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Following the Trail of an HIV-Prevention Web Site Enhanced for Mobile Cell Phone Text Messaging Delivery

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Since the emergence of HIV, a plethora of Web sites have been developed to disseminate information about the disease. HIV-related Web sites provide facts about prevention, treatment, clinical trials, funding, support, and resources (Chou, Holzemer, Portillo, & Slaughter, 2004; Courtenay-Quirk et al., 2010; Courtenay-Quirk, Wolitski, Hoff, & Parsons, 2003; Kremer & Ironson, 2007; Reeves, 2000, 2001). However, while the number of HIV-related Web sites has increased, rates of infection among African-American adolescents has also increased. In 2005, African Americans were 15% of the U.S. population ages 13–19 but represented 66% of adolescent AIDS cases (Centers for Disease Control and Prevention [CDC], 2007, 2008). These infection rates indicate that HIV-prevention efforts have not been fully effective in reaching at-risk adolescents. One evidence-based intervention, *Becoming a Responsible Teen* (BART), has been effective in reaching African-American adolescents with HIV information (CDC, 2009), but the face-to-face approach of BART limits dissemination to only small groups of teens. Clearly an alternative approach to the delivery of this information is needed. One such alternative is the use of mobile cell phones (MCPs).

MCPs are ubiquitous in the hands of youth today and are an important part of adolescent culture. African Americans, 13–17 years of age, are high MCP users (Lenhart, Ling, Campbell, & Purcell, 2010). The multimedia features of MCP technology (pictures, videos,

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and text messaging), however, have not been fully explored in the delivery of safer sex information. The BART Text Messaging Project examined the feasibility of enhancing the BART curriculum with multimedia MCP text messages (Cornelius, Cato, St. Lawrence, Boyer, & Lightfoot, 2011). To disseminate information about the project to parents and teens, we developed a Web site (BART.uncc.edu). An increase in Web traffic to the site led us to analyze incoming traffic patterns of the HIV-prevention Web site.

Methods

We collected data on Web site traffic from March 2009 to April 2010 using Advanced Web Statistics (AWStats logfile analyzer version 7.0) software to gain information on traffic to the site. We developed seven questions to guide the analysis:

1. How many unique visitors have visited the site?
2. On what days of the week do unique visitors visit the site?
3. At what hours of the day do unique visitors view the site?
4. How long do unique visitors stay on the site (duration)?
5. What are keywords and phrases used to gain access to the site?
6. What are the entry and exit pages for the Web site?
7. Who are the unique visitors to the Web site?

BART Text Messaging Web Site

The Web site was in six sections and was in the public domain. The first section, the homepage, contained an infomercial entitled *The BART Text Messaging HIV Introductory Video*. This video introduced members of the Teen Advisory Committee who spoke about why they were participating in the project. A short synopsis of the project and pictures of the teen advisors were also included. The next section, Grant Information, listed the grant abstract. The third section, Staff Information, gave a short biography of each member of the research team. The fourth section, Teen Advisory Board, listed each member on the board with individual and group photos. Additionally, in this section each teen provided a one-sentence statement of why the project was important. The fifth section provided sample text messages used to enhance the BART curriculum, and the last section provided directions to the project site, sample consent forms, a calendar with dates for activities, and a counter for the number of hits (traffic) to the Web site.

Hits Versus Visits

The counter on the Web site showed 5,882 hits, a 2,000-hit increase over a 3-month period. Since a hit is not a visitor to the Web site but a hit to the Web server only, further analysis was essential to determine unique visits to the site. Data were entered into a Microsoft Office Excel 2007 spreadsheet, and descriptive statistics were used to answer the research questions.

Results

As shown in Table 1, the total number of unique visitors was 2,125 with an average of 152 unique visitors per month. The largest number of unique visitors was in the month of October 2009 ($n = 478$). The Web site was visited every day of the week, yet was most frequently visited on Thursdays. The largest number of Web site pages was visited during the month of October 2009 ($n = 2,057$). The total number of pages viewed from March 2009 to April 2010 was 19,038, with an average of 1,360 pages viewed per month. There were 12

different hours of the day in which Web site pages were visited. The most frequently viewed time was 1800 (6:00 p.m.) Eastern Standard Time (EST). The total length of time that unique visitors stayed on the Web site was 3,644 seconds (an average of 60.73 minutes per month). More time was spent viewing the Web site during the month of March 2009 ($n = 1,094$ seconds). Each unique visitor visited the Web site 1.5 times and viewed an average of 5.3 pages per visit.

At least 203 key words and 227 key phrases were used to search for the Web site. The most frequently visited page was the Web site home page with introductory information about the project. Unique visitors who viewed pages on the Web site were from 61 countries (see Table 2). The largest number of Web site pages was viewed by unique visitors from the United States and South Korea, and the smallest number of Web site pages was viewed by unique visitors from South Africa, Malaysia, Qatar, Egypt, Argentina, and Thailand.

