Prevalence of Genital Warts Among Sexually Transmitted Disease Clinic Patients—Sexually Transmitted Disease Surveillance Network, United States, January 2010 to December 2011

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Background: A quadrivalent vaccine that prevents genital warts (GWs) has been recommended by the Advisory Committee on Immunization Practices for women since 2007 and for men since 2011. National estimates of GW burden in sexually transmitted disease (STD) clinic settings are useful to provide a baseline assessment to monitor and evaluate reductions in GW and serve as an important early measure of human papillomavirus (HPV) vaccine impact in this population.

Methods: Genital wart prevalence among STD clinic patients from January 2010 to December 2011 was determined from a cross-sectional analysis of all patients attending STD clinics in the STD Surveillance Network (SSuN). We conducted bivariate analyses for women, men who have sex with women (MSW), and men who have sex with men (MSM) separately, using χ^2 statistics for the association between GW diagnosis and demographic, behavioral, and clinical characteristics.

Results: Among 241,630 STD clinic patients, 13,063 (5.4%) had GWs. Wide regional differences were observed across SSuN sites. The prevalence of GW was as follows: 7.5% among MSW (range by SSuN site, 3.9–15.2), 7.5% among MSM (range, 3.3–20.6), and 2.4% among women (range, 1.2–5.4). The highest rate was among 25- to 29-year-old MSW (9.8%). Non-Hispanic black women and MSW had a lower prevalence of GWs than did women and MSW in other racial/ethnic groups.

Conclusions: There is a significant burden of GW in STD clinic populations, most notably in men. Given the opportunity for prevention with a quadrivalent HPV vaccine, STD clinics may be an ideal setting for monitoring trends in GW prevalence among men (MSW and MSM). However, given the observed low GW prevalence among female STD clinic patients, STD clinics may not provide an appropriate setting to monitor the impact of HPV vaccine among women.

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Acknowledgments: The authors thank Susan Hariri and Eileen Dunne for their assistance and critical feedback of this manuscript.

Conflict of interest: None declared.

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Received for publication June 21, 2013, and accepted November 13, 2013.
DOI: 10.1097/OLQ.0000000000000077

Genital warts (GWs) are a commonly recognized clinical manifestation of genital human papillomavirus (HPV) infection, with an estimated 1% of the sexually active adult population in the United States having clinically apparent GWs.[1] Although not life threatening, GWs are a common problem with a considerable impact on health care costs,[2–5] as well as a source of psychological stress and shame for patients.[6] Of the 40 HPV genotypes that are known to infect the genital tract, HPV types 6 and 11 (nononcogenic types) typically causes 90% of all GW,[7,8] whereas HPV types 16 and 18 (oncogenic types) are frequently associated with cervical and anogenital cancers.[9–11] The Advisory Committee on Immunization Practices recommends routine use of either bivalent or quadrivalent HPV vaccine for girls aged 11 or 12 years, with catch-up vaccination through age 26 years,[12] and routine use of the quadrivalent HPV vaccine for boys aged 11 or 12 years, with catch-up vaccination through age 21 years.[13,14] For men who have sex with men (MSM) and for immunocompromised males, HPV vaccine is also recommended through age 26 years. Clinical trials found that quadrivalent HPV vaccine had more than 95% efficacy for prevention of GWs in females[15] and 90% in males.[16]

Widespread uptake of the HPV quadrivalent vaccine represents a promising strategy for reducing clinical conditions associated with HPV vaccine types, with the primary goal being prevention of cervical and anogenital cancers and their precursors. However, monitoring the impact of the HPV vaccine is challenging because HPV infections are often asymptomatic and transient, and a full assessment of the quadrivalent vaccine's impact on cervical and anal cancer will likely take decades. Compared with monitoring cervical dysplasia or cancer, GW surveillance permits a quicker assessment of vaccine impact. Ecologic studies from Australia,[17] Sweden,[18] and the United States[19,20] have shown a substantial decline in cases of GW after the introduction of the quadrivalent vaccine. Although the ecologic design of these studies makes an in-depth exploration of associations between HPV vaccination and declines in GW impossible, the observed population-level declines demonstrate the potential for vaccine impact. Sentinel sexually transmitted disease (STD) clinic-based surveillance may be a feasible approach for monitoring GWs in the United States. The use of conducting sentinel surveillance for GWs in STD clinic settings is that these health care facilities provide services to populations that may be disproportionately affected by GW and with which we can establish a reliable, baseline prevalence and assess the downstream impact of vaccination for

both females and males, including MSM. We describe the burden of GW in an existing network of STD clinics to provide a baseline for monitoring quadrivalent HPV vaccine's impact on GWs.

