

STD/HIV Prevention for Teenagers: A Look at the Internet Universe

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The objective was to determine how the Internet is used to promote sexual health among adolescents. Six key words were entered into three search engines producing 87,180 results. Three percent (n=36) were educational Web sites targeted at teenagers and covered a range of sexually transmitted diseases (STDs). These were content analyzed using sexuality education and usability guidelines. All sites addressed some STD information, but only two covered negotiation. Navigability results were mixed; only one third offered a site map. Sexual health educators may need to include more information on how to negotiate safe sex and improve Web navigability for teenagers.

Of the nation's estimated 140 million regular Internet users, some 52 million use the Net for information on health—diseases, clinical trials, treatment and nutrition—and many of them are teenagers (Richardson, 2000). Forty-six percent of 12–17-year-olds have gone online in the past month, spending an average of 303 minutes per month online (CyberAtlas, 2000). Many teens use mass media, including the Net, for sexual information. Although teens say they would prefer to get sexual education from their parents, more than half of adolescents report learning about sexual issues from TV, movies and magazines (Kaiser Family Foundation, 1998). Recently, the Kaiser Sex Smarts study found that 20% of teenagers 12–17 years old use the Internet for sexually transmitted disease (STD) information (Kaiser Family Foundation & Seventeen Magazine, 2002).

Simultaneously, U.S. adolescents face increasing risks of STDs. About one in four sexually active youth in the United States will be infected with an STD by age 24 (Cates & McPheeters, 1997).

The coincidence of these two trends—increasing use of the Internet for health information and an adolescent STD epidemic—provides health educators with a unique opportunity to convey sexual health education. The Internet's uniquely intermediate status between a mass medium and interpersonal communication make it an ideal venue for communicating sensitive information because it offers anonymity and sophisticated mes-

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sage tailoring (Cassell, Jackson, & Chevront, 1998). In addition, the Internet has the advantage of being able to relay information on demand, meeting health clients' immediate needs or answering questions when their needs occur—a quality especially important for issuing reproductive health information to young people, who may not be connected to health care services and often lack transportation. The Internet can facilitate personal decision-making and risk assessment; and provide online peer support through message boards, chat rooms, and E-mail. Online support groups have been shown to positively impact women with breast cancer and persons with AIDS (Eng & Gustafson, 1999). Finally, another advantage of the Internet is its ability to promote self-efficacy and model communication skills, key components of healthy adolescent development, and prerequisites to safe sex practice and STD prevention (Campbell, *et al.*, 1994; Dijkstra & de Vries, 1999).

Clearly, a few limitations of using the Internet to deliver health information remain. For one, inaccurate or inappropriate information is rampant (Smith, Gertz, Alvarez, & Lurie, 2000). Another is the risk of violations to privacy and confidentiality. Third, the opportunity to provide sexual health information on the Internet may be limited due to the increasing use by libraries, parents and school systems of software designed to block out sexually explicit information (Hafner, 1998). Perhaps the greatest impediment to using the Internet as a vehicle for reducing adolescent sexual health risks has to do with access. While 81–88% of families with incomes over \$50,000 are using the Internet, this is true for only 41% of families with incomes less than \$14,000 (Cole *et al.*, 2000).

Despite the continued spread of STDs throughout the world and the increasing use of the Net for health care, little is known about how the Internet is being used to prevent and treat STDs/HIV. At least two articles have reviewed online HIV/AIDS resources (Brettle, 1997; Mallory, 1997), and one (Smith, Gertz, Alvarez, & Lurie, 2000) examined Web sites that covered a range of STDs (in addition to HIV). This study did not look in-depth at specific sites, nor did it examine material specifically targeted towards teenagers. A case study of one STD prevention Web site (www.iwannaknow.org), which did look in-depth at a single Web site, found a lack of information teaching teenagers how to negotiate safe sex (Keller, Gilbert, & LaBelle, 2001).

