	http://www.epa.gov/radon/healthrisks.html	Health Effects Radon	1
U.S. National Library of Medicine	-		3
	http://sis.nlm.nih.gov/enviro.html	Environmental Health & Toxicology	1
	http://toxtown.nlm.nih.gov/	Tox Town	1
	http://www.nlm.nih.gov/medlineplus/environmentalhealth.html	Environmental Health	1

Table 12 continued.

Univ. of California E.O. Lawrence Berkeley National Laboratory			3
	http://eetd.lbl.gov/r-indoor-pehr.html	Pollutant Exposure & Health Risk	2
	http://www.lbl.gov/ehs/	Environmental Health & Safety Division	1

APPENDIX C
PILOT TEST RESULTS

C.1: INDIVIDUAL WEBSITES' PILOT TEST RESULTS

Table 13. Evaluation of the ATSDR/CDC website's presentation of PM information during the website evaluation tool pilot test.

ATSDR / CDC Website Evaluation					
Topic Page Address (URL):		http://www.atsdr.cdc.gov/general/theair.html	Date Evaluated: 6/25/09		
Webpage Title:		"Air"	Evaluator: Samantha Malone		
Host Organization & URL:		Agency for Toxic Substances & Disease Registry www.atsdr.cdc.gov/ / Centers for Disease Control & Prevention, www.cdc.gov			
Host Organization's Mission:		"Is to collaborate to create the expertise, information, and tools that people and communities need to protect their health – through health promotion, prevention of disease, injury and disability, and preparedness for new health threats."	Final Website Score (on scale from -68 to +68): 42		
#	Sub-Type	Specific Question(s) Addressed	Response	Point System	Point(s) Received
Content					
1	Scope	Does the website cover all areas of the topic?	Y	Y=1, N=-1	1

Table 13 continued.

2		Does the website go into adequate detail to encourage appropriate knowledge acquisition and decision-making?	N	Y=1, N=-1	-1
3	Accuracy	Is the information provided on the website accurate and free of bias?	Y	Y=2, N=-2	2
4		If applicable, is advertising clearly differentiated from the informational content?	NA	Y=1, N=-1, NA=1	1
5	Risk Communication	Are the hazards/risks stated clearly?	Y	Y=2, N=-2	2
6		Is the probability of the exposure/risk stated clearly?	N	Y=2, N=-2	-2
7		Is the probability of harm resulting from exposure clearly provided?	Y	Y=2, N=-2	2
8		Does the site list vulnerable populations to the risk in question?	Y	Y=2, N=-2	2
9		Does the website adequately explain how this exposure/risk interacts with others?	Y	Y=2, N=-2	2
10		Does the site adequately explain the characteristics of the hazard?	Y	Y=2, N=-2	2
11		Is the total population at risk clearly stated?	N	Y=2, N=-2	-2
12		If applicable, are benefits associated with the exposure/hazard provided and described?	NA	Y=1, N=-1, NA=0	0
13		Are alternatives to the exposure/risk provided?	Y	Y=2, N=-2, NA=0	2

Table 13 continued.

14		Is the effectiveness of the alternative(s) provided?	Y	Y=1, N=-1, NA=0	1
15		Does the site explain the risks vs. benefits of choosing the alternative(s) or of failing to act entirely?	Y	Y=1, N=-1, NA=0	1
16		If uncertainties exist about the level of risk or about the amount or certainty of research available, is this made clear by the organization?	NA	Y=2, N=-2, NA=0	0
17		Does the website appear to have taken stakeholders' perspectives or situations into account (perhaps during the development of risk management choices or when determining the level of risk)?	N	Y=1, N=-1, NA=0	-1
18	Authority	Was the website created by a reputable organization and/or experts?	Y	Y=2, N=-2, NA=0	2
19		Does the site list references for the content?	Y	Y=2, N=-2, NA=0	2
20		If so, are the references from peer-reviewed or official government sources?	Y	Y=2, N=-2, NA=0	2
21		Can the author(s) of the content (if applicable) be contacted for more information?	Y	Y=1, N=-1, NA=0	1
22		Is it clear what organization is responsible for the contents of the page and is this information available on every webpage?	Y	Y=1, N=-1	1
23		Is there a link to a page describing the goals of the organization?	Y	Y=1, N=-1	1
24		Can the legitimacy of this organization be verified? (Site provides more than just an email address, e.g. phone number or address)	Y	Y=1, N=-1	1

Table 13 continued.

25	Up-to-Date	Has the webpage been updated / reviewed in the last year?	Y	Y=1, N=-1, NA=0	1
26		Are page updates and information upload dates clearly visible to the user? (usually located at the bottom of every page)	Y	Y=1, N=-1	1
27	Links	Are links to other resources appropriate and have they been kept up-to-date?	Y	Y=1, N=-1, NA=0	1
28		Are links to outside sources distinguished between internal ones?	Y	Y=1, N=-1, NA=0	1
29		If applicable, does it appear that the organization requested permission to reproduce information from other sources?	Y	Y=1, N=-1, NA=0	1
30	Writing Quality	Is the text well written? (smooth, clear, well organized)	Y	Y=1, N=-1	1
31		Do the authors use grammar and spelling appropriately?	Y	Y=1, N=-1	1
Appearance / Layout					
32		Is the website visually appealing? (good use of colors, no flashing text, appropriate text font and size)	Y	Y=2, N=-2	2
33		Do the visuals distract the user rather than contributing to the site's content?	N	Y=-1, N=1, NA=0	1
34		Do the graphics (images, Adobe flashplayer, or videos) include content? (e.g. A photo that helps demonstrate a health statistic)	Y	Y=1, N=-1, NA=0	1

Table 13 continued.

