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Use of the Internet in STD/HIV Prevention

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The Internet has been identified as a risk environment for STDs, including HIV, for several years. Like the HIV epidemic itself, this online risk environment rapidly increased in importance, and revealed critical areas of the public health infrastructure that require new expertise and support. In the first section of this chapter, we will discuss the risk environment of the Internet, with most of the focus on men who have sex with men (MSM). The second half of the chapter will focus on the potential of the Internet for facilitating STD/HIV prevention, health education, outbreak awareness, and other public health interventions. In times of rapid change, public health officials often learn by trial and error in the interest of expediency, rather than taking the time to establish careful, scientific evaluations of new interventions. Such is the case with the Internet; thus, while we describe many Internet-based interventions here, we have very little data to support the feasibility, acceptability, efficacy, cost-effectiveness, and generalizability of these efforts.

The Risk Environment: History and Motivations

We will soon show that the Internet is a new risk environment for STDS, including HIV. First, it is important to understand how the Internet itself arose, and why people use it for facilitating sexual risk behavior. Historically, any new communications medium is soon used for sexual purposes, such as pornography, dating, prostitution, or facilitating sexual encounters between anonymous or casual partners (1). Gackenbach and Ellerman (2) point out that, as early as 1986, groups of electronic communicators were gathering online for sexual discussions under the newly created Usenet venues of alt.sex, alt.drugs, and other, similar channels. The World Wide Web as we know it was born in March 1989, and freely available software for viewing web pages quickly ignited the Internet craze. As computers and software increased in speed and decreased in cost over the subsequent decade, electronic communication became faster, included photos, and even incorporated video and audio streaming. All of these capabilities combined to provide users with a social network that could be visited without leaving the comfort of one's own home.

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Soon, electronic communications technology improved to the point that Internet sites could be accessed from cell phones; additionally, Bluetooth devices can be used to communicate with like-minded persons within very close proximity, such as on a commuter train.

Cooper and his colleagues (3) suggested years ago that the accessibility, affordability, and perceived anonymity of the Internet are the “triple-A engine” that drives sexual disinhibition online. In the years since he suggested this terminology, the accessibility and affordability have increased exponentially. A number of others have emphasized other characteristics of the Internet, such as the ability to rapidly find a group of people with similar (sexual) interests, and to engage those people in “conversation”—and sexual negotiation—with a potentially low level of social anxiety.

Risks Presented by the Internet

The vast majority of research regarding sexual behavior and the Internet has focused on MSM. In early research (4), investigators showed that among HIV-testing patients in Denver, Colorado, Internet sex-seekers were more likely to be male and to have partners of either the same or both sexes. For purposes of this exposition, we will call this group RSM±W (respondents who have sex with men or with men *and* women). A much higher percentage of RSM±W were Internet sex-seekers when compared with exclusively heterosexual respondents. Internet sex-seekers were more likely to have had a past STD, and were more likely to have had sex with someone they knew to be HIV-positive. (Note that these were patients in an HIV-testing clinic, nearly 98% of whom were HIV-negative; thus, exposure to HIV-positive partners does not represent serosorting in this population.) Internet sex-seekers had more lifetime and past-year partners than respondents who found their sex partners offline. While this study presented data showing a relationship between online sex-seeking and STD/HIV risk behaviors, it has been criticized for involving a specialized, localized sample. In addition, due to the relatively homogenous demographics of the sample, the study did not examine differences by race or ethnicity.

A study of Atlanta Gay Pride attendees (5) found that 34% of respondents had had sex with someone whom they had initially met online. As is often the case with convenience samples, the majority of participants in online sexual partnerships were white (84%) and younger than respondents who met their sex partners elsewhere. Importantly, this study examined the relationship between meeting sex partners online and having unprotected anal intercourse with two or more partners in the past six months. The relationship was adjusted for age, education, ethnic status, AIDS knowledge, condom attitudes, and use of cocaine, marijuana, methamphetamines, and nitrites. Meeting sex partners over the Internet was shown to be related to the risky behavior even after adjusting for all these factors. The analysis was replicated for four subsets of men: HIV seropositive men, HIV seronegative men, men who reported ever accessing a gay-oriented web site, and men who reported sexual activity in the past six months. Meeting sex partners over the Internet continued to be independently related to the outcome variable except in the HIV seropositive men.

We have presented only two studies of STD/HIV risk behavior related to the Internet. There are many more such studies, some with data collected online, and others with data collected in person (5–12). A few studies attempt to compare data from in-person surveys to data from online surveys. For example, Rhodes et al. (10) performed a survey of MSM in two venues: the Internet and bars. In this case, the Internet sample was older, more educated, and more likely to report being bisexual (versus exclusively gay). Controlling for age and education, the Internet sample was far more likely to report a history of STD and to be HIV-infected. Interestingly, bar respondents were more likely to report engaging in anal sex in the past year, though this difference is between two very high proportions (88% vs. 97%).