Only a small number of studies have examined the effectiveness of interactive health communication (AHCPR, 1997). One study indicates that some patients prefer online counseling to face-to-face interaction (Alemi *et al.*, 1996), and that people may be more likely to be truthful to a computer than a clinician in reporting HIV-risk factors (Erdman, Klein, & Greist, 1985; Locke *et al.*, 1992). In fact, a study of 1,690 males ages 15–19 found that adolescents were three times more likely to report risky behavior (including sexual acts, drug use, and violence) when using audio computer-assisted self-interviewing (audio-CASI) technology compared to more traditional self-administered questionnaires (Turner *et al.*, 1998).

Prominent research institutions are calling for more empirical work to examine the effects of interactive media on health attitudes, beliefs and behavior (Eng & Gustafson, 1999). One strategy of Web evaluation uses expert or health-related standards to assess the quality of health information online (Kapoun, 2000). Our project aimed to do precisely this, by comparing the content of STD/HIV Web sites targeted at adolescents to national guidelines for comprehensive sexuality education curricula developed by the Sexuality Information and Education Council (SIECUS), a clearinghouse for sexual health information in New York City (SIECUS, 1996). We also used American Library Association standards to assess Web sites for navigability, readability and design.

We are aware of no systematic studies concerning online sex education targeted at teenagers, other than an ongoing study by the American Social Health Association

(ASHA) (Keller et al., 2001). We undertook this study to assess the content and accessibility of sex education information for adolescents on the Internet and to develop suggestions for how this information might be improved. The results can be used to develop measurement tools to evaluate the impact of STD/HIV sites on adolescents' knowledge, attitudes, and intended behaviors. A second potential outcome of this project is to contribute to a general strategy for tracking and evaluating HIV/STD prevention interventions on the Web. Finally, the sites assessed in this study can be unified under a single umbrella Web site (that is how it is usually termed) that can refer adolescents to online STD/HIV information according to their individual needs.

Research Plan & Methods

Methodology: Content Analysis

We strove to answer two research questions: (1) what are the characteristics being used in HIV/STD information on the Internet?; and (2) what are the specific sexual health topics being employed to deliver HIV/STD prevention messages on the Internet? Content analysis is a common method of inquiry in mass communication research. Simply put, content analysis investigates the attributes of what is read, watched, and heard. Based on the coding categories, we analyzed the content of 36 educational STD/HIV Web sites, comparing the topics covered with those recommended by SIECUS, and listing those topics that were not addressed.

Sampling Procedure

This study borrowed and expanded on a content analysis procedure developed by Kim (in press) in their study of tobacco companies' use of the Internet to sell cigarettes. Using data from Media Matrix, three of the most commonly used search engines were chosen (Yahoo!, Netscape, and Lycos). Yahoo! was also chosen based on its rating by PC Data Online as the most popular site in October 2000, receiving the most unique visitors in one month (CyberAtlas, 2000). Unfortunately, none of the common Internet demographic sites provided data on search engine use broken down by age group. Since a large percentage of teenagers are Internet users, we determined that the most popular search engines among the U.S. Internet population at large would also be likely to be popular, if not *the* most popular, among young users.

Inclusion/exclusion criteria were established based on the study parameters. Given the research goals of understanding the Internet's role in STD/HIV education, researchers opted to confine the study to Web sites that were educational, that contained information about both HIV and other STDs, and that were specifically targeted towards teenagers. Sex education sites were defined as sites with a primary purpose of providing sexual health information. Sites that provided educational content that was not presented in a format intended for teenagers were excluded, as were "advocacy" sites, which merely stated the existence or position of an organization but did not present educational material online. Both commercial and noncommercial sites were included, as long as the primary mission of the site was clearly educational. We also limited the search to English-language sites.