35		Are the most important information and links located at the top or near the top of the page?	Y	Y=1, N=-1	1
Purpose / Audience					
36		Is the purpose of the website or page clearly stated?	Y	Y=2, N=-2	2
37		Does the content match/fulfill the purpose that was provided?	Y	Y=2, N=-2, NA=0	2
38		Is the intended audience made clear to the user?	N	Y=1, N=-1	-1
39		Is the information presented in a way that is accessible to the intended audience? (e.g. reading level appropriate, if technical terms are used they are defined)	N	Y=1, N=-1	-1
		* Determine Flesch-Kincaid Grade Level & Flesch Reading Ease Score - Is the grade level at 8 or below and the reading ease score 60 or above?	None	Both=1, 1=0, None =-1	-1
Access/Use					
40		Does the site let the user know if special programs are needed to properly view the site?	NA	Y=1, N=-1, NA=0	0
41		Is help available to users if needed?	N	Y=1, N=-1	-1
42		Is the website viewable using more than one browser or computer system (PC vs. MAC)?	Y	Y=1, N=-1	1

Table 13 continued.

43		Is the website accessible by people who are using visually impaired browsers?	Y	Y=1, N=-1	1
44		Can urgent information be obtained on the homepage?	Y	Y=1, N=-1, NA=0	1
45		Can information be effectively retrieved from the website through moderate searching?	Y	Y=1, N=-1	1
46		Does the website utilize a table of contents, site map, or search engine to improve searchability?	Y	Y=1, N=-1	1
47		If applicable, does the search engine allow the user to access the whole website during the search?	Y	Y=1, N=-1, NA=0	1
48		Does the site provide a link for more information about the organization responsible for its content? (A link such as "About Organization X," "Background," "Mission", etc.)	Y	Y=1, N=-1	1
49		Is the website organized in a logical manner to allow for ease in browsing?	N	Y=1, N=-1	-1
50		If applicable, do interactive forms (such as surveys) add to the value of the site?	Y	Y=1, N=-1, NA=0	1
51		Can the website be accessed reliably (vs. often being busy or offline)?	Y	Y=1, N=-1	1
				TOTAL:	42

Table 13 continued.

Basic Website Demographics (If Available)				
% Site Users from U.S.	Main Users	Where people visit on the site	Average Load Time	Alexa Traffic Rank
58%	Age: 35-55, Sex: Female,	80% visit cdc.gov directly (vs. 1.9% www.atsdr.cdc.gov)	Fast (1.569 Seconds), 70% of sites are slower.	1,389
<i>Traffic rank is a measure of website popularity (by combining number of average daily visitors and page views). #1 is most popular website globally.</i>				
User Demographics Pulled from Online Resource, www.Alexa.com, on June 29, 2009.				

Table 14. Evaluation of the U.S. EPA website's presentation of PM information during the website evaluation tool pilot test.

U.S. EPA Website Evaluation					
Topic Page Address (URL):		http://www.epa.gov/particles/	Date Evaluated: 6/25/09		
Webpage Title:		"Particulate Matter"	Evaluator: Samantha Malone		
Host Organization & URL:		Environmental Protection Agency, www.epa.gov			
Host Organization's Mission:		The mission of the Environmental Protection Agency is to protect human health and the environment.	Final Website Score (on scale from -68 to +68): 47		
#	Sub-Type	Specific Question(s) Addressed	Response	Point System	Point(s) Received
Content					
1	Scope	Does the website cover all areas of the topic?	Y	Y=1, N=-1	1
2		Does the website go into adequate detail to encourage appropriate knowledge acquisition and decision-making?	Y	Y=1, N=-1	1
3	Accuracy	Is the information provided on the website accurate and free of bias?	Y	Y=2, N=-2	2
4		If applicable, is advertising clearly differentiated from the informational content?	NA	Y=1, N=-1, NA=1	1
5	Risk Communication	Are the hazards/risks stated clearly?	Y	Y=2, N=-2	2

Table 14 continued.

6		Is the probability of the exposure/risk stated clearly?	Y	Y=2, N=-2	2
7		Is the probability of harm resulting from exposure clearly provided?	Y	Y=2, N=-2	2
8		Does the site list vulnerable populations to the risk in question?	Y	Y=2, N=-2	2
9		Does the website adequately explain how this exposure/risk interacts with others?	Y	Y=2, N=-2	2
10		Does the site adequately explain the characteristics of the hazard?	Y	Y=2, N=-2	2
11		Is the total population at risk clearly stated?	Y	Y=2, N=-2	2
12		If applicable, are benefits associated with the exposure/hazard provided and described?	NA	Y=1, N=-1, NA=0	0
13		Are alternatives to the exposure/risk provided?	Y	Y=2, N=-2, NA=0	2
14		Is the effectiveness of the alterative(s) provided?	Y	Y=1, N=-1, NA=0	1
15		Does the site explain the risks vs. benefits of choosing the alternative(s) or of failing to act entirely?	Y	Y=1, N=-1, NA=0	1
16		If uncertainties exist about the level of risk or about the amount or certainty of research available, is this made clear by the organization?	NA	Y=2, N=-2, NA=0	0
17		Does the website appear to have taken stakeholders' perspectives or situations into account (perhaps during the development of risk management choices or when determining the level of risk)?	N	Y=1, N=-1, NA=0	-1

Table 14 continued.