Does the Internet somehow enhance a given person's willingness to be risky, or does the Internet merely attract persons who already engage in risk behaviors? Data to support either assertion are difficult to obtain. Most studies of risky behavior of Internet sex-seekers ask about Internet sex and about overall risk in the past several months. For example, Hirshfield et al. (13) found that men who met their partners both online and offline were more likely than "offline only" men to have engaged in unprotected anal intercourse in the study time period. The data do not show, however, that men engage in riskier behavior with their online vs. offline partners. Very few studies have asked questions about sexual behaviors with both Internet partners and non-Internet partners. In part, this is because a survey asking about both sets of partners is very cumbersome and repetitive, a poor measurement strategy when assessing samples of people who may have limited interest in responding to long, drawn-out questionnaires.

Despite these difficulties, Bolding et al. (14) studied this very question with MSM in a London HIV treatment clinic, HIV testing clinic, gyms, and on UK Internet sites devoted to gay men. They found that, in their sample, men met "casual UAI partners" (casual partners with whom they engaged in unprotected anal intercourse) of the same HIV status through the Internet. They were no more likely to meet serodiscordant casual UAI partners, or casual UAI partners of unknown status online than offline. The notion that the Internet contributes to HIV serosorting is intriguing. While HIV serosorting may present reduced risk for HIV transmission, its effects on STD transmission potentially could be harmful.

Is the Internet adding to the overall risk of the MSM population, or does it simply replace bars, bathhouses, and clubs for some MSM? Again, this is difficult to answer, but we have some data to suggest an additive effect of the Internet on population sexual behavior. In interviews with patients with early syphilis in San Francisco over the years 2001–2003 (15), public health officials found that the proportion reporting meeting partners at bars, bathhouses, etc., remained fairly constant. The Internet, however, increased in importance as a partner-seeking venue over that time period. This implies that, while the Internet is growing, other risk venues do not appear to have suffered a drop-off in their attendance. It is important to note that these data are from San Francisco, which is not representative of the rest of the United States. However, the Internet may be a venue of similar or greater importance in very rural areas, such as Wyoming (11), where bricks-and-mortar gay social venues are few or nonexistent. Other data (16) show that a significant percentage of Internet sex-seekers have traveled 100 miles or more to meet an online sex partner. The

potential for rapid disease transmission represented by this type of Internet-facilitated partnership would have been unthinkable in the pre-Internet age.

Much remains to be done in assessing the true nature of the Internet as a risk venue. Some unanswered questions present real challenges to researchers who are accustomed to traditional epidemiology and assessment. For instance, how can we determine whether the online population is growing when it is difficult to assess how big it is at any time? How can we know how many people are using the Internet sex sites at any given time, when one person can be logged onto several such sites simultaneously? How can we be sure that people are providing us with valid data during online interviews? An interim answer to many of these questions is to use multiple methods and multiple disciplines to address the problem. Marketing specialists are aware of the size and demographics of many Internet groups. Internet service providers (ISP) and web-site owners are aware of how many unique subscribers log on to their services. Computer scientists have developed methods of searching the Internet for discussions of potential risk behaviors and outbreaks. Epidemiologists and behavioral scientists can collaborate to collect data from clinic patients, from outreach samples, and from Internet users. When these data converge (or diverge), we advance our knowledge of the credibility of the conclusions drawn. This multidisciplinary, multimethod approach to the Internet is essential not only in the assessment of risk, but in the efforts to perform online disease control and health promotion.

Why Use the Internet for Disease Control and Health Promotion?

The Internet has ample potential to facilitate interventions that can promote STD/HIV control and prevention. The medium can be used to promote disease prevention as a stand-alone intervention (i.e., all intervention components would be delivered online to a “virtual” audience, and no contact with public health clinical staff would occur). The medium can also be used to complement existing interventions by way of a “hybrid” intervention that combines the convenience of the Internet with existing clinic services. The advantages of using the Internet either as a stand-alone or hybrid intervention for STD prevention are numerous. The medium offers unprecedented reach to populations with potential risk for STD. The unique opportunity for interactivity online means the Internet can deliver sophisticated messages tailored to specific individual risk behaviors in a way no broadcast message can, and the Internet can serve as an avenue for social support to online communities and individuals at possible risk for STD.

