

# Content and Design Attributes of Antivaccination Web Sites

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VACCINES ARE CONSIDERED ONE of the greatest achievements of biomedical science and public health.<sup>1</sup> However, during the last few decades an increasingly vocal antivaccination movement has challenged the safety and effectiveness of recommended vaccines.<sup>2,3</sup> The extent of concern in the United States was highlighted by a national survey that found that although the majority of parents supported vaccination, 25% believed that too many vaccinations could weaken children's immune systems and 23% believed that children get too many immunizations.<sup>4</sup>

Recent studies indicate that 66% of US adults (137 million) are now online and that 80% of all adults online use the Internet to look for health information.<sup>5,6</sup> Furthermore, 52% of those who have visited online health sites believe that "almost all" or "most" of the health information they find online is credible.<sup>7</sup> Individuals searching for vaccination information may find themselves visiting antivaccination sites. This study explored the content and design attributes of antivaccination sites that an individual might encounter doing a typical Web search, with the goal of enhancing our understanding of concerns raised on these sites.

## METHODS

### Search Strategy

Using the *Netlingo Dictionary of Internet Words* (<http://www.netlingo.com>) and the *Webopedia Online Computer Dictionary of Internet Terms* ([http://](http://www.pcwebopedia.com)

**Context** Individuals searching the Internet for vaccine information may find antivaccination Web sites. Few published studies have systematically evaluated these sites.

**Objectives** To examine antivaccination Web site attributes and to delineate the specific claims and concerns expressed by antivaccination groups.

**Design and Setting** In late 2000, using a metasearch program that incorporates 10 other search engines, we reviewed and analyzed 772 links to find 12 Web sites that promulgated antivaccination information. Analyzing links from these 12 sites yielded another 10 sites, producing a total of 22 sites for study. Using a standardized form, 2 authors (R.M.W., L.K.S.) systematically evaluated these sites based on specific content and design attributes.

**Main Outcome Measures** Presence or absence of 11 Web site content attributes (antivaccination claims) and 10 Web site design attributes.

**Results** The most commonly found content claims were that vaccines cause idiopathic illness (100% of sites), vaccines erode immunity (95%), adverse vaccine reactions are underreported (95%), and vaccination policy is motivated by profit (91%). The most common design attributes were the presence of links to other antivaccination sites (100% of sites), information for legally avoiding immunizations (64%), and the use of emotionally charged stories of children who had allegedly been killed or harmed by vaccines (55%).

**Conclusion** Antivaccination Web sites express a range of concerns related to vaccine safety and varying levels of distrust in medicine. The sites rely heavily on emotional appeal to convey their message.

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[www.jama.com](http://www.jama.com)

[www.pcwebopedia.com](http://www.pcwebopedia.com)), we defined a "Web page" as a single html file or document viewed on a Web browser and a "Web site" as a site (location) on the World Wide Web. Each Web site contains a "home page," which is the first document users see when they enter the site. Each site is owned and managed by an individual, company, or organization.

A "link" (or "hyperlink") is an element in an electronic document that links to another place in the same document or to an entirely different document. Typically, clicking on a hyperlink will transport a user to another document or section of the document.

Antivaccination Web pages were identified using Copernic 2000 v4.55a (Copernic Technologies Inc, Sainte Foy,

Québec), an Internet search utility program designed to simultaneously submit searches on numerous search engines. We used 10 search engines: *AltaVista*, *EuroSeek*, *Excite*, *Google*, *GoTo.com*, *HotBot*, *Infoseek*, *Lycos*, *Yahoo*, and *All the Web FAST Search*, with up to 30 results returned on each engine for a maximum of 300 results per search. Two of the investigators (R.M.W., L.K.S.) jointly conducted 4 searches between August 3, 2000, and

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September 3, 2000, using the keywords *vaccine*, *vaccinate*, *vaccination*, *immunize*, *immunization*, *immunise*, *immunisation*, *anti-vaccination*, *anti-immunization*, and *anti-immunisation*.

The initial searches identified 851 links to Web sites, of which 79 were invalid or duplicate links. The resulting 772 sites were reviewed together by both searchers to select those for study based on the criteria below.

