Use of the internet and self-collected samples as a sexually transmissible infection intervention in rural Illinois communities

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Abstract. Background: In the USA, reported cases of chlamydia (Chlamydia trachomatis) continue to rise despite substantial funding for screening. National gonorrhoea (Neisseria gonorrhoeae) rates have remained relatively stable, with clusters associated with metropolitan areas. Rural areas are no exception, as every county in Illinois reported cases of chlamydia in 2007. Morbidity associated with infection remains a public health concern, with costs of $US2.5+ billion annually. Novel screening interventions must be examined for their ability to reach those at risk who are missed by traditional methods.

Methods: The website Iwantthekit.org was modified to allow residents from 25 contiguous counties in Central Illinois to request a self-collected sample kit. Returned kits were tested for chlamydia and gonorrhoea. The initial study period was 12 months.

Results: During the study period, 343 kits were requested from 20 counties and 39.9% were satisfactorily returned for analysis. Positivity rates for chlamydia and gonorrhoea were 5.8% and 1.2%, respectively, for females and 1.9% and 0% for males. Males comprised 37.7% of all internet samples (compared with 23.4% for traditional screening venues) and 40.4% of all internet samples submitted by whites (compared with only 17.2% of traditional screening).

Conclusions: The female positivity rate was comparable to those seen in other screening venues and the method successfully engaged at-risk males. Overall, participation was low and the costs associated with the program outweighed the averted costs associated with the few cases identified. While this methodology resulted in sample requests from a wide area, it must be utilised by more individuals to become cost-effective.

Additional keywords: chlamydia, gonorrhoea, testing.

Background

Chlamydia trachomatis (CT) and gonorrhoea (Neisseria gonorrhoeae; GC) are the two most commonly reported notifiable diseases in the USA, with case numbers continuing to rise. Reported cases of CT exceeded 1 million for the first time in 2006 (1 030 911 cases, an increase of 23.5% from 2002) and continues to rise each year.1,2 It is likely that much of the increase in reported CT cases is due to increased screening and more sensitive tests. Reported cases of GC seem to be more stable, with 358 366 cases in 2006, an increase of only 1.9% from 2002.1,2 Females aged 15–19 were the group with the highest infection rates for both CT and GC at 2862.7 and 647.9/100 000, respectively.1 From 2002 to 2006 in Illinois, the incidence of CT increased 11.4% to 53 586 cases, whereas GC decreased 16.0% to 20 186 cases. This decrease may be misleading, as the statewide count, excluding Chicago, rose each year from 2002 to 2006, and may be a reflection of issues related to GC screening and reporting in Chicago during that time.3 Both diseases remain a significant threat to health and are major contributors to the more than 1 million estimated annual cases of acute pelvic inflammatory disease (PID) and 100 000 cases of infertility, as well as chronic pelvic pain and ectopic pregnancy.4 The annual national cost associated with CT and GC infection is in excess of $US2.5 billion.5 Current estimations place the progression of untreated chlamydial PID at upwards of 40%, with a cost of treating PID of $US1995 and direct medical costs of CT and GC of $US315 and $US343, respectively.6,7

Current intervention efforts are largely devoted to the provision of screening and treatment through a variety of public and private providers. Common public provider types include sexually transmissible infection clinics (STICs), family planning clinics (FPCs) and neighbourhood health centres. However, public providers are relatively few in number, not available in many areas, and relatively expensive to create and maintain. This places limitations on their efficacy. Private health care providers such as physicians are more ubiquitous, but access may be limited for those who are either underinsured
or without insurance. Furthermore, for those who do see a physician, not all are likely to be screened. It was reported that only 30.2% of eligible females enrolled in managed care plans in Illinois in 2006 were screened according to guidelines developed by the United States Preventive Services Task Force.8,9

Rural areas generally have fewer screening providers and resources and 43 of Illinois’ 102 counties have a population of <20,000 individuals (considered rural for this study). In spite of their small populations, these counties maintain endemic CT, as reflected by cases reported every year (a mean of 19 per year v. counties with a population of ≥20,000 with a mean of 895 reported cases per year).3,10 There have been multiple studies examining the effectiveness of screening programs, and all require a minimum local prevalence for cost-effectiveness.11–19 This may be difficult to achieve in lightly populated or low prevalence areas typical of more rural communities. In addition, persons residing in smaller communities may fear loss of anonymity and thus avoid screening or treatment.20 Screening avoidance is compounded as adolescent women generally underestimate their susceptibility and rural youth have even more reduced perceptions of infection risk.21–23 However, female CT prevalence in rural clinical settings has been reported to range from 2.5 to 27.4%.24–30