18	Authority	Was the website created by a reputable organization and/or experts?	Y	Y=2, N=-2, NA=0	2
19		Does the site list references for the content?	Y	Y=2, N=-2, NA=0	2
20		If so, are the references from peer-reviewed or official government sources?	Y	Y=2, N=-2, NA=0	2
21		Can the author(s) of the content (if applicable) be contacted for more information?	Y	Y=1, N=-1, NA=0	1
22		Is it clear what organization is responsible for the contents of the page and is this information available on every webpage?	Y	Y=1, N=-1	1
23		Is there a link to a page describing the goals of the organization?	Y	Y=1, N=-1	1
24		Can the legitimacy of this organization be verified? (Site provides more than just an email address, e.g. phone number or address)	Y	Y=1, N=-1	1
25	Up-to-Date	Has the webpage been updated / reviewed in the last year?	Y	Y=1, N=-1, NA=1	1
26		Are page updates and information upload dates clearly visible to the user? (usually located at the bottom of every page)	Y	Y=1, N=-1	1
27	Links	Are links to other resources appropriate and have they been kept up-to-date?	Y	Y=1, N=-1, NA=1	1
28		Are links to outside sources distinguished between internal ones?	Y	Y=1, N=-1, NA=1	1

Table 14 continued.

29		If applicable, does it appear that the organization requested permission to reproduce information from other sources?	Y	Y=1, N=-1, NA=1	1
30	Writing Quality	Is the text well written? (smooth, clear, well organized)	Y	Y=1, N=-1	1
31		Do the authors use grammar and spelling appropriately?	Y	Y=1, N=-1	1
Appearance / Layout					
32		Is the website visually appealing? (good use of colors, no flashing text, appropriate text font and size)	Y	Y=2, N=-2	2
33		Do the visuals distract the user rather than contributing to the site's content?	N	Y=-1, N=1, NA=0	1
34		Do the graphics (images, Adobe flashplayer, or videos) include content? (e.g. A photo that helps demonstrate a health statistic)	Y	Y=1, N=-1, NA=1	1
35		Are the most important information and links located at the top or near the top of the page?	Y	Y=1, N=-1	1
Purpose / Audience					
36		Is the purpose of the website or page clearly stated?	Y	Y=2, N=-2	2
37		Does the content match/fulfill the purpose that was provided?	Y	Y=2, N=-2, NA=0	2

Table 14 continued.

38		Is the intended audience made clear to the user?	N	Y=1, N=-1	-1
39		Is the information presented in a way that is accessible to the intended audience? (e.g. reading level appropriate, if technical terms are used they are defined)	Y	Y=1, N=-1	1
		* Determine Flesch-Kincaid Grade Level & Flesch Reading Ease Score - Is the grade level at 8 or below and the reading ease score 60 or above?	None	Both=1, 1=0, None=-1	-1
Access / Use					
40		Does the site let the user know if special programs are needed to properly view the site?	NA	Y=1, N=-1, NA=0	0
41		Is help available to users if needed?	N	Y=1, N=-1	-1
42		Is the website viewable using more than one browser or computer system (PC vs. MAC)?	Y	Y=1, N=-1	1
43		Is the website accessible by people who are using visually impaired browsers?	N	Y=1, N=-1	-1
44		Can urgent information be obtained on the homepage?	NA	Y=1, N=-1, NA=0	0
45		Can information be effectively retrieved from the website through moderate searching?	N	Y=1, N=-1	-1
46		Does the website utilize a table of contents, site map, or search engine to improve searchability?	Y	Y=1, N=-1	1

Table 14 continued.

47		If applicable, does the search engine allow the user to access the whole website during the search?	Y	Y=1, N=-1, NA=0	1
48		Does the site provide a link for more information about the organization responsible for its content? (A link such as "About Organization X," "Background," "Mission", etc.)	Y	Y=1, N=-1	1
49		Is the website organized in a logical manner to allow for ease in browsing?	N	Y=1, N=-1	-1
50		If applicable, do interactive forms (such as surveys) add to the value of the site?	N	Y=1, N=-1, NA=0	-1
51		Can the website be accessed reliably (vs. often being busy or offline)?	Y	Y=1, N=-1	1
				TOTAL:	47
Basic Website Demographics (If Available)					
% Site Users from U.S.	Main Users	Where people visit on the site	Average Load Time		Alexa Traffic Rank
61%	Age: 35-65, Sex: Female	88% visit epa.gov directly	Average (2.004 Seconds), 59% of sites are slower.		6,384
Traffic rank is a measure of website popularity (by combining number of average daily visitors and page views). #1 is most popular website globally.					
User Demographics Pulled from Online Resource, www.Alexa.com, on June 29, 2009.					

Table 15. Evaluation of HP2010 website's presentation of PM information during the website evaluation tool pilot test.