**Inclusion and Exclusion Criteria**

A Web site was considered for review if it contained content specifically opposing vaccination for human infants or children. The following Web sites were excluded: (1) online health/medical journals or newspaper sites, (2) listservs or newsgroups containing online conversations, and (3) sites not written in the English language. Two

authors (R.M.W., L.K.S.) reviewed the 772 links, identifying 12 Web sites opposing childhood vaccinations. A secondary survey of all links leading from the 12 sites to other antivaccination sites identified 10 additional links resulting in a total of 22 sites for final data extraction. Of the final 22 sites, there were 16 from the United States, 2 from the United Kingdom, 2 from Australia, 1 from New Zealand, and 1 from France (text available in English).

**Data Extraction**

Data extraction included 11 Web site content attributes (antivaccination claims, FIGURE 1) modified from the work of Leask and Chapman<sup>8</sup> on the antivaccination movement in Australia, from the US Centers for Disease Control and Prevention criteria,<sup>9</sup> and 2 items developed by the authors. In addition,

10 design attributes (FIGURE 2) were identified based on criteria published by Kim et al.<sup>10</sup>

Only material present on the original Web site was evaluated. Links to other sites were excluded. For each site, each content and design item was classified as present or absent. Two authors (R.M.W., L.K.S.) reviewed 4 sites separately, with 100% interrater reliability. These authors reviewed the 18 remaining sites jointly.

**RESULTS**

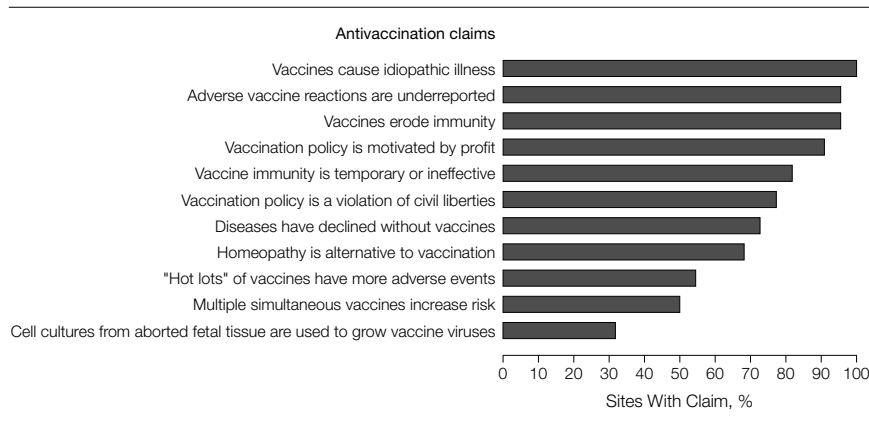
**Content Variables: Antivaccination Claims**

The total number of claims per site ranged from 2 to 11, with 18 (82%) of the sites exhibiting 7 or more of the 11 claims. Two sites with the fewest claims were created by medical researchers with publications in peer-reviewed medical journals.

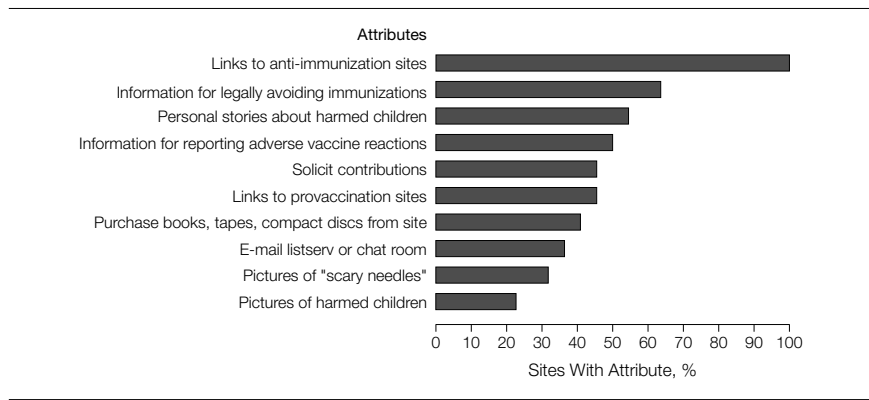
“Vaccines cause idiopathic illness.” All of the sites included content suggesting that vaccines cause idiopathic illnesses. The most common illnesses ascribed to vaccination included: autism (specifically from measles/mumps/rubella [MMR] and/or diphtheria/pertussis/tetanus [DPT] vaccine), sudden infant death syndrome (SIDS), immune dysfunction, diabetes, neurologic disorders (including seizures, brain damage, learning disabilities, attention deficit disorder, antisocial behavior), and atopic disorders, including allergic rhinitis, eczema, and asthma.