METHODS

Basic demographic, clinical, and laboratory data were collected from all patients seen by a clinical provider from January 1, 2010, through December 31, 2011, at 40 STD clinics participating in the STD Surveillance Network (SSuN). The SSuN is a sentinel surveillance platform comprising 12 collaborating state and local health departments that implement similar protocols for collecting and analyzing enhanced surveillance data. These collaborating sites aim to improve the capacity of national, state, and local STD programs to detect, monitor, and respond rapidly to trends in STDs. There are 40 urban STD clinics located in 12 geographically diverse areas: Birmingham, Alabama (1 clinic); Baltimore, Maryland (2 clinics); Los Angeles, California (12 clinics); Denver, Colorado (1 clinic); New Haven and Hartford, Connecticut (2 clinics); Chicago, Illinois (5 clinics); New Orleans, Louisiana (1 clinic); New York, New York (9 clinics); Philadelphia, Pennsylvania (2 clinics); San Francisco, California (1 clinic); Richmond, Virginia (3 clinics); and Seattle, Washington (1 clinic).

The case definition used for this analysis was a diagnosis of GWs for any of the visits within the analytic time frame. Diagnoses were based on clinical evaluation and physical examination findings. A patient's demographic, clinical, and behavioral data were abstracted from medical records. Men who reported sex with a man ever or who self-identified as gay/homosexual or bisexual were defined as MSM. Two percent of the male population for whom sex of sex partners was unknown was excluded from the analysis.

We described baseline characteristics of all women, MSM, and men who report sex only with women (MSW) who attended SSuN STD clinics. We estimated the period prevalence of GW; this was calculated as the total number of persons with a GW diagnosis during the 24-month analytic period, divided by the total number of persons with 1 or more clinic visits during the analytic period. Each site contributed to a single mean observation for the continuous variables (age and number of sex partners in 3 months), and a median was calculated using each site's mean. We conducted bivariate analyses (separately for MSW, MSM, and women) to assess the associations between GW and the following independent variable: age, site, race/ethnicity, and history of a laboratory-confirmed chlamydia (*Chlamydia trachomatis*, or *CT*) or gonorrhea infection (*Neisseria Neisseria gonorrhoeae*, or *GC*). A *P* value less than 0.05 was used to determine statistical significance. Data were analyzed using SAS version 9.3 (SAS Institute Inc, Cary, NC). SSuN data collection is a public health surveillance activity. Analysis of de-identified SSuN data does not constitute research involving human subjects so institutional review board was not required.

TABLE 1. Descriptive Demographic and Clinical Characteristics of All Clinic Patients Attending SSuN STD Clinics, Stratified by Women, MSW, and MSM, SSuN, 2010 to 2011 (N = 241,630)

	Women (n = 98,890)		MSW (n = 113,206)		MSM (n = 29,534)	
Characteristic	**n**	**%**	**n**	**%**	**n**	**%**
Age, y						
≤19	15,336	15.5	8024	7.1	1145	3.9
20–24	30,118	30.5	27,210	24.0	6173	20.9
25–29	20,181	20.4	25,506	22.5	6568	22.2
30–39	18,471	18.7	28,044	24.8	7509	25.4
≥40	14,784	15.0	24,422	21.6	8139	27.6
Site						
Birmingham	7705	7.8	6588	5.8	788	2.7
Baltimore	9348	9.5	11,832	10.5	1106	3.7
Los Angeles	14,689	14.9	20,416	18.0	3847	13.0
Chicago	4575	4.6	5337	4.7	707	2.4
Denver	4869	4.9	5097	4.5	1223	4.1
Hartford/New Haven	1436	1.5	2168	1.9	326	1.1
New Orleans	3708	3.8	4620	4.1	716	2.4
New York City	34,556	34.9	32,884	29.1	9145	31.0
Philadelphia	6177	6.3	9622	8.5	1182	4.0
San Francisco	4960	5.0	7100	6.3	6046	20.5
Richmond	3534	3.6	8212	2.5	286	1.0
Seattle	3333	3.4	4730	4.2	4162	14.1
Race						
NH black	58,847	60.4	66,071	58.9	7724	26.6
NH white	12,992	13.3	18,709	16.7	11,904	41.0
Hispanic	18,732	19.2	20,596	18.4	6802	23.4
Other	5203	5.3	4802	4.3	2196	7.6
Missing/UNK	1692	1.7	1977	1.8	396	1.4
No. sex partners in last 3 mo						
0	3156	3.2	2874	2.5	596	2.0
1	54,430	55.0	44,375	39.2	7153	24.2
2	20,240	20.5	32,150	28.4	7147	24.2
3	4609	4.7	12,097	10.7	4407	14.9
≥4	3384	3.4	10,336	9.1	7903	26.8
Missing/UNK	13,071	13.2	11,374	10.1	2328	7.9
HIV status						
Negative	92,794	93.8	106,064.0	93.7	23,540	79.7
Positive	653	0.7	997.0	0.9	5374	18.2
Unknown	5443	5.5	6145.0	5.4	620	2.1
History of *CT*						
No	85,553	86.5	95,617	84.1	25,802	87.4
Yes	13,337	13.5	18,039	15.9	3732	12.6
History of *GC*						
No	94,311	95.4	104,123	92.0	24,521	83.0
Yes	4579	4.6	9083	8.0	5013	17.0
GW diagnosis						
Yes	2397	2.4	8451	7.5	2215	7.5

UNK indicates unknown.