HP2010 Website Evaluation					
Topic Page Address (URL):		http://www.healthypeople.gov/Document/HTML/Volume1/08Environmental.htm	Date Evaluated: 7/1/09		
Webpage Title:		"Environmental Health"	Evaluator: Samantha Malone		
Host Organization & URL:		Healthy People 2010, www.healthypeople.gov			
Host Organization's Mission:		Healthy People 2010 is a set of health objectives for the Nation to achieve over the first decade of the new century. It can be used by many different people, States, communities, professional organizations, and others to help them develop programs to improve health.		Final Website Score (on scale from -68 to +68): 38	
#	Sub-Type	Specific Question(s) Addressed	Response	Point System	Point(s) Received
Content					
1	Scope	Does the website cover all areas of the topic?	N	Y=1, N=-1	-1
2		Does the website go into adequate detail to encourage appropriate knowledge acquisition and decision-making?	N	Y=1, N=-1	-1
3	Accuracy	Is the information provided on the website accurate and free of bias?	Y	Y=2, N=-2	2
4		If applicable, is advertising clearly differentiated from the informational content?	NA	Y=1, N=-1, NA=1	1

Table 15 continued.

5	Risk Communication	Are the hazards/risks stated clearly?	Y	Y=2, N=-2	2
6		Is the probability of the exposure/risk stated clearly?	Y	Y=2, N=-2	2
7		Is the probability of harm resulting from exposure clearly provided?	Y	Y=2, N=-2	2
8		Does the site list vulnerable populations to the risk in question?	Y	Y=2, N=-2	2
9		Does the website adequately explain how this exposure/risk interacts with others?	Y	Y=2, N=-2	2
10		Does the site adequately explain the characteristics of the hazard?	N	Y=2, N=-2	-2
11		Is the total population at risk clearly stated?	Y	Y=2, N=-2	2
12		If applicable, are benefits associated with the exposure/hazard provided and described?	NA	Y=1, N=-1, NA=0	0
13		Are alternatives to the exposure/risk provided?	Y	Y=2, N=-2, NA=0	2
14		Is the effectiveness of the alternative(s) provided?	Y	Y=1, N=-1, NA=0	1
15		Does the site explain the risks vs. benefits of choosing the alternative(s) or of failing to act entirely?	Y	Y=1, N=-1, NA=0	1
16		If uncertainties exist about the level of risk or about the amount or certainty of research available, is this made clear by the organization?	NA	Y=2, N=-2, NA=0	0
17		Does the website appear to have taken stakeholders' perspectives or situations into account (perhaps during the development of risk management choices or when determining the level of risk)?	Y	Y=1, N=-1, NA=0	1

Table 15 continued.					
18	Authority	Was the website created by a reputable organization and/or experts?	Y	Y=2, N=-2, NA=0	2
19		Does the site list references for the content?	Y	Y=2, N=-2, NA=0	2
20		If so, are the references from peer-reviewed or official government sources?	Y	Y=2, N=-2, NA=0	2
21		Can the author(s) of the content (if applicable) be contacted for more information?	Y	Y=1, N=-1, NA=0	1
22		Is it clear what organization is responsible for the contents of the page and is this information available on every webpage?	Y	Y=1, N=-1	1
23		Is there a link to a page describing the goals of the organization?	Y	Y=1, N=-1	1
24		Can the legitimacy of this organization be verified? (Site provides more than just an email address, e.g. phone number or address)	Y	Y=1, N=-1	1
25	Up-to-Date	Has the webpage been updated / reviewed in the last year?	Y	Y=1, N=-1, NA=0	1
26		Are page updates and information upload dates clearly visible to the user? (usually located at the bottom of every page)	N	Y=1, N=-1	-1
27	Links	Are links to other resources appropriate and have they been kept up-to-date?	Y	Y=1, N=-1, NA=0	1
28		Are links to outside sources distinguished between internal ones?	Y	Y=1, N=-1, NA=0	1

Table 15 continued.

29		If applicable, does it appear that the organization requested permission to reproduce information from other sources?	Y	Y=1, N=-1, NA=0	1
30	Writing Quality	Is the text well written? (smooth, clear, well organized)	Y	Y=1, N=-1	1
31		Do the authors use grammar and spelling appropriately?	Y	Y=1, N=-1	1
Appearance / Layout					
32		Is the website visually appealing? (good use of color but not in excess, no flashing text, appropriate text font and size, and page design and layout that focus the eye onto the most important information)	N	Y=2, N=-2	-2
33		Do the visuals distract the user rather than contributing to the site's content?	N	Y=-1, N=1, NA=0	1
34		Do the graphics (images, Adobe flashplayer, or videos) include content? (e.g. A photo that helps demonstrate a health statistic)	Y	Y=1, N=-1, NA=0	1
35		Are the most important information and links located at the top or near the top of the page?	Y	Y=1, N=-1	1
Purpose / Audience					
36		Is the purpose of the website or page clearly stated?	Y	Y=2, N=-2	2

Table 15 continued.

37		Does the content match/fulfill the purpose that was provided?	Y	Y=2, N=-2, NA=0	2
38		Is the intended audience made clear to the user?	Y	Y=1, N=-1	1
39		Is the information presented in a way that is accessible to the intended audience? (e.g. reading level appropriate, if technical terms are used they are defined)	N	Y=1, N=-1	-1
		* Determine Flesch-Kincaid Grade Level & Flesch Reading Ease Score - Is the grade level at 8 or below and the reading ease score 60 or above?	None	Both=1, 1=0, None=-1	-1
Access/Use					
40		Does the site let the user know if special programs are needed to properly view the site?	NA	Y=1, N=-1, NA=0	0
41		Is help available to users if needed?	Y	Y=1, N=-1	1
42		Is the website viewable using more than one browser or computer system (PC vs. MAC)?	Y	Y=1, N=-1	1
43		Is the website accessible by people who are using visually impaired browsers?	Y	Y=1, N=-1	1
44		Can urgent information be obtained on the homepage?	NA	Y=1, N=-1, NA=0	0
45		Can information be effectively retrieved from the website through moderate searching?	N	Y=1, N=-1	-1
46		Does the website utilize a table of contents, site map, or search engine to improve searchability?	Y	Y=1, N=-1	1

Table 15 continued.