"Teen-friendliness" was determined by ease of use, language, appearance, use of graphics, and tone of voice. Since this was subjectively defined, we tested intercoder reliability for decisions about teen-friendliness using 10% of our total sample of Web sites. We found that coders agreed 100% of the time about which sites were targeted

towards adolescents. Sites were considered “teen-friendly” if their look and feel seemed appropriate to adolescents, even if the sites did not explicitly mention youth as their target audience.

Appropriate key words were collected from master’s students at a private university in the Northeast, using open-ended questionnaires asking students to list the words they would use to find sexual health information on the Internet. Certainly master’s students (ages 21–32) were substantially older (both psychologically and biologically) than our target audience (ages 13–17), and would likely use different words to obtain sexual health information on the Internet than would teenagers. However, the need to acquire informed parental consent and human subjects committee approval to conduct an adolescent survey made it extremely difficult to access such data within the resource and time confines of this study. We felt it better to assess search term usage among older young adults, rather than exclude external verification altogether.

Twelve search terms were derived from the survey. These were pretested by performing searches and examining results to determine which terms most efficiently retrieved the target sites (i.e., educational STD/HIV prevention sites for teenagers). Results showed that health phrases (e.g., STDs and STD) were more effective when combined with an adolescent-specific term (e.g., Teens). The word “teens” was chosen, as opposed to “adolescents” or “teenagers,” because we believed that teenagers themselves would be more likely to use this term. (These decisions were made by the three investigators in this study who are under age 25 in order to increase the likelihood that their choices would be similar to those of their younger peers). Health-related terms by themselves produced the highest numbers of results on all search engines. In response to the term “HIV,” Yahoo! produced 1,010 results; for the term “AIDS,” Yahoo! found 2,243 sites; and for “STD or STDs,” Yahoo! accumulated 444 sites. When the key word “teens” was added to a search phrase, as with “STD or STDs and teens,” Yahoo! found only four sites (Figure 1). Not all search engines behaved the same way, and results varied dramatically, based on differences in search strategies. Lycos found 7,441 in response to the key words “HIV and teens” and 34,235 for “AIDS and teens;” figures still substantially less than were found using only “HIV” or “AIDS.” By combining key words into phrases, the 12 initial key words were reduced to six search phrases. The resulting phrases included “STD or STDs and teens,” “HIV and teens,” etc.

Searches on each of the six key word phrases were conducted on each of the three search engines. The first 100 hits from each set of results were categorized by topic and type of site into nine types of sites (e.g., news articles, umbrella web sites, advocacy sites, non-teen-friendly sites, other, etc.) (Figure 1). These nine categories were empirically derived, based on qualitative cluster analysis of the search results. Results were simultaneously screened for inclusion in the study. Sites that housed a subsite that met the criteria were included. Sites that merely linked to another (external) site were excluded, as were “umbrella” sites that only contained lists of links to other sites, but no unique content. We developed a “one-click rule” whereby the site to be included in the study could not be more than one click away from the link listed on the search results, based on the belief that teenagers would likely turn to a new Web site if they were unable to easily find the information or type of site they were seeking.

Measure Development

Building on the content analysis used in ASHA’s prior research, the coding tools were revised to assess additional usability characteristics (e.g., criteria for credibility) and