Within this context of growing sexually transmissible infection (STI) identification is the increasing use of the internet and other electronic communication to facilitate STI interventions. The groups at the highest risk of infection (those aged 15–24) are also avid internet and social network users, with over half participating in some form of blogging.31,32 Adolescents and young adults are also comfortable using the internet to search for health information.33 The ever-increasing use of the internet and development of rapid test methods for various STIs has contributed to the growing number of private websites, some of questionable value, offering STI testing services for a fee.34 Other websites, such as Iwantthekit.org (verified April 2010) are publically funded and validated.35 A recent innovation is the use of text messaging to relay test results, where individuals are comfortable with receiving health information by phone or text, without a resultant delay in treatment.36,37

The website Iwantthekit.org is based out of Johns Hopkins University (JHU) and allows individuals to access STI educational information and request a free home collection sample kit be mailed to them. The sensitivity of self-collected vaginal swabs and male urines rivals that of cervical swabs and sample kit be mailed to them. The sensitivity of self-collected vaginal swabs and male urines rivals that of cervical swabs and is essentially equal in terms of vaginal swabs and male urines rivals that of cervical swabs and is essentially equal in terms of method and removes many potential barriers such as cost, travel, anonymity and visit time. It has been shown to be effective in reaching both females and males.35–41 CT prevalence determined from these studies was high and ranged from 9.1% to 15.3% for females and from 7.5% to 20.6% for males. The objective of this study was to determine if the availability of Iwantthekit.org services to Illinois counties, especially those considered more rural, was an effective complement to existing STI services. Specifically, could this service be effectively implemented with minimal cost and would it identify infected individuals who might not otherwise be detected by traditional means?

Methods

The Iwantthekit.org website was modified in early 2008 to allow kit request access to all residents of 25 Illinois counties. The website discusses the recommendation that all sexually active women aged 25 and younger be screened annually for CT. Print and radio advertisements promoted screening for those aged 14 and older who were sexually active, but did not set an upper age limit. Counties were chosen as a contiguous group in the central portion of the state and contained a mix of rural and urban communities (Fig. 1). The average county population in Illinois (excluding Cook County, which has 43% of the state population alone; adjusted state mean) is 69,725 residents; 18 study counties (72%) are below this level and 10 have <20,000.35 Data were to be collected for 12 months and then analysed.

Kits became available mid-May 2008. Fig. 1 was placed on the website and individuals residing in test counties were encouraged to request a test kit. There was no cost for the kit, analysis or treatment for study participants. Once collected, samples were returned to JHU for analysis for CT, GC and Trichomonas vaginalis (trich). Trich information was collected for surveillance purposes only. Samples were tested by Aptima Combo 2 (GenProbe Inc., San Diego, CA, USA). All test results were faxed to the Illinois Department of Public Health Sexually Transmitted Disease Section (IDPH STD). Individuals were instructed to wait at least 14 days for sample analysis before contacting the IDPH for test results by a toll-free phone number. Those testing positive were directed by IDPH STD staff on how to obtain treatment and partner services from their local health department (LHD).

Previous data have indicated that radio advertising was the single most successful method by which previous study participants learned of the website.34 Data from the past few years showed that 34.4% of participants heard about the site on the radio. We therefore contracted with seven broadcast companies representing in excess of 11 radio stations in Central Illinois with a combined coverage over the entire study area. They broadcast 30-s commercials on Friday and Saturday evenings on a 7-week on, 7-week off basis, beginning May 23 2008, for the duration of the study period. This corresponds to a minimum of 224 contracted airings of the commercial in each community during the study period (the number of volunteer public service announcements made on sister stations is unknown). Print advertisements with a message identical to the radio spots were also printed and distributed to participating LHDs in each county. LHD staff were to display them on site, where possible, and distribute them to local venues where deemed appropriate.

All other non-internet (traditional means) chlamydia and gonorrhea case report data for the 25 study counties were obtained from the IDPH STD Program for comparison to the Internet data. The study was reviewed and approved by the Southern Illinois University School of Medicine and Johns Hopkins University institutional review boards.
Results
For the first 3 months of the project, there were requests from 7 out of 25 test counties. Two counties accounted for 74% of requests, and only 2% of all kit requests were from counties with a population less than 20,000 (rural). By the end of the initial study, there were requests from 20 counties, with two counties accounting for 39% of requests, and 4% coming from rural counties. Kit request was heavily dependent upon radio advertising, as shown in Fig. 2. Regression analysis showed a significant association between county population and the total number of kits requested ($P < 0.001$; $R^2 = 0.64$).