“Hot Lots” and “Increased Risk From Multiple Simultaneous Vaccines.” Two claims related to issues of vaccine manufacture and administration. The first claim, that allegedly contaminated vaccination lots (ie, “hot lots”) are more likely to cause an adverse reaction, was addressed by 12 (55%) of the sites. The second claim, that giving multiple vaccines at the same time increases the risk of an adverse event, appeared on 11 (50%) of the sites. A number of sites where this claim appeared cited 2 published case reports that suggested that combined MMR vaccine was a risk factor for au-

**Figure 1.** Content Attributes



**Figure 2.** Design Attributes



tism.<sup>11,12</sup> Several studies and medical review panels that have not supported this hypothesis were not referenced.<sup>13-16</sup>

**“Vaccines Erode Immunity” and “Immunity Is Temporary/Ineffective.”** Twenty-one sites stated that vaccinations eroded or harmed the immune system, specifically inducing autoimmunity. A frequent concomitant claim was that naturally occurring diseases helped the immune system, preventing illnesses such as asthma and atopy, and that vaccinations interfered with this benefit. One site included an antivaccination article written by a physicians’ group specializing in “family, environmental and preventive medicine” that cited 4 references in support of this idea,<sup>17-20</sup> without mention of the opposing published data.<sup>21-23</sup>

Eighteen (81%) of the sites alleged that vaccines are ineffective or produce temporary immunity.

**“Adverse Vaccine Reactions Are Underreported.”** Twenty-one (95%) sites argued that adverse vaccine reactions (or vaccine failure) are underreported, but reasons given for underreporting varied. The most common reason was that physicians fail to recognize delayed reactions as vaccine related or fail to report them. Others argued that agencies involved with vaccine production and regulation were purposefully covering up the truth.

**“Diseases Have Declined” and “Homeopathy Alternative.”** Sixteen sites (73%) stated that prior to the use of vaccinations these diseases had begun to decline due to improved nutrition and hygiene, and that vaccines were given undue credit for these declines. Homeopathy, alternative health, and natural methods of enhancing immunity, such as breastfeeding or proper diet, were promoted on many of these sites. Homeopathy was also endorsed as a means of reducing the severity of post-vaccination reactions. Sites advocating homeopathy were often associated with statements attacking Pasteur and the germ theory of disease.

**“Vaccine Policy Is Motivated by Profit.”** The idea that vaccine policy is motivated by profit was found on 20 of

the sites (91%). The general thesis was that vaccine manufacturers make enormous profits, which influences universal vaccination recommendations and promotes the cover-up of vaccine adverse effects. More extreme arguments posited that physicians are biased by financial inducements from vaccine manufacturers, especially in the form of gifts or research grants.

**“Violation of Civil Liberties.”** Seventeen (77%) of the sites mentioned civil liberty concerns associated with mandated vaccination. Electronic vaccine registries, designed to allow tracking of childhood immunizations, were attacked as an example of “Big Brother” intruding into the lives of citizens.

**“Use of Aborted Fetal Tissue.”** Seven (32%) of the sites raised the fact that viruses grown from cell cultures of aborted fetuses (lines MRC5 and WI-38) are used in varicella, rubella, and hepatitis A vaccines.<sup>24</sup> Antivaccination sites raise both moral issues and concerns about adverse effects from injecting such materials into humans.