47		If applicable, does the search engine allow the user to access the whole website during the search?	N	Y=1, N=-1, NA=0	-1
48		Does the site provide a link for more information about the organization responsible for its content? (A link such as "About Organization X," "Background," "Mission", etc.)	Y	Y=1, N=-1	1
49		Is the website organized in a logical manner to allow for ease in browsing?	N	Y=1, N=-1	-1
50		If applicable, do interactive forms (such as surveys) add to the value of the site?	NA	Y=1, N=-1, NA=0	0
51		Can the website be accessed reliably (vs. often being busy or offline)?	Y	Y=1, N=-1	1
				TOTAL:	38
Basic Website Demographics (If Available)					
% Site Users from U.S.	Main Users	Where people visit on the site	Average Load Time		Alexa Traffic Rank
81%	Age: 55-64 Sex: Female	100% visit healthypeople.gov directly	Very Fast (0.285 Seconds), 98% of sites are slower.		373,211
Traffic rank is a measure of website popularity (by combining number of average daily visitors and page views). #1 is most popular website globally.					
User Demographics Pulled from Online Resource, www.Alexa.com, on July 1, 2009.					

Table 16. Evaluation of the Kansas website's presentation of PM information during the website evaluation tool pilot test.

Kansas Department of Health and the Environment Website Evaluation					
Topic Page Address (URL):		http://www.kdheks.gov/bar/air-monitor/pollutants.html	Date Evaluated: 6/26/09		
webpage Title:		"Criteria Pollutants" - <i>The title of the page was difficult to see because the font and its background were the same color.</i>	Evaluator: Samantha Malone		
Host Organization & URL:		The Kansas Department of Health and the Environment, www.kdheks.gov			
Host Organization's Mission:		Our vision is 'healthy Kansans living in safe and sustainable environments'.		Final Website Score (on scale from -68 to +68): 20	
#	Sub-Type	Specific Question(s) Addressed	Response	Point System	Point(s) Received
Content					
1	Scope	Does the website cover all areas of the topic?	N	Y=1, N=-1	-1
2		Does the website go into adequate detail to encourage appropriate knowledge acquisition and decision-making?	Y	Y=1, N=-1	1
3	Accuracy	Is the information provided on the website accurate and free of bias?	Y	Y=2, N=-2	2
4		If applicable, is advertising clearly differentiated from the informational content?	NA	Y=1, N=-1, NA=1	1
5	Risk Communication	Are the hazards/risks stated clearly?	Y	Y=2, N=-2	2

Table 16 continued.

6		Is the probability of the exposure/risk stated clearly?	Y	Y=2, N=-2	2
7		Is the probability of harm resulting from exposure clearly provided?	Y	Y=2, N=-2	2
8		Does the site list vulnerable populations to the risk in question?	N	Y=2, N=-2	-2
9		Does the website adequately explain how this exposure/risk interacts with others?	Y	Y=2, N=-2	2
10		Does the site adequately explain the characteristics of the hazard?	Y	Y=2, N=-2	2
11		Is the total population at risk clearly stated?	N	Y=2, N=-2	-2
12		If applicable, are benefits associated with the exposure/hazard provided and described?	NA	Y=1, N=-1, NA=0	0
13		Are alternatives to the exposure/risk provided?	N	Y=2, N=-2, NA=0	-2
14		Is the effectiveness of the alternative(s) provided?	NA	Y=1, N=-1, NA=0	0
15		Does the site explain the risks vs. benefits of choosing the alternative(s) or of failing to act entirely?	Y	Y=1, N=-1, NA=0	1
16		If uncertainties exist about the level of risk or about the amount or certainty of research available, is this made clear by the organization?	NA	Y=2, N=-2, NA=0	0
17		Does the website appear to have taken stakeholders' perspectives or situations into account (perhaps during the development of risk management choices or when determining the level of risk)?	N	Y=1, N=-1, NA=0	-1

Table 16 continued.					
18	Authority	Was the website created by a reputable organization and/or experts?	Y	Y=2, N=-2, NA=0	2
19		Does the site list references for the content?	N	Y=2, N=-2, NA=0	-2
20		If so, are the references from peer-reviewed or official government sources?	NA	Y=2, N=-2, NA=0	0
21		Can the author(s) of the content (if applicable) be contacted for more information?	Y	Y=1, N=-1, NA=0	1
22		Is it clear what organization is responsible for the contents of the page and is this information available on every webpage?	Y	Y=1, N=-1	1
23		Is there a link to a page describing the goals of the organization?	Y	Y=1, N=-1	1
24		Can the legitimacy of this organization be verified? (Site provides more than just an email address, e.g. phone number or address)	Y	Y=1, N=-1	1
25	Up-to-Date	Has the webpage been updated / reviewed in the last year?	NA	Y=1, N=-1, NA=1	0
26		Are page updates and information upload dates clearly visible to the user? (usually located at the bottom of every page)	N	Y=1, N=-1	-1
27	Links	Are links to other resources appropriate and have they been kept up-to-date?	Y	Y=1, N=-1, NA=1	1

Table 16 continued.