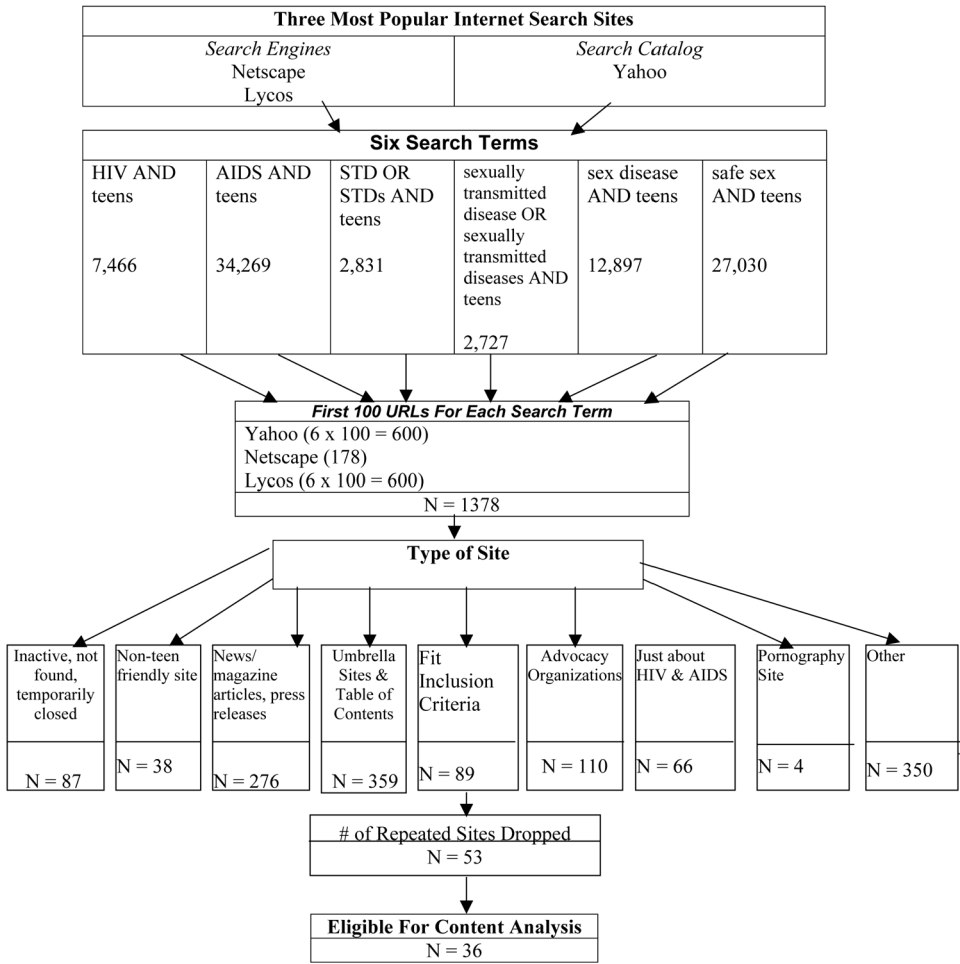


FIGURE 1 Organizational chart of search results.

broad sexual health topics were excluded (e.g., general reproductive health information). Categories for measurement of sexual health content were based on *The Guidelines for Comprehensive Sexuality Education, Kindergarten–12th Grade*, developed in 1991 and reissued in 1996 by a national taskforce of leading health, education and sexuality professionals convened by SIECUS. Categories for usability were obtained from national standards for Web evaluation and assessment from the American Library Association (Alexander & Tate, 1999). Researchers in this project converted the guidelines to serve as standards for Web-based sexuality education curricula.

Separate sets of instructions were written for each tool to describe to coders the purpose of the project, the goals of their particular tasks, how to interpret and apply the tools, and the meanings of each response value. Content addressing various health indicators (e.g., condom use; STD/HIV testing; delay of sex; and safer sex activities), and usability features were assessed. The results were used to assess whether and how much the educational teen Web sites cover the topics recommended by sexual health experts (SIECUS, 1996). For example, a section titled “Sex on the Brain” on the ASHA teen Web site (www.iwannaknow.org) (about peer pressure and feelings about sex)

fulfilled many of the coding categories on personal skills, which include values, decision-making, communication, negotiation; and about society and culture, which includes gender roles, sexuality and religion. In reviewing the Web sites' design and usability, coders assessed design, accuracy of STD information, organizational clarity, particularly in terms of helping users quickly find important information.

The coding instruments were pilot tested by two independent coders who analyzed the ASHA Web site in Summer 2000 (American Social Health Association, 2000). Pilot data showed the site scored poorly in navigability. For example, in order to find HIV information on the ASHA site, one coder said he had to go through two online sections, STDs 101 and STDs 201, before finding HIV/AIDS. Another coder recommended that a tool bar with buttons specific to each STD be added to the site. Coders also found that detailed information was often "hidden" in the glossary (a section of the site that defines specific vocabulary)—only findable through a key word search on the site's internal search engine.