There were a total of 343 kits requested during the study period, of which 137 (39.9%) were satisfactorily returned and tested. Many other requests were received from outside the study area but within Illinois. Of the 86 female kits tested, 6 were positive for CT (7.0%), 1 was positive for GC (1.2%) and 15 were positive for trich (17.4%). One female was infected with both CT and trich. Of the 52 male kits tested, two were
positive for CT (3.8%), none were positive for GC and five were positive for trich (9.6%). Of the nine individuals infected with CT or GC, eight (89%) were treated. This compares with treatment rates (within 14 days) in Illinois of 77% for STICs, 79% for FPCs, 89% for hospitals and school-based clinics, 91% for private physicians and 99% for universities.

Comparison of kit use versus traditional screening showed that the internet attracted a greater proportion of males, increasing from 23.4% to 37.7% ($P < 0.000$; Table 1). The distribution by race was also significantly different, but may be due to an increased proportion of those who listed their race as ‘unknown’ or ‘missing’ with internet kits. We also discovered that the racial distribution among males was significantly different, with a much greater proportion of whites utilising the internet compared to traditional means (69.2% v. 46.4%; $P < 0.000$), while the proportion of blacks dropped to 19.2% from 49.9% ($P < 0.000$; Table 2). The proportion of internet males with ‘missing’ race data also increased to 11.5% from the 3.1% found in traditional screening. Further investigation of distribution of tests by gender within a known race was different for whites, increasing from 17.2% males for traditional means to 40.4% for the internet ($P < 0.000$; Table 2). Total CT positivity rates for internet and traditional means were insignificantly different ($P = 0.092$). Stratification by gender or race was not examined due to small sample size. GC positivity was not analysed due to low numbers of positives during the study period.

Costs associated with the project were substantial. One-time expenditures included printing ($US977) and website

Table 1. Distribution of tests by gender and race for internet v. traditional screening means, Illinois internet intervention, May 2008–May 2009

<table>
<thead>
<tr>
<th></th>
<th>Internet</th>
<th>Traditional</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total tests</td>
<td>138</td>
<td>35 842</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>86 (62.3%)</td>
<td>27 426 (76.6%)</td>
<td>$\chi^2 = 15.49; P = 0.000$; male proportion of tests increased from 23.4% to 37.7%</td>
</tr>
<tr>
<td>Male</td>
<td>52 (37.7%)</td>
<td>8400 (23.4%)</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>89 (64.5%)</td>
<td>22 623 (63.1%)</td>
<td>$\chi^2 = 67.69; P = 0.000$; significance probably due to increased proportion of unknown</td>
</tr>
<tr>
<td>Black</td>
<td>31 (22.5%)</td>
<td>11 520 (32.1%)</td>
<td></td>
</tr>
<tr>
<td>Other or unknown</td>
<td>9 (6.5%)</td>
<td>1438 (4.0%)</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>9 (6.5%)</td>
<td>261 (0.7%)</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th></th>
<th>Internet</th>
<th>Traditional</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>53 (61.6%)</td>
<td>18 721 (68.3%)</td>
<td>$\chi^2 = 102.71; P = 0.000$; significance</td>
</tr>
<tr>
<td>Black</td>
<td>21 (24.4%)</td>
<td>7322 (26.7%)</td>
<td>probably due to increased proportion</td>
</tr>
<tr>
<td>Other or unknown</td>
<td>3 (3.5%)</td>
<td>1174 (4.3%)</td>
<td>of missing responses with internet requests</td>
</tr>
<tr>
<td>Missing</td>
<td>9 (10.5%)</td>
<td>209 (0.8%)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>36 (69.2%)</td>
<td>3898 (46.4%)</td>
<td>$\chi^2 = 27.42; P = 0.000$; significance due to increased proportion of white males, and other or unknown responses with internet requests</td>
</tr>
<tr>
<td>Black</td>
<td>10 (19.2%)</td>
<td>4191 (49.9%)</td>
<td></td>
</tr>
<tr>
<td>Other or unknown</td>
<td>6 (11.5%)</td>
<td>262 (3.1%)</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>0 (0%)</td>
<td>49 (0.6%)</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>53 (59.6%)</td>
<td>18 721 (82.8%)</td>
<td>$\chi^2 = 33.36; P = 0.000$; significance due to increased proportion of males using the internet</td>
</tr>
<tr>
<td>Male</td>
<td>36 (40.4%)</td>
<td>3898 (17.2%)</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>21 (67.7%)</td>
<td>7322 (63.6%)</td>
<td>$\chi^2 = 0.229; P = 0.711$</td>
</tr>
<tr>
<td>Male</td>
<td>10 (32.3%)</td>
<td>4191 (36.4%)</td>
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modification ($US1485). Continuous expenses included advertising ($12,992), kit assembly and postage ($US5 \times 343 = $US1715), and kit analyses ($US20 \times 137 = $US2740). Direct costs totalled $US19,909, of which printing and website modification accounted for 12%. Sample kit assembly and postage, kit analyses and radio advertising accounted for the remaining 88%, with advertising alone accounting for 65% of the total. Academic salary support costs were significant, but are not considered here, as they will not be required once the methodology moves from an academic and research basis to a public or best practice administered by state or local health departments.