Reach of the Internet

According to the PEW Internet and American Life Project, 66% of male and 61% of female adult Americans (defined as aged 18 and older) are now Internet users, and 78% of 18–29 year olds use the Internet. Although digital divide issues with regard to user race/ethnicity, education, and income persist, these divides have been continuously shrinking. Current data show that 43% of Black Americans use the Internet, 59% of Latinos/Hispanics, and 50% of rural residents, with anticipation that more and more of the American public

will be wired in the near future (17). We can reach people online in much higher numbers than through any face-to-face campaign. In addition, the advance of such technologies as geo-targeting can allow us to target our efforts online to particular geographic areas where we know incidence and prevalence of disease is higher, or where there is a higher concentration of people with a particular STD risk profile. Such geo-targeting allows the use of banner ads or other information sharing online to be targeted to a given geographic area, allowing more judicious use of online advertising resources.

Why is reach important? Given the literature on sexual networks (18), it is clear that we are unlikely to identify all the “core” transmitters for various STD by relying on them to show up in a publicly funded STD clinic. Also, given the rise in sex partner seeking online, particularly among men who have sex with men (MSM) (16), it becomes imperative to consider multiple ways to share messages about STD risk and prevention to large numbers of people who would otherwise might not see them. For example, studies of MSM who use the Internet have shown them to be affluent, well educated, and largely covered by health insurance (11,16). If infected with STD or exposed to STD infection, they may not be aware of it, and may not be exposed to community or clinic level educational interventions that target lower income areas or publicly funded health clinics. Also, we can simply get messages to a much larger number of people online than in any clinic or community setting.

Examples of Programmatic Efforts: Overview

Current Internet-based programmatic efforts can be divided into several categories. In general, local efforts begin in the context of an Internet-implicated outbreak. Disease intervention specialists (DIS), tasked with finding partners of persons diagnosed with syphilis, are often provided with only an e-mail address or a chat-room nickname or “handle” for one or more partners. DIS must then find, or convince the patient to find, those partners in the Internet milieu. In one city, automated, anonymous “greeting cards” notifying partners of exposure can be sent. In some instances, chat rooms are used to raise outbreak awareness and augment partner notification strategies. To further facilitate testing, one city has implemented online “test slips,” i.e., a signed, online order for a laboratory to perform a syphilis test that can be redeemed in the local jurisdiction. In conjunction with these techniques, some health departments or community-based organizations (CBOs) have negotiated for banner advertisements in various chat rooms and Internet venues. Banner advertisements generally direct the user to a web site that contains standard, didactic health communications, speaking to the need for interactive, targeted interventions. Because these have been the steps followed by several health departments with varying degrees of success, we will address each step in turn: online partner notification, chat-room outreach, online test slips, banner advertisements, and interactive, targeted interventions.

Internet-Based Partner Notification

Many STD programs have been forced to adapt traditional, face-to-face, partner-notification strategies to the Internet. In some cities, health department staff is restricted from performing online partner notification by lack of

computer access in clinics, lack of access to the Internet in most offices, firewalls protecting any Internet-enabled computers from gaining access to “sexual” web sites, and local policy restricting use of the Internet by city employees for activities that can be construed as sexual. Fortunately, local CBO partners may not be so restricted, and may work with the health department to assist with online efforts. Staff at health departments and CBOs use e-mail and chat rooms to perform partner notification when warranted.

The use of e-mail is often preferable to the use of live chat, because the two strategies require vastly different investments of staff time for finding partners. E-mail can be accomplished passively (i.e., an e-mail message can be sent and the DIS can move on to other tasks while awaiting a response); however, locating someone in a chat room requires “lurking” for long periods in the chat rooms, hoping that the “target” person will enter the room. The chat room window may be placed in the “background” of the computer, but still, the DIS need to be at the computer until the task is complete. The task is complicated if the only locating information is a chat-room handle. In such cases, it may be difficult to identify people at all, as many online sex seekers use multiple handles. Once online contact is made with a partner, staff typically do not reveal to contacts that they have been exposed to syphilis, nor that they have been exposed to a disease at all. Rather, online contacts are told that staff have “important health information for you” and are encouraged to call or visit a local facility. Syphilis is mentioned only on the phone or face-to-face, after the identity of the contact has been verified.

Though some evaluation data have been gathered from programs conducting online partner notification, the data collection has been sporadic and no formal evaluation system exists. Of an initial 10 “online contacts” named during syphilis case interviews in Chicago, 8 were found by CBO partners in chat rooms, and 7 of those presented to the DIS for diagnosis and treatment. Two tested positive for syphilis. Most DIS will recognize these as particularly good contact rates for syphilis partners; however, without systematic evaluation, it is difficult to tell if these results are typical.