Pilot data from the ASHA study showed that the tools could be narrowed in terms of their sexual health parameters, but expanded to include more Web technical specifics (Keller et al., 2001). The initial coding tool included categories pertaining to love, marriage, reproductive anatomy, and family planning. Since the focus of this project was on STDs, all but STD-related content was excluded. Based on the pilot study results pointing to the need for negotiation skills in sex education Web sites, we included the personal skills category of the SIECUS guidelines, addressing sexual decision-making, communication, and negotiation.

Input from Web evaluation literature was used to improve the measurement of usability (Alexander & Tate, 1999; Kapoun, 2000; Kim, in press; Spool, Schroeder, Scanlon, & Snyder, 1998). For example, our measure for assessing a Web site's "authority" was taken from librarian information specialists at the American Library Association (Alexander & Tate, 1999). Their criteria include:

Is it clear what organization is responsible for the contents of the page?

Is there a link to a page describing the goals of the organization?

Is there a way of verifying the legitimacy of this organization? That is, is there a phone number or postal address to contact for more information? (Simply an email address is not enough).

Is there a statement that the content of the page has the official approval of the organization?

Is it clear whether this is a page from the national or local chapter of the organization?

Is there a statement giving the organization's name as copyright holder?

Answers to these questions were compiled to create a score for "authority and credibility" for each Web site.

Content Analysis

For the content analysis, the Web sample for this study was divided in three and each coder was given a separate list to analyze. Each of three investigators (Heather LaBelle, Nema Karimi, Shefali Gupta) visited the sites (independently) and completed the two-part coding instruments. Each coder was given access to the text—i.e., the Web sites—and asked to navigate them on a personal computer while they worked. The coders were instructed to have the relevant portions of the content categories and a pen or pencil in front of them, at the same time. The coders filled out their answers on the content analysis

guide, while they navigated the Web. Qualitative comments were noted at the end of each section of the coding instruments, pertaining to both the content findings (i.e., sexual health content and Web usability of the site), and the process (i.e., the coding tools and instructions they were following).

Extensive training of coders was conducted in order to achieve acceptable intercoder reliability. Investigators examined 10% of the sample (three Web sites) to determine intercoder reliability. Intercoder reliability was calculated using Scott's pi, subtracting the expected rate of agreement (35%) from the observed agreement (85%), divided by the number of observations, to produce an acceptable rate of agreement at 77% (Wimmer & Dominick, 1987, p. 185). The expected rate of agreement was calculated at 35%—based on a 20% expected agreement for 5-point scales (half of the questions in the coding sheet) and a 50% rate for binary answers. Thereafter, each researcher worked independently. When particular questions arose, all four of us met to discuss the classification system.

Results

The combined searches for each set of key terms entered into each search engine produced 87,130 sites. Skimming off the top 100 sites from each of these searches produced a sample of 1,378 sites (6×100 for each key word on two search engines, and a smaller number of results, 178, for Netscape). Netscape brought up significantly fewer results because of its unique searching style. The Netscape search strategy combines results from the Netcenter, Open Directory (its primary search database), and the Web. Secondary results come from another search engine, Google.com. Results are displayed in four sections: Official Web sites (sites that most closely match search term); Netcenter pages (tools, services and premium content that most closely match your search term); Web site categories (groups of reviewed web sites related to search term); and reviewed Web sites (hand-selected web sites that have been reviewed and categorized by a team of editors). We refined our search to the latter category owing to its higher specificity. Selection of sites by editors is probably one reason why Netscape brings up fewer results. Netscape attempts to offer the most relevant links for a given search. Another reason why Netscape results are few is that Netscape search results are regularly scanned for outdated or dead links which are immediately removed. By contrast, Yahoo! search results typically contain up to 15% "dead" links (Netscape, 2000).