Discussion

This analysis examined traffic to an HIV-prevention Web site developed for parents and teens. The analysis found that there were unique visitors from a total of 61 countries, who visited primarily on Thursdays and during the hour of 1800 EST. With 195 countries in the world, individuals from 32% of countries visited our Web site. The Internet is an attractive medium for HIV-related information because it can reach large groups of people and can have far-reaching effects in providing information regardless of where the viewer is located. The duration of visits to our Web site indicated that the strategy of using an introductory video with youth explaining the project was a popular starting point.

The largest number of unique visitors to the Web site was in the month of October. During this time, we were in the third and final month of implementing the daily MCP text messages. It is possible that we had more unique visitors to the site at this time because teens were telling others about the project. As in previous research, attitudes, beliefs, and sexual behaviors were important in the delivery of messages and the acceptance of information over the Web (Uhrig, Bann, Wasserman, Guenther-Grey, & Eroglu, 2010).

HIV-related Web sites have been effective in increasing HIV disclosure among men who have sex with men (Chiasson, Shaw, Humberstone, Hirshfield, & Hartel, 2009) and in providing information about how to care for persons living with HIV (Horvath et al., 2009). In 2006, however, Kaplan noted that there was almost no published literature on MCP interventions with HIV (Kaplan, 2006). Since that time, MCP HIV interventions such as Cell-phones4HIV and the BART Text Messaging Project have emerged. Both projects provide adolescents with alternatives to problems when they are pressured to engage in risky behaviors. Our Web site provided information on how to use MCP text messaging to enhance adolescent HIV prevention. The Web site can provide information for those who are interested in designing an HIV-prevention program enhanced by or based on MCP technology about how to use this approach.

The World Health Organization has called for the use of MCPs to improve the quality of care in resource-poor countries (Kunutsor, 2010). The level of MCP penetration worldwide makes this approach a promising platform for the delivery of prevention information.

Surprisingly, however, unique visitors from only four countries in Africa accessed our Web site (Egypt, South Africa, Nigeria, and Kenya). Africa continues to have the highest rates of infection in the world, and there is a proliferation of MCP use in the countries of Africa. While there were more unique visitors to the Web site from the United States and South Korea, there are more MCP HIV prevention and awareness programs in Africa. The large number of unique visitors from the United States and South Korea may be an indication that

individuals in these countries are ready to use mobile Health (mHealth) interventions for safer sex practices.

The major limitation of this analysis was that it represented a snapshot in time of one MCP HIV-prevention Web site. Returning to this site at another time may reveal new and different data. Nevertheless, we were able to examine the characteristics of 2,125 unique visitors to the site, and this information adds an important dimension to the limited literature on MCP HIV-prevention Web sites.

Web analysis such as the one described in this report can provide a systematic approach to examining traffic to a Web site likely to be seen by individuals interested in information on MCP HIV-prevention technology. Future research could explore the significance of Web sites in the development of mHealth interventions using MCP technology.

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Table 1

Unique Visitors, Day, Hour, and Length of Web Site Visit Per Month

Month and Year	Total Number of Unique Visitors	Day of Week Most Frequently Visited	Total Number of Pages Visited	Hour of the Day Pages Were Most Frequently Viewed (EST)	Total Length of Visit
March 2009	12	Thursday	1,652	1400	1,094 seconds
April 2009	162	Wednesday	1,695	0900	186 seconds
May 2009	106	Thursday	1,247	1800	233 seconds
June 2009	224	Thursday	1,370	0800	227 seconds
July 2009	232	Wednesday	1,798	1200	216 seconds
August 2009	202	Tuesday	1,712	2100	159 seconds
September 2009	192	Friday	1,527	1800	118 seconds
October 2009	478	Monday	2,057	2000	86 seconds
November 2009	90	Wednesday	765	1100	295 seconds
December 2009	106	Sunday	811	1500	385 seconds
January 2010	81	Monday	761	1300	93 seconds
February 2010	86	Thursday	490	0800	90 seconds
March 2010	100	Tuesday	548	1000	319 seconds
April 2010	54	Friday	334	1800	143 seconds
Total	2125		19,038		3,644 seconds
Mean	152 unique visitors per month		1,360 pages per month		260 seconds per month
Range	466 unique visitors		1,723 pages		1,008 seconds

NOTE: EST = Eastern Standard Time (U.S.).

Table 2**Countries and Number of Pages Visited**

Country	Pages Visited
United States	13,738
South Korea	2,894
Canada	799
Germany	326
Russia Federation	325
Netherlands	150
China	81
Ukraine	79
Great Britain	76
Haiti	48
India	40
Colombia	37
Brazil	34
Sweden	28
France	27
Indonesia	26
Luxembourg	20
Australia	18
Japan, Sri Lanka	17 (each)
Norway, Iran, Philippines	16 (each)
Costa Rica	13
Turkey	12
Latvia	10
Estonia	7
Nigeria	6
Mexico, Taiwan	5 (each)
New Zealand, Jamaica, Romania	4 (each)
Israel, Greece, Czech Republic, Bangladesh, Spain, Greece, Guam,	3 (each)
Singapore, Lithuania, Kenya, Pakistan, Myanmar, Ireland	2 (each)
South Africa, Malaysia, Qatar, Egypt, Argentina, Thailand, Portugal, Hong Kong, Trinidad & Tobago, Belgium, Denmark, Austria	1 (each)