28		Are links to outside sources distinguished between internal ones?	N	Y=1, N=-1, NA=1	-1
29		If applicable, does it appear that the organization requested permission to reproduce information from other sources?	N	Y=1, N=-1, NA=1	-1
30	Writing Quality	Is the text well written? (smooth, clear, well organized)	Y	Y=1, N=-1	1
31		Do the authors use grammar and spelling appropriately?	Y	Y=1, N=-1	1
Appearance / Layout					
32		Is the website visually appealing? (good use of colors, no flashing text, appropriate text font and size)	N	Y=2, N=-2	-2
33		Do the visuals distract the user rather than contributing to the site's content?	N	Y=-1, N=1, NA=0	1
34		Do the graphics (images, Adobe flashplayer, or videos) include content? (e.g. A photo that helps demonstrate a health statistic)	Y	Y=1, N=-1, NA=1	1
35		Are the most important information and links located at the top or near the top of the page?	Y	Y=1, N=-1	1
Purpose / Audience					
36		Is the purpose of the website or page clearly stated?	Y	Y=2, N=-2	2

Table 16 continued.

37		Does the content match/fulfill the purpose that was provided?	Y	Y=2, N=-2, NA=0	2
38		Is the intended audience made clear to the user?	N	Y=1, N=-1	-1
39		Is the information presented in a way that is accessible to the intended audience? (e.g. reading level appropriate, if technical terms are used they are defined)	N	Y=1, N=-1	-1
		* Determine Flesch-Kincaid Grade Level & Flesch Reading Ease Score - Is the grade level at 8 or below and the reading ease score 60 or above?	None	Both=1, 1=0, None =-1	-1
Access/Use					
40		Does the site let the user know if special programs are needed to properly view the site?	NA	Y=1, N=-1, NA=1	0
41		Is help available to users if needed?	Y	Y=1, N=-1	1
42		Is the website viewable using more than one browser or computer system (PC vs. MAC)?	Y	Y=1, N=-1	1
43		Is the website accessible by people who are using visually impaired browsers?	Y	Y=1, N=-1	1
44		Can urgent information be obtained on the homepage?	Y	Y=1, N=-1, NA=1	1
45		Can information be effectively retrieved from the website through moderate searching?	N	Y=1, N=-1	-1

Table 16 continued.

46		Does the website utilize a table of contents, site map, or search engine to improve searchability?	Y	Y=1, N=-1	1
47		If applicable, does the search engine allow the user to access the whole website during the search?	Y	Y=1, N=-1, NA=0	1
48		Does the site provide a link for more information about the organization responsible for its content? (A link such as "About Organization X," "Background," "Mission", etc.)	Y	Y=1, N=-1	1
49		Is the website organized in a logical manner to allow for ease in browsing?	N	Y=1, N=-1	-1
50		If applicable, do interactive forms (such as surveys) add to the value of the site?	Y	Y=1, N=-1, NA=1	1
51		Can the website be accessed reliably (vs. often being busy or offline)?	Y	Y=1, N=-1	1
				TOTAL:	20
Basic Website Demographics (If Available)					
% Site Users from U.S.	Main Users	Where people visit on the site	Average Load Time		Alexa Traffic Rank
83%	Age: 18-44, Sex: Female	100% visit kdheks.gov directly	Fast (1.325 Seconds), 75% of sites are slower.		308,071
Traffic rank is a measure of website popularity (by combining number of average daily visitors and page views). #1 is most popular website globally.					
User Demographics Pulled from Online Resource, www.Alexa.com, on June 29, 2009.					

Table 17. Evaluation of the Mass. website's presentation of PM information during the website evaluation tool pilot test.

Commonwealth of Massachusetts Website Evaluation					
Topic Page Address (URL):		http://www.mass.gov/dep/air/aq/aq_pm.htm		Date Evaluated: 7/1/09	
webpage Title:		"Particle Pollution and Air Quality" (Sub-host organization: Massachusetts Department of Environmental Protection)		Evaluator: Samantha Malone	
Host Organization & URL:		Commonwealth of Massachusetts, www.mass.gov			
Host Organization's Mission:		The Department of Environmental Protection is the state agency responsible for ensuring clean air and water, the safe management of toxics and hazards, the recycling of solid and hazardous wastes, the timely cleanup of hazardous waste sites and spills, and the preservation of wetlands and coastal resources. (No mission statement available for the Commonwealth of Massachusetts)		Final Website Score (on scale from -68 to +68): 43	
#	Sub-Type	Specific Question(s) Addressed	Response	Point System	Point(s) Received
Content					
1	Scope	Does the website cover all areas of the topic?	Y	Y=1, N=-1	1
2		Does the website go into adequate detail to encourage appropriate knowledge acquisition and decision-making?	Y	Y=1, N=-1	1
3	Accuracy	Is the information provided on the website accurate and free of bias?	Y	Y=2, N=-2	2
4		If applicable, is advertising clearly differentiated from the informational content?	Y	Y=1, N=-1, NA=1	1