When categorized by type, 89 sites met the inclusion criteria but 53 were dropped due to repetition, producing 36 sites for analysis (Figure 1). These 36 sites were coded (Tables 1, 2, & 3).

The remaining sites in our sample of 1,378 were categorized by type:

- 26% ($n = 359$) of the sites were "umbrella sites" defined as lists of links to other sites;
- 25% ($n = 350$) were classified as "other" (e.g., sex education without information on STDs, discussion forums, and pharmaceutical sales pages);
- 20% ($n = 276$) were news articles or press releases;
- 8% ($n = 110$) were advocacy sites;
- 6% ($n = 87$) were inactive sites;
- 5% ($n = 66$) focused exclusively on HIV and AIDS, with no information about other STDs;

TABLE 1 Number and Proportion of Sites that Contained Selected STD/HIV Messages Recommended by SIECUS

STD/HIV messages	Sites (<i>n</i> = 36)	Sites that covered each message (%)
Discuss HIV/STDs concerns with any sexual partner	24	67
Proper use of latex condoms reduces chance of getting STDs/HIV	22	61
Some STDs can be cured and some cannot	22	61
Call this phone number for STD/HIV information and medical services	19	53
Abstinence and not sharing needles are best ways to avoid STDs/HIV	17	47
STDs/HIV infected should encourage partner to seek care	16	44
HIV is not spread by casual, social, or family contact	15	42
Masturbation and hugging pose no risk of infection	14	39
Counseling and support is helpful for the STDs/HIV infected	14	39
Deep open mouthed kissing does not cause HIV	9	25
Hepatitis B is the only STD prevented by vaccine	9	25
STD/HIV/AIDS infected need family and friend support	6	17
Can get more than one STD at once	5	14
Help fight STD/HIV by being a responsible role model	4	11
Sexual partners can reinfect each other with STD	3	8

- 3% (*n* = 38) provided sexuality education but did not specifically target teenagers; and
- < 1% (*n* = 4) were pornographic sites.

Of the 36 sites coded, all addressed STD/HIV prevention, to varying degrees (Table 1). The most frequently covered message (addressed by 24 of 36 sites coded) was, "One should discuss concerns about STDs/HIV with any sexual partner." Other messages that were covered by most of sites included: "Proper use of latex condoms, along with water-based lubricants, can greatly reduce, but not eliminate the chance of getting STDs/HIV; some STDs can be cured and some cannot; call [phone number] for STD/HIV information and medical services." The least frequently covered message (addressed by only one site) was, "Sexual partners can re-infect each other with an STD unless both get proper treatment."

Overall, few negotiation messages were addressed (Table 2). Only two sites dealt with safe sex negotiation (www.itsyoursexlife.com and www.chebucto.ns.ca/health/teenhealth/std), and even then, those sites addressed only three to four of eight SIECUS objectives in that area. One of these sites presented three scenarios of how adolescents

TABLE 2 Number and Proportion of Sites that Contained Negotiation Messages Recommended by SIECUS

Negotiation messages	Sites (<i>n</i> = 36)	Frequency (%)
Good negotiation can enhance relationships	2	6
Teenagers who date need to learn to learn to negotiate decisions about sexual behaviors and limits	2	6
Many relationship and sexual concerns can be resolved through negotiation	1	3
To negotiate, one must decide what trade-offs can be accepted and what cannot be compromised	1	3
Negotiation works best when a problem or conflict is addressed in its early stages	1	3
Negotiation is a way to get one's needs met without using guilt, anger to intimidate	1	3
Negotiation requires give and take on the part of both persons	0	0
Effective negotiation requires certain skills	0	0
There are many different negotiation techniques	0	0

may deal with discomfort in discussing safe sex with a partner, including tips on how to have such conversations and how to cope with conflicting emotions around sex. The total sample of sites fared better in general communication skills (tips on how to verbally or nonverbally communicate one's intentions and feelings). Nine sites addressed at least one communication message and 12 sites addressed at least one sexual decision-making message. However, on average, the sites covered only 9% of the communications