May 2009 was the end of the funded study period. We were able to continue to offer testing, but unable to continue advertising. Sample receipt subsequently dropped fairly dramatically, with females requesting nine samples in June (two positive for CT) and another nine samples from July–September (one positive for trich). These additional tests raised the number of positives to 8 out of 104 kits tested, with a positivity rate of 7.6% (vs. 7.0% during the initial study period). Males requested four samples in June (three positive for CT) and another two samples July–September (zero positives). These additions raised the number of positives to 5 out of 58 kits tested, with a positivity rate of 8.6% (vs. 3.8%).

Discussion

Over the course of the initial study period, kits were requested from 20 of 25 participating counties. This indicates we were only partially successful in reaching the target areas with the contracted radio stations. Further investigation would need to be done to ensure that areas in the periphery of the study area receive adequate advertising coverage. For example, Vermilion County, on the outer edge of the study area, has a population in excess of the state average, received only partial radio coverage and requested only three kits. In addition, more populated counties were associated with more requested kits, and we found that current radio advertising was critical to instigate kit requests.

Kit return rates were in excess of 38% for females and males. Female CT positivity was 7.0% and was comparable to other Illinois STI screening venues (ranging from 5.7% for FPCs to 12.4% for STICs in Illinois during 2002–2006; unpubl. data, IDPH). We found that the internet was effective in reaching a greater proportion of males, especially white males at risk of infection. Continuing research might seek to obtain greater participation by black males, who were under-represented.

We only detected eight cases of CT and one case of GC during the study period, resulting in a cost savings of $US4543 (one projected case of PID and direct medical costs associated with seven cases of CT and one case of GC). Given that the non-salary costs were in excess of $US19,900, this methodology may not be cost-effective, given the current implementation strategy. At this cost, the intervention would need ~20 detected cases to ‘break even’ (assuming eight cases were to progress to PID). For comparison to other programs, the per-person costs were $US58 per person tested and $US2212 per identified infection (CT or GC).

Feedback from LHD staff in participating areas showed that while the largest and most popular radio stations were contracted for advertisement, they might not necessarily have been the best for reaching the highest risk populations, and that additional stations might have resulted in better responses. We also found that LHDs were largely unable to make use of the print advertisements due to such factors as a lack of staff time or time. An inherent goal of this project was to show if it could be successfully used in more rural areas where additional resources are scare. Relying on LHDs to drive local marketing for the program is not likely to be sufficiently effective.

Instead, we propose that future similar programs engage student groups in local social marketing campaigns. Social marketing, utilising peer counselling and internet presence, has been successful in raising awareness for other STIs (e.g. syphilis (Treponema pallidum) and HIV) in other venues. Prior to the program, we consulted with a local student chapter of the Brothers and Sisters United Against HIV, a peer-driven organisation to reach out to African Americans, and incorporated their feedback into the choice of local radio contract. While they also recommended incorporating elements of the program into social networking websites, we were unable to do so due to institutional review board constraints. We propose that future projects engage local student groups to provide social marketing in the form of peer advertisement and encouragement. While the engagement of local student groups is prohibitively time consuming for those at the state or regional level, LHDs may be able to use existing contacts to perform this at the local level with little additional resources or time. This strategy may be particularly needed in more rural areas with less radio coverage.

There are several limitations to this study. Kit request was subject to occasional abuse (e.g. requesting a kit for someone else without their knowledge) and loss of kit materials, as only 39.9% of all requested kits were satisfactorily returned for analysis. In addition, kits must be mailed to a home address and some target users of this methodology (those aged 15–24) may fear that a large brown envelope arriving in the mail might raise questions with parents. There were likely biases in the types of individuals who heard the advertisements and responded to them. Individuals in more remote areas may not have been in range of any contracted radio station. Perhaps, more importantly, each radio station played a fairly specific type of music (e.g. classic rock) and individuals not preferring that type may listen exclusively to other stations (e.g. African Americans may prefer hip-hop).

Ultimately, the utility of the methodology as implemented was significantly hampered by the lack of use. Cost-effectiveness requires a scale of use which we did not attain. In concept, this methodology should be an effective tool for smaller health departments or rural areas with fewer screening resources. However, there is a need to develop an effective, consistent and low-cost method of marketing. Specifically, LHDs need to be involved to determine the most appropriate local venues and radio stations for advertising, and engage local peers to both advertise the website and encourage its use. This may be especially beneficial in more rural areas
where there is a decreased perception of risk, and where website utilisation may be disproportionately effective due to a lack of other screening resources.

Conflicts of interest
None declared.

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