In order for evaluations to be successful, it is helpful for program staff to routinely request e-contact information during partner elicitation interviews. In one syphilis case-management interview, a patient provided over 200 names of online contacts. Because of the hours that may be required to reach patients’ partners, high-volume cases such as this one may require alternative or additional efforts, such as general awareness campaigns to promote STD testing within a geographic region. Again, no formal evaluation of the partner-interview or partner-notification systems exists, but anecdotes indicate that the success of online partner notification is greatly enhanced when the original patient sends personal e-mail to the contacts.

Some local governments, department heads, health commissioners, and patients may have concerns about, or negative reactions to, online partner-notification efforts. Some concern has been expressed by local governments that violations of privacy regulations potentially could result from these efforts. Local areas have reported a wide range of number and proportion of partners found via online partner-notification efforts; of course, mixed results are often encountered in face-to-face partner notification as well. In the course of their pioneering, Internet-based efforts, the San Francisco Department of Health has learned several important lessons regarding online partner notification (19).

These include asking the original patient to notify partners before contact by public health personnel; sending e-mail messages from within, rather than from outside, the target's Internet service provider (such as AOL or Mindspring); using credible e-mail accounts with Department of Health logos; noting in the subject line that the e-mail is about an urgent health matter; protecting privacy by sending only individual (not group) messages; and gathering alternate, non-Internet contact information from respondents.

inSPOT

One method of allowing patients with sexually transmitted infections to notify their partners in a web-based, anonymous manner has been developed in San Francisco by Internet Sexuality Information Services (ISIS), Inc. The system is accessible at inSPOT.org, and allows users to send electronic greeting cards to sex partners. The cards can be sent anonymously (i.e., with no indication of the sender's identity or e-mail address), and can include a personally created message in addition to the standard text of the card. The cards notify partners that they may be infected with an STD, and urge partners to seek testing and treatment. As of November 2005 (Deb Levine, personal communication, November 2005), inSPOT.org was visited by an average of 750 people per day. Approximately 200 people send cards each month, and people send cards to an average of 2.5 partners, for an average of 500 cards per month. The anonymity of the system is clearly appealing, as 80% of cards are sent without any identification of the sender. However, 80% of the cards do include a personal message of some kind, which may provide some identifying information. About half (51%) of recipients clicked on the included web-link to the health department to find out more information about testing and treatment. Other cities, such as Los Angeles, recently have launched inSPOT in their cities.

Online Prescriptions

In 2005, San Francisco launched a program associated with inSPOT that allows e-card recipients to print their own prescriptions for antibiotics for the treatment of gonorrhea and chlamydia. The program is in its early stages of implementation at this writing, and has not been evaluated. To date, researchers in San Francisco have relied on pharmacists to send faxes regarding inSPOT prescriptions to the prescribing doctor. However, this system has not worked well, and new evaluation methods are being developed (Jeffrey Klausner, personal communication, January 2006).

Chat-Room Outreach

Chat-room outreach currently occurs in many areas, often in the context of community-based organization (CBO) efforts. Because chat rooms may not be active or "crowded" during the day, chat-room outreach often must occur at night. This can be difficult logistically for health departments. Outreach in chat rooms may have many components, but generally involves individual staff members logging into chat rooms, often with a handle (or nickname) such as "letstalkaboutsex" or "askmeaboutSTD." Staff members create "profiles" (self-descriptions registered with the Internet service provider) that explain the purpose of their visit to the chat rooms, the types of questions they can answer, and referral information for testing and treatment. Sometimes, to establish credibility, the staff member may reveal his or her sexual orientation, race/

ethnicity, or other pertinent characteristics. For the majority of efforts, the outreach staff are fairly passive in the chat rooms, with the exception of sending welcome messages to new arrivals and occasionally posting a brief line such as, "IM [instant message] me for sexual health info." This passivity prevents the chatters from becoming annoyed with the outreach staff, as has occurred in more active efforts. In addition, this passivity is more in line with the requirements of the ISPs who own the chat rooms.

When conducting online outreach, it is important that the staff member fully understand the nature of the online venue. For example, an outreach working in Atlanta may have questions and concerns from chatters in nearby states such as Alabama, Tennessee, and North and South Carolina. Thus, the outreach staff member must be equipped to answer questions and provide referrals for individuals from these nearby areas. Answering questions can be a difficult adventure, because chatters can and do ask disturbing or explicit questions. Questions can also be very specific, such as, "Can you get an STD from urine?" Thus, the outreach worker has to be well-versed in STD/HIV transmission, in chat-room parlance and etiquette, and in referrals to STD/HIV services. Referrals may not necessarily be limited to STD/HIV, but may also include drug treatment or detoxification referral and mental health emergency hotlines.