### Design Attributes

Figure 2 shows the frequencies of the 10 design attributes we used to further characterize these sites. All sites had links to other antivaccination sites. Ten (45%) of the sites displayed links to authoritative provaccination sources such as the Centers for Disease Control and Prevention. Stories of children harmed by vaccines were very common, as was information on how to legally avoid vaccinations. Seven sites (32%) displayed pictures of menacing needles, and 5 sites (23%) displayed pictures of children allegedly harmed or killed by vaccine reactions.

### COMMENT

This study systematically collected information on the content and design attributes of antivaccination Web sites. Our results show that such sites express a variety of claims that are largely unsupported by peer-reviewed scientific literature. There were 3 broad themes expressed on the antivaccination Web sites: concerns about vac-

cine safety and effectiveness, concerns about governmental abuses, and a preference for alternative health practices. The key concern relates to the perceived risk of disease, harm, or death when a child receives a vaccine. Second, mandated vaccination is viewed as an unacceptable infringement of personal choice and civil liberties. Furthermore, there is a pervasive sense of distrust, expressed in beliefs that governmental oversight bodies suppress reports of adverse vaccine reactions and collude with the pharmaceutical industry to profit from vaccine sales. And third, alternative health practices are valued over allopathic health care, and are believed to obviate the need for vaccination. The arguments used on these sites are not new: most were used in the 19th century by opponents of compulsory smallpox vaccination.<sup>8,25</sup>

Fifty-five percent of the sites provided personal accounts written by parents who believed that their child was killed or permanently harmed by vaccination, and almost one fourth of the sites included pictures of the affected children. Such visual images of purported adverse consequences can be unsettling to parents facing vaccination decisions. In social psychology terms, these parents may be swayed by “false consensus bias,” a tendency to rely on personal experience as opposed to scientific evidence. In essence, an individual’s beliefs regarding vaccination are unduly swayed by personal and emotional anecdotes to the exclusion of evidence. In contrast, the once overwhelmingly apparent visual images of the benefits from vaccination have disappeared as their respective diseases—such as polio—have disappeared.

Although this study did not formally evaluate the accuracy of medical references provided on antivaccination Web sites, a separate review found that sites that contain citations to scientific papers often misrepresent their contents.<sup>26</sup> Many claims we encountered were supported by references from homeopathic or alternative medical literature. Typically, arguments connecting vaccination to

adverse effects were made using the logical fallacy *post hoc ergo propter hoc* ("after this, therefore because of this"), which mistakes association for causation.<sup>8</sup> For example, since autism occurs in the first 2 years of life when multiple vaccines are given, many anti-immunization proponents conclude that vaccines cause autism. Although controlled studies do not support this association, it remains an area of contention between public health authorities and antivaccinationists, reflected in recent congressional hearings about vaccine safety.<sup>27,28</sup>

This study is limited by the dynamic nature of the Internet, where entire Web sites appear and disappear or move to other "addresses" overnight. Defining the content of a site is also a problem. On the Internet, a document on an-

other site, accessed by clicking on a link, is often no harder to reach than a document on the original site. This study looked only at pages on the original site, believing this implied more "ownership" of the material and provided a standardized method of assessing each site. The study was limited to English-language sites; therefore, the findings may not extend to antivaccination sites written in other languages.

Vaccination is not risk free, but most in mainstream medicine agree that the benefits of vaccination outweigh the risks.<sup>29</sup> While the majority of the public accepts immunization, it appears that increasing numbers of parents are seeking philosophical exemptions from vaccination for their children. For example, in Colorado the rate of philosophical exemptions from vaccination rose from

0.87% in 1988 to 1.87% in 1998, with the rate of religious exemption holding steady at about 0.2%.<sup>30</sup> Although a few unimmunized individuals are most likely protected by herd immunity, growing numbers of unvaccinated individuals could eventually pose a risk to both themselves and society.<sup>31</sup> We believe our study findings can help direct research aimed at more effectively addressing the concerns of individuals opposing childhood vaccination.

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*Acquisition of data:* Wolfe, Sharp.

*Analysis and interpretation of data:* Wolfe, Sharp, Lipsky.

*Drafting of the manuscript:* Wolfe, Sharp.

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*Statistical expertise:* Sharp.

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