

Review

Use of the Internet for the surveillance and prevention of sexually transmitted diseases

Wiley D. Jenkins^{a,*}, Brittany Wold^{b,1}

^a Southern Illinois University School of Medicine, Department of Family and Community Medicine, 913 N. Rutledge St., PO Box 19671, Springfield, IL 62791-9671, USA

^b Southern Illinois University School of Medicine, Center for Clinical Research, 801 N. Rutledge St., PO Box 19664, Springfield, IL 62791-9671, USA

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Abstract

The Internet is a relatively new tool in the surveillance and prevention of sexually transmitted infections, and this review examines its global use in this regard. Much use has been made in the form of information collection and dissemination; targeted population engagement through chat rooms, partner notification and other mechanisms; and the provision of testing services and other products. Internet users may need education concerning reputable websites, and public health practitioners need proficiency in the use of social media and marketing.

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1. Introduction

In 2011 it is somewhat difficult to consider the Internet as a “new” technology. Those under the age of 20 have not known life without the World Wide Web and it has become one of the most ubiquitous of household technologies in the modern world. By 2011, there were 2.1 billion Internet users, with English speakers comprising 565 million (43.4%) and Chinese speakers another 445 million (37.2%) [1]. Regionally, North America has the highest proportionate use with 272 million users (78.3% of the population) followed by Oceania/Australia with 21 million (60.1%) and Europe with 476 million (58.3%). The greatest outright number of users resides in Asia at 922 million (23.8%). The greatest growth is in Africa which increased use by 2,527% since 2000 (and is currently at 119 million users and 11.4% of the population). While actual Internet usage likely varies considerably by geographic

location and culture, the time spent online by United States (US) visitors may be approximate to those for other industrialized countries. In 2010, the unadjusted time average for all those aged 18 and older was 35.8 h per month [2].

The Internet being used as a medium for work, pleasure, and social networking is widely acknowledged, and its use to seek out health information is also rapidly increasing. In the US, 61% of all adults have used the Internet to find health or medical information [3], while the proportion is reported at 44% in Europe and Hong Kong [4,5], and 29% in France (of Internet users) [6]. Separately, it has been shown that while 93% of US teens are Internet users, adolescents are generally wary of sexual health information found on the Internet [7]. Here, only 5 of 58 interviewees described the Internet as one of their most trusted sources of sexual health information. This may not be generalizable to some specific groups, as studies show that 26% of young men who have sex with men (YMSM) and 75% of lesbian, gay, bisexual and transgendered (LGBT) youth reported searching the Internet for sexual health information [8,9].

This work seeks to examine the uses of the Internet in the area of sexually transmitted disease surveillance, prevention

* Corresponding author. Tel.: +1 217 545 8717.

E-mail addresses: wjenkins@siu.edu (W.D. Jenkins), bwold@siu.edu (B. Wold).

¹ Tel.: +1 217 545 4970.

and intervention, and treatment. While not exhaustive of all conceivable applications, we hope to describe past and current practices, their relative effectiveness, challenges, and opportunities for future use. For the purposes of this paper, the terms ‘sexually transmitted disease’ (STD) and ‘sexually transmitted infection’ (STI) are considered synonymous.

2. Methods

We performed a search of the English language peer-reviewed literature using PubMed. Search terms included ‘Internet’ in the *title* and ‘chlamydia’, ‘gonorrhoea’, ‘syphilis’, ‘HPV’, ‘HIV’, ‘sexually transmitted disease’, ‘sexually transmitted infection’, ‘STD’, or ‘STI’ in *any field*. Supplemental articles were found through article bibliography review. In light of the rapidly and continuously changing nature of both the Internet itself and individual user habits, references were limited to those published after January 1, 2000. Furthermore, some data (e.g. concerning global Internet use) were found on public websites.