Howard Brown Health Center in Chicago, Illinois, conducts outreach in venues such as manhunt.net, gay.com, and America OnLine (AOL) chat rooms. Outreach staff announce their presence and state that they are there to answer questions. The outreach staff target syphilis in particular, but are trained to answer questions regarding any STD. Though no evaluation has been conducted, an evaluation plan includes counting the number of contacts made during various times of day, descriptions of encounters, and number of referrals made. Because Chicago chat-rooms often include participants from other parts of Illinois, as well as Wisconsin and Indiana, it may not be possible to evaluate whether referrals result in clinic attendance at nearby clinics.

In Houston, Montrose Clinic staff conduct online outreach as part of Project CORE (Cyber OutReach Education). A handbook has been developed for staff performing online interventions (20). The handbook contains material contributed by other sites, and is a valuable resource for the project staff. The chat-room outreach in Houston is slightly more active than in Chicago, in the sense that staff will occasionally post a topic, question, or statistic in an effort to generate contact with chatters. Staff use instant messaging, private chat, and larger "group" chat to accomplish their outreach. Referrals are made to other online resources, such as gayhealth.com, and to the Project CORE web site with its full list of referrals. The web site address is listed in the staff member's signature and profile.

One method of evaluating the Project CORE outreach includes counting the number of hits on Project CORE's web site. A more intricate evaluation, involving qualitative analysis of all online conversations (saved electronically and without identifiers), is planned. As a major focus of the outreach is referral for STD testing, it is hoped that the referral system can be evaluated.

The most formal evaluation of chat-room outreach to date comes from San Francisco. In San Francisco during two months of 2002, health professionals and staff from Internet Sexuality Information Services, Inc. (ISIS) conducted chat-room outreach in three venues. These venues were AOL chat-rooms specific

to San Francisco, Craigslist (San Francisco), and M4M4Sex. Topics in the outreach program included symptoms, transmission, and treatment of syphilis (as well as other STDs, including HIV), and referral to testing. Health professionals responded to questions and provided syphilis fact sheets and online coupons for syphilis testing at the public STD clinic.

During the two-month outreach period, San Francisco staff spent 57 hours conducting outreach in the three online venues. They logged 212 interactions (67 on M4M4Sex, 21 on Craigslist, 124 on AOL). The rate of coupon redemption for clinic-based testing was 16% (35 coupons redeemed).

Additional San Francisco efforts include an “ask the expert” function on the San Francisco City Clinic’s web page. The physician’s photograph is posted online in order to increase the user’s awareness that the posted queries are delivered to a real person. Users can type in any question, which will be forwarded to the physician and answered promptly. Similar web sites abound on the Internet, many of them including a “Frequently Asked Questions” section.

Auditorium-Style Chat

In another form of online outreach, San Francisco Department of Public Health (SFDPH) collaborated with ISIS to establish seven auditorium-style chats with online visitors to gay.com. In auditorium-style chats, many audience members can pose questions to the “expert” but not to each other. These sessions were real-time, one-hour interactions facilitated by a physician from SFDPH. Online chatters entered questions that were then selected by a moderator for expert response. The moderator posted the question, and the expert then posted an answer as quickly as possible. The software for conducting auditorium chat recorded the number of participants at any given time, and transcripts were reviewed and edited for clarity and removal of personal identifiers. Edited transcripts were posted on gay.com. During the seven, one-hour auditorium chats, approximately 120 visitors per session attended, with 10 to 50 people in the room at any given time. Questions were answered at the rate of 15 per hour. It is not clear whether participants were from the San Francisco area, or from elsewhere. This can be considered a drawback of the Internet for some program operations: it is impossible to tell if Internet users are physically located in the relevant city, or even in the country.

In Florida, United Foundation for AIDS (UFA) actively conducts Internet-based outreach to MSM. One focus of this CBO outreach is to communicate with users of crystal methamphetamine (“crystal meth”). UFA, in collaboration with an advisory board of former meth users, developed the Crystal Alert program, focused on Internet users who use crystal meth, to get users to meet face-to-face to address risk issues. The daily meetings have grown from approximately 7–10 members to 25–30 attendees. Other UFA outreach focuses on bringing MSM to the health department for STD and HIV testing. The Miami outreach is possibly the most intensely personal type of outreach, occasionally going so far as to send staff members to drive people to the clinic for testing. When appropriate, outreach staff follow up with chatters who have been tested, and provide a type of support throughout the process. During the chats, staff have noted a desire on the part of chatters to understand what sexual behaviors are less risky than others (e.g., “Is a top less risky than a bottom? Is oral sex likely to get me infected?”). These and other questions about the risks

associated with particular sexual behaviors speak to the need for well-trained, expert outreach workers. They also speak to a willingness on the part of users to consider safer sexual activity.