TABLE 3 Usability Results: Number and Proportion of Web Sites that Met Each Criterion

Usability criteria	Sites (<i>n</i> = 36)	Frequency (%)
Consistent template design	28	78
Internal hyperlinks work	24	67
Asks or requires personal user information	15	42
External hyperlinks work	16	44
Includes search mechanism	13	36
Option for fewer graphics or text-only version	12	33
Additional software needed	12	33
Content pages author name and/or credentials stated	9	25
Moving images on site (text or graphics)	9	25
Includes site map	7	19
Authored by qualified medical/health professional	7	19

TABLE 4 Scores of Top Performing Web Sites

Web site	STD/ HIV (%)	Communication (%)	Usability (%)	Av. Score (%)
1. www.nmfr.org/adolsex/fact/adolsex_std.html	82	33	45	53
2. www.unspeakable.com/truth.html	63	24	55	47
3. www.siecus.org/teen/	23	33	82	46
4. www.chebucto.ns.ca/Health/TeenHealth/	77	0	50	43
5. www.coolnurse.com	50	0	73	42
6. www.cdc.gov/nchstp/dstd/dstdp.html	59	0	64	41
7. www.cfoc.org/3_teen/3_stdsteens.cfm	27	33	55	38
8. www.itsyoursexlife.com	41	38	45	41.3
9. www.umkc.edu/sites/hsw/teens/index2.html	41	24	27	31
10. www.aidspartnership.org/teens.shtml	59	0	27	29
Average of top 10 sites	55	20	54	
Average for all 36 sites	33	9	44	

Note. For each topic, the fraction of criteria met were calculated. Then the fractions of each score were converted to decimals and multiplied by 100.

messages recommended by SIECUS, and the top communication site (www.itsyoursexlife.com) covered 38% or eight of 21 messages (Table 4).

All of the sites demonstrated deficiencies in usability (Table 3). Although most sites had working internal hyperlinks (28) and consistent template design (24), only seven sites had content authored by a qualified health or medical professional, based on the stated title of the Web site's author or citation. (Although authority and credentials can clearly be falsified on the Net, we felt there was a greater chance that Web sites with professional authorship would represent it; hence, we accepted at face value claims made on the Web site about professional credentials or sources cited, but gave more value to these claims when they were backed up with clear contact information).

Results on navigability were mixed. Few sites provided site maps or search mechanisms. The average Flesch-Kincaid Grade Reading Level was high, at 9.3, potentially too high for a majority of the adolescent target audience. (The reading level was determined by cutting and pasting a text paragraph from the site's first page and using Microsoft Word 2000 to assess it).

The sites were rank ordered according to performance (Table 4). The sites were given one point for each message mentioned out of 22 possible points for STD/HIV, 21 possible points for communication, and 11 possible points for usability. These points were calculated as a percent of 100 for each topic area (e.g., STD/HIV, communication and usability, etc.), and were averaged to give a score for overall performance for each site. Results for the top five are in rank order, as follows:

- 53 points, www.nnfr.org (Children, Youth and Families Education and Research Network, CYFERNet, a national network of Land Grant university faculty and county extension educators funded by the U.S. Department of Agriculture);
- 47 points, www.unspeakable.com (The Naked Truth, a public health outreach project by Pfizer Inc.);
- 46 points, www.siecus.org, (Sexuality Information and Education Council of the United States, a national, nonprofit organization that develops, collects, and disseminates information, promotes comprehensive education about sexuality);
- 43 points, www.chebucto.ns.ca (Chebucto Community Net in Halifax, Nova Scotia); and
- 37 points, www.itsyoursexlife.org (Kaiser Family Foundation), scored the highest on communication skills messages, but covered less than half of the recommended STD/HIV content.