3. Results

The PubMed search returned a total of 252 peer-reviewed manuscripts. A further 19 on the topic were identified by bibliographic review. A great number of these articles were descriptive of Internet users, sexual activities associated with Internet use, and users’ sexual risk factors and infection status. However, we identified five general and widespread uses of the Internet for STD prevention and intervention. Broadly defined, they are: information collection and surveillance, information provision, client and provider engagement, testing services, and as a medium for other products and services. There is considerable overlap between these activities, with websites providing information also seeking to engage users in surveys, or those enhancing partner notification also providing counseling and condoms. Works described below were selected to be as inclusive as possible of both variations and global uses, but not exhaustive of all published works.

3.1. Use of the Internet for sexual activity

Individuals frequently use the Internet for sexual purposes, and nearly one third of all Internet visits are to sexually oriented web sites [10]. Furthermore, many individuals use the Internet to find sex partners, with different studies finding that 1.3–4.8% of WSM (women who have sex with men), 4.4–10.0% of MSW (men who have sex with women) and 28–6–43.5% of MSM sought sex partners online [11,12]. Such individuals reported more risky behaviors such as unprotected penetrative sex, increased number of partners, decreased frequency of condom use, increased number of oral and anal sex acts, unprotected anal intercourse (UAI), more partners known to be HIV-positive, a recent STI, anonymous sex partners, and drug use [13–18]. However, protective behaviors associated with Internet partners have also been reported, with WSM more likely to have used a condom with

their last Internet partner and to have been tested for a STI [19].

Whether or not an increase in Internet-facilitated risky sexual behavior (RSB) leads to increased rates of infection is still controversial. Studies in Denver, US [20], London, UK [21] and Sweden [17] show no increased risk of infection, while others such as Denver, US [13], showed an increased risk of infection with *Chlamydia trachomatis* (chlamydia; CT), *Neisseria gonorrhoeae* (gonorrhoea; GC) or human immunodeficiency virus (HIV). Syphilis (*Treponema pallidum*) in particular has been associated with having sex with partners met online [22]. It is likely that those who engage in RSB are also more likely to seek sex partners online. It has been proposed that the main risk of STI due to the Internet in MSM is through the increased efficiency of finding other sex partners, thus increasing their number and frequency [23].

3.2. Information collection and surveillance

Behavioral surveillance is done to describe the evolution of population disease progression. A 2008 survey of 31 European Union and European Free Trade Association countries concerning their MSM behavioral surveillance activities found that 14 reported convenience sampling and recruitment through the Internet, 3 exclusively so [24]. Internet sample sizes tended to be larger than community recruited samples, ranging from 900 to 15,000 versus 100 to 2000. While Internet-based surveillance may be easier to perform, there are questions about the generalizability as the MSM population is not well defined throughout Europe, and those recruited through Internet websites may not be representative of all MSM. This was highlighted by a comparison study of Internet-recruited MSM versus a national probability sample in Great Britain [25]. While there were no differences in many social and demographic variables (e.g. ethnicity, employment and alcohol consumption), Internet users were younger, and more likely to report having an STI in the past year and participating in anal intercourse. Thus, Internet samples are likely to overestimate RSB to some degree.

The use of Internet-based surveys to collect information from target group members has been successfully demonstrated with MSM in Norway examining associations between RSB, demographic risk factors, and STIs [26]. Using a banner advertisement, the authors recruited 2430 males during a 19-day period from a single website. Somewhat similar was a study of the efficacy of Internet sampling versus respondent driven sampling among MSM in Estonia [27]. The authors report that Internet recruiting engaged a more diverse population, including more MSM who: were aged 40 and over; were self-described as bisexual; had female sex partners; and were less likely to have been tested for HIV. This method of surveillance has also been shown to be convenient and cost-effective in the UK (MSM) [28], the US (gay and bisexual males) [29,30], and Sweden (males and females) [17]. While Internet sampling may be convenient and reach otherwise inaccessible individuals, potential biases in demographic characteristics and sexual activities must be taken into account.

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