Table 17 continued.					
5	Risk Communication	Are the hazards/risks stated clearly?	Y	Y=2, N=-2	2
6		Is the probability of the exposure/risk stated clearly?	Y	Y=2, N=-2	2
7		Is the probability of harm resulting from exposure clearly provided?	Y	Y=2, N=-2	2
8		Does the site list vulnerable populations to the risk in question?	Y	Y=2, N=-2	2
9		Does the website adequately explain how this exposure/risk interacts with others?	Y	Y=2, N=-2	2
10		Does the site adequately explain the characteristics of the hazard?	Y	Y=2, N=-2	2
11		Is the total population at risk clearly stated?	Y	Y=2, N=-2	2
12		If applicable, are benefits associated with the exposure/hazard provided and described?	NA	Y=1, N=-1, NA=0	0
13		Are alternatives to the exposure/risk provided?	N	Y=2, N=-2, NA=0	-2
14		Is the effectiveness of the alterative(s) provided?	NA	Y=1, N=-1, NA=0	0
15		Does the site explain the risks vs. benefits of choosing the alternative(s) or of failing to act entirely?	Y	Y=1, N=-1, NA=0	1
16		If uncertainties exist about the level of risk or about the amount or certainty of research available, is this made clear by the organization?	NA	Y=2, N=-2, NA=0	0

Table 17 continued.

17		Does the website appear to have taken stakeholders' perspectives or situations into account (perhaps during the development of risk management choices or when determining the level of risk)?	N	Y=1, N=-1, NA=0	-1
18	Authority	Was the website created by a reputable organization and/or experts?	Y	Y=2, N=-2, NA=0	2
19		Does the site list references for the content?	N	Y=2, N=-2, NA=0	-2
20		If so, are the references from peer-reviewed or official government sources?	NA	Y=2, N=-2, NA=0	0
21		Can the author(s) of the content (if applicable) be contacted for more information?	Y	Y=1, N=-1, NA=0	1
22		Is it clear what organization is responsible for the contents of the page and is this information available on every webpage?	Y	Y=1, N=-1	1
23		Is there a link to a page describing the goals of the organization?	Y	Y=1, N=-1	1
24		Can the legitimacy of this organization be verified? (Site provides more than just an email address, e.g. phone number or address)	Y	Y=1, N=-1	1
25	Up-to-Date	Has the webpage been updated / reviewed in the last year?	NA	Y=1, N=-1, NA=1	0
26		Are page updates and information upload dates clearly visible to the user? (usually located at the bottom of every page)	N	Y=1, N=-1	-1

Table 17 continued.					
27	Links	Are links to other resources appropriate and have they been kept up-to-date?	NA	Y=1, N=-1, NA=1	0
28		Are links to outside sources distinguished between internal ones?	NA	Y=1, N=-1, NA=1	0
29		If applicable, does it appear that the organization requested permission to reproduce information from other sources?	NA	Y=1, N=-1, NA=1	0
30	Writing Quality	Is the text well written? (smooth, clear, well organized)	Y	Y=1, N=-1	1
31		Do the authors use grammar and spelling appropriately?	Y	Y=1, N=-1	1
Appearance / Layout					
32		Is the website visually appealing? (good use of color but not in excess, no flashing text, appropriate text font and size, and page design and layout that focus the eye onto the most important information)	Y	Y=2, N=-2	2
33		Do the visuals distract the user rather than contributing to the site's content?	N	Y=-1, N=1, NA=0	1
34		Do the graphics (images, Adobe flashplayer, or videos) include content? (e.g. A photo that helps demonstrate a health statistic)	Y	Y=1, N=-1, NA=1	1
35		Are the most important information and links located at the top or near the top of the page?	Y	Y=1, N=-1	1

Table 17 continued.

Purpose / Audience					
36		Is the purpose of the website or page clearly stated?	Y	Y=2, N=-2	2
37		Does the content match/fulfill the purpose that was provided?	Y	Y=2, N=-2, NA=0	2
38		Is the intended audience made clear to the user?	Y	Y=1, N=-1	1
39		Is the information presented in a way that is accessible to the intended audience? (e.g. reading level appropriate, if technical terms are used they are defined)	Y	Y=1, N=-1	1
		* Determine Flesch-Kincaid Grade Level & Flesch Reading Ease Score - Is the grade level at 8 or below and the reading ease score 60 or above?	None	Both=1, 1=0, None =-1	-1
Access/Use					
40		Does the site let the user know if special programs are needed to properly view the site?	NA	Y=1, N=-1, NA=1	0
41		Is help available to users if needed?	Y	Y=1, N=-1	1
42		Is the website viewable using more than one browser or computer system (PC vs. MAC)?	Y	Y=1, N=-1	1
43		Is the website accessible by people who are using visually impaired browsers?	Y	Y=1, N=-1	1
44		Can urgent information be obtained on the homepage?	Y	Y=1, N=-1, NA=1	1

Table 17 continued.