Online Testing

The San Francisco Department of Public Health (SFDPH) launched its online syphilis testing program in June 2003. Persons can log on to stdtest.org to obtain a physician-ordered (and signed) laboratory requisition (“lab slip”) and a unique identification number. The lab slip, once printed by the user, can be taken to a number of local laboratories for specimen collection and analysis. When testing is complete, the results are provided to SFDPH, who takes responsibility for posting the results with the identification number on the web site. The site also provides syphilis-related educational information, including signs, symptoms, and recommendations for future screening. Through mid-January of 2004, thousands of visits were logged on stdtest.org, but only 140 completed syphilis testing. Of the participants who completed testing, six (4.3%) had new syphilis infections (four infectious, two latent). Five of these infected patients were gay men. Of the gay men, one was HIV-positive, two were HIV-negative, and two were of unknown HIV serostatus. All infected patients received medical evaluation and treatment (21).

Banner Advertisements

Considering that the Internet is a multimedia environment with vast reach to the U.S. and international population, it is natural to consider broad-based, public-health communications online. Banner advertisements represent one such broad-based communication option. Banner advertisements are analogous to billboards, in that they are generally rectangular advertisements, often approximately one to two inches high and three to five inches wide or larger, placed in high-traffic areas of the Internet. Clicking on a banner advertisement results in a transfer to the web page of the advertiser’s specification. One advantage of banner ads over traditional billboards is the ability to more effectively target advertising. For example, running a banner ad aimed at southern MSM in gay-oriented web venues is potentially more efficient than placing a billboard along southern highways.

The sale of banner advertisements is a major source of revenue for online entities, similar to the sale of radio and television advertising time. Banner advertisements are sold by quantities of “impressions,” or the number of times an advertisement appears on the web page, and costs can range from \$1000 per month to \$10,000 per month. Usually, an advertiser purchases thousands or millions of impressions. Popular locations for banner advertising include gay.com, AOL, manhunt.net, craigslist.com, and similar venues. Some site owners may allow for the placement of banner advertisements for free in “remnant” space, i.e., space that hasn’t been sold and would otherwise be unused. This remnant space is likely to be at lower traffic times and days (e.g., after midnight on weekdays).

The evaluation of banner ads is slightly less difficult than the evaluation of other interventions. It is fairly easy to count the number of people who click on the banner; in fact, some advertisers pay for the number of click-throughs, rather than the number of impressions. Once a user has clicked on the banner, however, it can be difficult to determine what effect the information on the linked web page has on behavior. In some instances, the owner of the linked

web page may be able to track the “click trails” of viewers, or may incorporate redeemable coupons on the web page.

In San Francisco, SFDPH conducted an online banner-advertising campaign on gay.com and on AOL. Nine separate advertisements were run, for a total of more than 33 million impressions. The advertisements yielded 32,270 clicks to SFDPH web sites with syphilis information, for a click-through rate of 0.1%. The cost per click-through ranged from \$0.05 to \$10, depending on the host site and ad placement. Data on the amount of time spent on SFDPH web sites are not yet available. Additionally, there is no information regarding the acceptability or perceived utility of the information found on the SFDPH site.

Some organizations can be persuaded to provide online advertising for reduced or no cost, as a service to the public-health community. This practice has not been widespread among online venue owners. However, in recent months, officials from manhunt.net, an online sex-seeking venue, have contacted local public health partners in Houston (i.e., Montrose Clinic) to offer some free services such as online accounts for outreach workers, banner advertising, etc. Manhunt.net staff continue to contact local health departments in areas to which they are expanding their market. The company reports mixed responses from health departments, with some not returning phone calls. The owners of manhunt.net are trying to establish a community norm among venue owners; that is, they hope that by turning their subscribers' attention to public health and continuing to amass profit, they will show other owners that working with public health is not a detriment to business. Other web-site owners have been willing to work with researchers or health officials in localized areas, but not necessarily on a national basis.

Tailoring Online

Health promotion online has so far failed to take advantage of one of the primary benefits of the Internet—interactivity. Tailoring is a key component of interactivity, i.e., the capability to tailor messages to an individual based on their responses to a survey or questionnaire online. Tailoring has been utilized for many years to improve printed health education material—one investigation of patient health risk assessments for multiple risk behaviors including smoking, diet, and physical activity showed that persons receiving tailored feedback on risk assessment were 18% more likely to change at least one risk behavior compared to persons who received standardized or no feedback (22).