Discussion

This study shows that a carefully performed search can obtain valuable sex educational sites designed for teenagers. Specifically, combining sexual health terms with adolescent-specific terms is more likely to bring up adolescent-oriented Web sites. However, this study also demonstrated the difficulty of finding Web sites with teen-oriented sex education. Of the sites surveyed, only 36 were educational sites geared to teenagers. Most (46%) of the Web sites identified by the key words we used were umbrella sites (lists of links) or sites containing only news articles. Whereas Smith and others (2000) found a majority of search results on sex education key words to be pornographic, less than 1% of our search results fell into this category. It seems that careful key word selection, as recommended by Smith and colleagues, may remove the bulk of unwanted sites in a given search, including pornography. This finding highlights the need to educate young people on efficient search strategies and key word selection.

Difficulty finding reproductive health material on the Internet points to a need for better cataloguing of educational information online, perhaps sorted by age-appropriateness and content. While many sites full of links are out there, few of the existing umbrella Web sites offer evaluative information about the quality and content of their links. No umbrella sites that we found are dedicated to sorting teen educational STD/HIV information online. An online clearinghouse of reproductive health information for teens might be useful (Smith et al., 2000).

Of the sites geared towards adolescents, many used language (an average grade reading level of 9.3) that may have exceeded the abilities of most adolescents, especially those at highest risk for STDs. Since the recommended reading level for most daily newspapers is 6th or 7th grade, a 9th grade reading level may only capture the most educated adolescents. The sites that used adolescents' input in generating content were the most teen-friendly. Health educators need to do a better job of presenting online information in formats and styles appealing to young people. More formative research, pretesting and youth involvement in Web site design may help achieve this goal.

While the study revealed some deficiencies in sex education content, it should be noted that our rating system was lenient. To receive credit for a message, a Web site needed only to display the message called for by the Sexuality Information and Education Council of the United States (SIECUS); no assessment was made of content accuracy. Thus, with only one-third of the sites mentioning a given STD/HIV message, on average, the depth of content

was poor. Among the sites containing any STD/HIV messages, information tended to be strongest about STD transmission, symptoms, prevention, and treatment. Substantially less information was available about specific STDs, such as Hepatitis B, confidential testing, support groups, and the lifestyles and rights of infected individuals. Notably, the ASHA Web site (www.iwannaknow.org) proved strong in these latter areas.

All of the sites showed deficiencies in usability. Internal navigation (i.e., site maps, search engines, and organizational structure) was weak for most of the sites, as was source credibility (authorship by qualified medical professionals). The use of internal search engines, more frequent updates, better organizational design, and emphasis on source credentials would improve the usability of online sex education.

These findings should be used to inform educators and health care providers about what information is currently available for adolescents about HIV/STD education on the Internet, and which HIV/STD topic areas are relatively absent. Perhaps more importantly, Internet health educators might learn from this study about the need to concentrate on single categories of sexual health content, rather than trying to broadly encompass entire sexuality education curricula within individual Web sites. None of the sites examined here achieved perfect scores, covering all of the recommended SIECUS messages, even within specific content categories. We conclude that no single site should attempt to cover so many messages. Indeed, investigators in this project found that some sites covered too much information, becoming confusing and hard to use in process. The findings point to areas for improvement in communication strategies by Web health educators.

It is hoped that this study will contribute to new approaches for harnessing Internet technology to disseminate HIV/STD prevention information. Web sites culled from this study can provide the data needed to create a clearinghouse for HIV/STD prevention information that could enable users to identify the messages they most need, when they most need it. (For an example, see http://www.library.tufts.edu/hsl/new_tech/STD_3.htm). This site, once developed, can be posted on the Emerson College Health Communication Program Web site, and disseminated to health education, sexual health advocacy, and research organizations nationwide. The content analysis tools can also be made available to the community of Internet and health communication researchers doing similar work.

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