45		Can information be effectively retrieved from the website through moderate searching?	Y	Y=1, N=-1	1
46		Does the website utilize a table of contents, site map, or search engine to improve searchability?	Y	Y=1, N=-1	1
47		If applicable, does the search engine allow the user to access the whole website during the search?	Y	Y=1, N=-1, NA=1	1
48		Does the site provide a link for more information about the organization responsible for its content? (A link such as "About Organization X," "Background," "Mission", etc.)	Y	Y=1, N=-1	1
49		Is the website organized in a logical manner to allow for ease in browsing?	Y	Y=1, N=-1	1
50		If applicable, do interactive forms (such as surveys) add to the value of the site?	Y	Y=1, N=-1, NA=1	1
51		Can the website be accessed reliably (vs. often being busy or offline)?	Y	Y=1, N=-1	1
				TOTAL:	43
Basic Website Demographics (If Available)					
% Site Users from U.S.	Main Users	Where people visit on the site	Average Load Time		Alexa Traffic Rank
90%	Age: 45-54, Sex: Female	88% visit mass.gov directly	Very Fast (0.773 Seconds), 90% of sites are slower.		5,691
Traffic rank is a measure of website popularity (by combining number of average daily visitors and page views). #1 is most popular website globally.					
User Demographics Pulled from Online Resource, www.Alexa.com, on July 1, 2009.					

C.2: COMBINED WEBSITES' PILOT TEST RESULTS

Table 18. Websites' raw data results by category and overall on website evaluation tool.

Website	Content	Appearance / Layout	Purpose / Audience	Access / Use	TOTAL
CDC	29	5	1	7	42
EPA	39	5	3	0	47
HP2010	31	1	3	3	38
Kansas	11	1	1	7	20
Mass.	22	5	5	11	43
ATSDR/CDC =	http://www.atsdr.cdc.gov/general/theair.html				
U.S. EPA =	www.epa.gov				
Kansas =	www.kdheks.gov				
HP2010 =	www.healthypeople.gov				
Mass. =	www.mass.gov				

C.3: GOVERNMENT WEBSITES' USER DEMOGRAPHICS

Table 19. Pilot-tested websites' user demographics.

Base Website URL	Where people visit on the site	% Users from U.S.	Average Load Time	Main Users
www.cdc.gov	80% visit www.cdc.gov vs. www.atsdr.cdc.gov	58%	Fast (1.569 Seconds), 70% of sites are slower.	Age: 35-55, Sex: Female,
www.epa.gov	88% visit www.epa.gov	61%	Average (2.004 Seconds), 59% of sites are slower.	Age: 35-65, Sex: Female
www.healthypeople.gov	100% visit www.healthypeople.gov	81%	Very Fast (0.285 Seconds), 98% of sites are slower.	Age: 55-64 Sex: Female
www.kdheks.gov	100% visit www.kdheks.gov	83%	Fast (1.325 Seconds), 75% of sites are slower.	Age: 18-44, Sex: Female
www.mass.gov	88% visit www.mass.gov	90%	Very Fast (0.773 Seconds), 90% of sites are slower.	Age: 45-54, Sex: Female
Note: Statistics are only available for the main websites, such as www.CDC.gov , not for any of the sites' branches or individual webpages, such as www.atsdr.cdc.gov/ .				
Source: http://www.alexa.com , June 29, 2009.				

C.4: SCREEN SHOT: U.S. EPA ACCESSIBILITY ERRORS

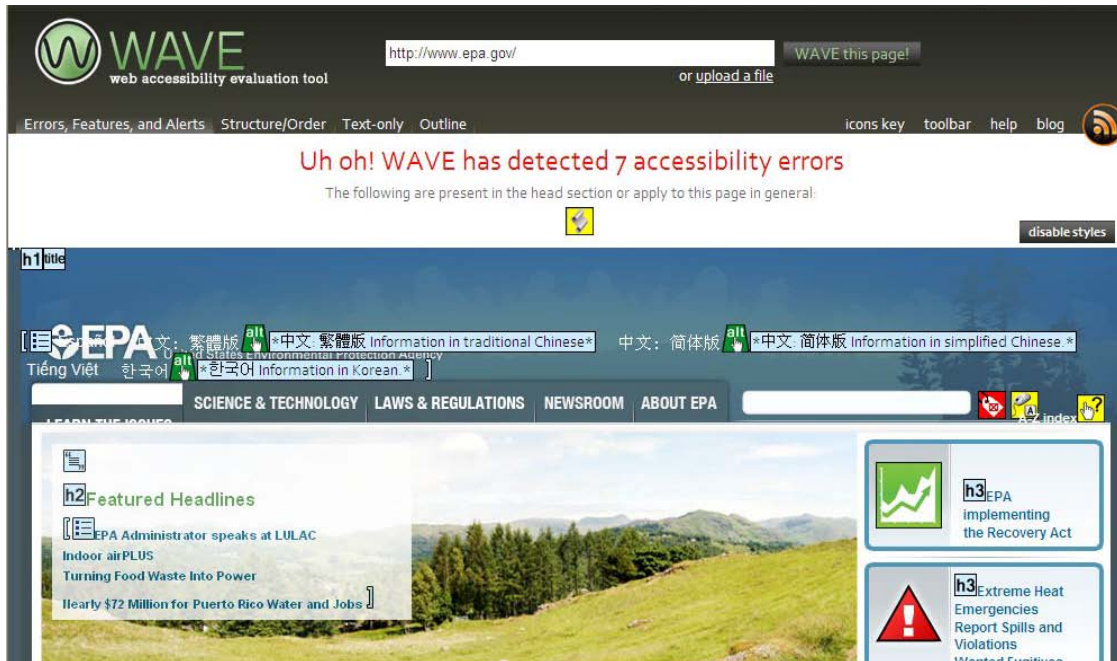


Figure 10. Example of accessibility errors on the U.S. EPA's website encountered during pilot test of evaluation.

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