Tailoring is an ideal interactive component of the Internet. We can make messages relevant to a given demographic or behavioral risk characteristic by asking people to tell us a little bit about themselves before being exposed to an STD prevention message. Preprogrammed algorithms can also be used to provide message content that is relevant to a specific risk behavior. For example, if a participant in an online education intervention completes a survey documenting that they have been in a new sexual relationship (i.e., three months long) and recently decided to stop using condoms with their partner, the message about risk could differ from that delivered to the participant indicating they have had three new partners in the past six months. Programs can also be used to deliver messages using role models that can be selected to match a participant race/ethnicity, gender, or age. Thus, tailoring assists us to deliver messages firmly grounded in social and behavioral science. For example, if a person receives a message that addresses their personal behavior from some-

one who looks like him or her, there is an increased likelihood that the message will have more personal relevance, and will be more likely to promote behavior change (23–28). Unfortunately, few sites related to health are taking regular advantage of the potential of the Internet to tailor information. A recent review of 87 publicly available web sites devoted to improving diabetes self-management, for example, found that less than 10% had tailoring functions offering feedback on any type of behavioral assessment (29).

Social Support Online

Another interactive component of the Internet that is promising but somewhat underutilized and not well evaluated for health promotion is social support. The Internet is filled with sites that include chat rooms, “ask the expert” message boards, and web logs or “blogs,” where people diary about any topic imaginable. Currently, we know there has been a proliferation of chat room–based sex education interventions developed and implemented by outreach workers in AIDS service organizations (ASO). Rhodes (30) described such an online HIV education process through chat rooms, and suggested that both the anonymity offered to chatters and the relationship established by the educator contributed to regular participation by chatters. We also know there have been randomized trials of Internet-related systems that utilize group visits online or chat rooms and have shown the approach has efficacy for increasing knowledge about disease, adherence to medications, and reduction in social isolation (31,32). The Comprehensive Health Enhancement Support System (CHESS) developed for cancer and chronic disease patients is perhaps one of the best-researched such interventions, and shows that online social support—in the context of a comprehensive online system that also includes access to web-based information, a library, and an “ask an expert” e-mail feature—is an effective approach for increasing participation in care among African American and White women with breast cancer (33).

We need to consider what new innovation the Internet offers to STD prevention initiatives; reach and interactivity suggest there are many promising interventions that can be developed and evaluated to capitalize on tailoring and social support capabilities of the medium.

While we are eager to embrace the Internet for STD/HIV prevention, we still have relatively little data on efficacy of the medium. Researchers have advocated taking a multi-level, or “social ecological” approach to health behavior change (34,35), arguing that the emphasis on psychological individual level behavior change interventions has missed important opportunities to consider influencing change by contemporaneously intervening at social, organizational and environmental levels (36–38). If we take this broad approach and consider any intervention at any of these levels could be informative for future Internet-based efforts to prevent STD, several studies of interest emerge.

Evidence from a recent study intervening at the organizational level to change physician behaviors is promising. The study compared the use of a multi-component Internet-based continuing education intervention specific to chlamydia (CT) symptoms, complications, diagnosis and treatment to a more generalized Internet-based continuing education program on women’s health for physicians to increase chlamydia screening. Physicians in the multi-component Internet-based intervention had significantly higher CT screening than those completing the more general women’s health module (39).

Another study of organizational level factors looked at outcomes when Investigators placed computers in the homes of persons infected with HIV and provided them with Internet access and regular electronic communication with clinic staff. This increase in access to care showed both increased use of computers and self-disclosure of risk behaviors for patients with HIV for the intervention group (40).

Looking at a multi-level intervention for STD prevention, a randomized control trial focused on providing both increased access to systems (i.e., organizational level) and social support to persons with HIV showed participants had greater satisfaction with HIV-related care; greater confidence in medical-related decision making; and decreased perception of social isolation (32).

It is interesting to note that the predominant trend emphasizing individual level interventions to promote behavior change for health interventions historically is so far not being replicated for online interventions, because there have been few randomized controlled trials of STD/HIV individual level prevention behaviors online that have incontrovertible findings. We do have some evidence from recently completed studies or studies that are in progress that can offer a glimpse of what might be possible online. A study of a tailored risk reduction message following completion of a sexual risk behavior assessment for MSM had high attrition, making interpretation of study results problematic, but investigators did document a trend in increased HIV testing among MSM assigned to the intervention group in this study (41). A study of rural MSM of an online education program to increase knowledge about HIV risk with a wait list control showed efficacy for increasing knowledge over a one week follow-up period (42). As of early 2007, data from 3 randomized trials involving web sites (funded by National Institute of Mental Health) are being evaluated. These web sites target a) MSM seeking sex partners online with a highly interactive e-learning application designed to increase knowledge, awareness of HIV risk and skills in reducing risk (Simon Rosser, PI-University of Minnesota); b) a web site testing the efficacy of tailored HIV prevention messages for youth (men and women, hetero- and homosexual) aged 18–24 at risk for HIV (Sheana Bull, PI-University of Colorado); and c) a comparison of efficacy of an online adaptation of the Popular Opinion Leader (POL) as an HIV educator versus the use of a traditional health educator in chat rooms online (Eric Benotsch, PI-University of Colorado).

What We Can Learn from Other Online Interventions

The results from these randomized controlled trials will not be available for at least one year. In the meantime, it can be instructional to consider ways the Internet has been used specifically to promote behavior change to address other health concerns. Data from a randomized trial using the Internet to deliver a behavioral weight loss program show that people will enroll, return frequently to the intervention web site, and derive benefits (i.e., significantly greater weight loss) from participation in an interactive Internet program (43). This program focused on the use of e-mail between participants and counselors during the weight loss program. Another weight loss program using a hybrid approach, where Internet-based counseling supplemented face-to-face counseling, showed significant weight loss among adults in the Internet program and adults and adolescents both demonstrated significant decreases in fat

intake when compared with those in a face-to-face counseling program only (44). Studies of diabetes self-management interventions have demonstrated that recipients of tailored self-management messages online will improve self-management (45). McMahon et al. (46) showed that when participants could regularly upload their blood glucose readings to a clinic web site they had significantly lower A1C levels compared with those not accessing the web-based clinic system. Data from a randomized control trial on the effects of a tailored nutrition-education intervention online showed that people who receive these tailored messages make more steps toward improved nutrition than those receiving non-tailored messages (47). A study of youth in New Zealand showed that university students who accessed a student health center and subsequently participated in a behavioral screening with tailored feedback had significantly higher levels of physical activity and fruit and vegetable consumption than students who did not complete web-based activities (48). Randomized controlled trials of Internet-based treatment for chronic headache have shown promising results in reduction in headache symptoms and disability, but these studies, like others, had very high attrition (56–65%) (49,50). Finally, studies published on the efficacy of group level mental health interventions delivered online showed significant reductions in related distress, depression and ratings of annoyance (these investigators, too, showed attrition levels higher than those seen in traditional randomized controlled trials, i.e., 50%), and improved body image (52).

In summary, while we do see substantial proliferation in literature related to the development of Internet-based approaches to health promotion, we still have a very limited number of completed studies using a randomized controlled trial to test efficacy of interventions. From what we have presented here regarding both STD/HIV-related and other health behavior interventions at multiple levels, we have learned the following:

1. Interventions to change physician behaviors can be implemented to promote STD prevention;
2. Interventions that enhance access to systems or organizations may be valuable to consider for STD prevention;
3. People can generate a sense of social support and increased satisfaction with health care through use of Internet-based interventions;
4. Programs that utilize e-mail as the primary mechanism for counseling can be effective in changing behaviors;
5. Programs that use tailoring to individualize and personalize messages can be effective in changing behaviors.

This review suggests many promising opportunities for program planners involved in STD prevention efforts. Clinicians should consider options to link Internet to existing clinic services—web pages online can offer specific detail about services offered, and links to other information about STDs. STD risk assessments online that offer tailored feedback to individual responses—available either through a kiosk in clinic waiting rooms and/or via the World Wide Web—can standardize information that patients receive and save valuable clinician time in covering “standard” STD messages. Follow-up with clinic staff via e-mail or chat room discussions can be used to reinforce messages delivered in the clinic setting.

Clinicians may also want to consider technologies in addition to the Internet that can enhance clinical care and promote STD prevention. The use of text

messaging via cell phones has been pilot tested and shown promising in an effort to reduce smoking among college students (53), and cell phones may offer a promising new platform for interventions, especially since they are even more ubiquitous than the Internet, and issues of digital divide appear to be less prominent for cell phone than Internet users. Likewise, the use of interactive voice recognition (IVR) automated telephone systems has been shown to have efficacy for increasing chronic illness prevention behaviors and access to care in diverse groups (54,55).

Certainly while we have little evidence of intervention efficacy available, it is challenging to identify specific strategies that are likely to have the greatest effect in STD prevention. However, it may be worth considering a more comprehensive approach like the CHES system, which combines multiple offerings simultaneously in a web site, such as information access, “ask an expert,” online access to medical record and social support. The SFDPH has implemented a number of different strategies for STD prevention online—perhaps their endeavors could serve as a blueprint for how to make interventions more comprehensive.

Finally, the work forthcoming that adapts efficacious community-, individual-, and group-level STD prevention interventions for the online environment may be instructive in illustrating the extent to which we may be able to borrow from “what works” in the real world and apply it to strategies online.

It is clear that the Internet is now and will continue to be an integral part of clinics and individual lives. While much has been written about how the Internet can fuel risk for STD, we have substantial optimism that the technology is available to exploit for innovative, far-reaching intervention.

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