RESULTS

The study population included 241,630 individuals who attended 40 SSuN STD clinics between January 1, 2010, and December 31, 2011, contributing to a total of 371,346 clinician visits (Table 1). The median age was 28.9 (range, 9–91) years for women, 31.3 (range, 11–95) years for MSW, and 33.2 (range, 13–91) years for MSM. Approximately a third of all patients were seen at STD clinics in New York City, and almost 50% of the MSM were seen at sites located in the western region of the United States. Most women, MSW, and MSM were nonwhite, although there were a higher proportion of non-Hispanic (NH) whites among MSM than among MSW or women. The median number of sex partners in the past 3 months was 1.6 for women, 2.0 for MSW, and 2.8 for MSM. The prevalence of HIV infection was higher among MSM (18.2%) than among MSW (0.9%) or women (0.7%). A history of *CT* was higher than *GC* among women and MSW, but there was a higher prevalence of *GC* than *CT* among MSM.

Among the STD clinic patients, 5.4% (13,063/241,630) had a diagnosis of GW, of whom 18.4% (n = 2397) were women, 17.0% (n = 2215) were MSM, and 64.6% (n = 8451) were MSW. The median age of patients with GW was 24.0 (range, 12–70) years for females, 28.0 (range, 14–79) years for MSM, and 28.0 (range, 14–76) years for MSW. The percentage of patients with GWs varied significantly by SSuN site (Fig. 1), with Denver (13.4%) having the highest percent and Birmingham

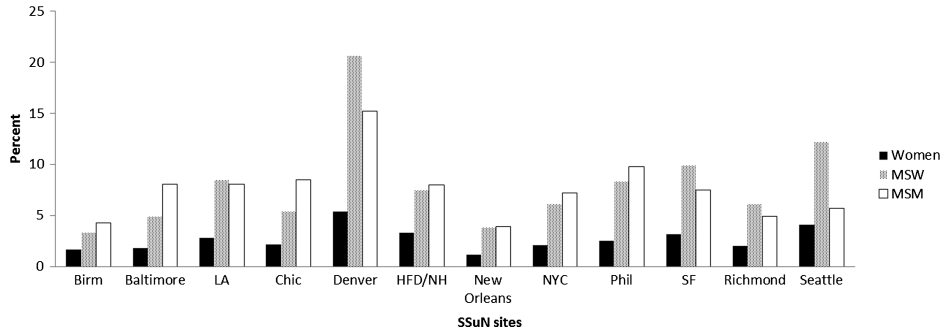

Figure 1. Prevalence of GWs among STD clinic patients by sex, sex of male sex partners, and SSuN site, January 1, 2010–December 31, 2011. Birm indicates Birmingham; LA, Los Angeles; Chic, Chicago; HFD/NH, Hartford/ New Haven; NYC, New York City; Phil, Philadelphia; SF, San Francisco.

having the lowest (2.6%). Among females attending STD clinics, the median prevalence was 2.4% across all SSuN sites, but varied by site, ranging from 1.2% in New Orleans to 5.4% in Denver. Among men, the median prevalence of GW was 7.7% among MSM (3.9% in New Orleans to 15.2% in Denver) and 6.8% among MSW (3.3% in Birmingham to 20.6% in Denver).

Table 2 details the associations between GWs and demographic and clinical characteristics of patients, stratified by sex, and, for males, by sex of sex partners. Women and MSW of NH black race were less likely to be diagnosed as having GW than women and MSW of other race/ethnicities. This finding remained even after adjusting for SSuN sites (data not shown). However, no association between race/ethnicity and GW was noted among MSM. Women in the 20- to 24-year-old age group and MSW in the 25- to 29-year-old age group were 1.5 and 3.2 times more likely to have GWs compared with women and MSW in the age group of 19 years and younger. Genital wart diagnosis was less likely among MSW who had a history of gonorrhea or *CT*, but this association was not seen among women or MSM.

DISCUSSION

These data represent the largest evaluation, to date, of GW prevalence in males and females attending US STD clinics. Our study findings provide baseline information about the burden of GWs in a clinic-based sample of thousands of cases and, on clinical evaluations and physical examination findings rather than on self report or a combination of International Classification of Diseases, Ninth Revision, Clinical Modifications and procedure codes, which may be nonspecific for GWs.[3] Although there was a considerable variation in prevalence across SSuN sites, the median prevalence of 5.4% was consistent with previously published data in the United States and Europe, where reported prevalence of GW has been between 4% and 11% in STD clinics.[1,21] We found that GWs were detected among male and female patients of all age groups, and overall prevalence rates were 3 to 4 times higher in MSM and MSW than in women.

There are a few reasons why STD clinics are a good setting for future HPV impact evaluations among males. First, the proportion of male patients seeking care at STD clinics makes this a natural group in which to evaluate GW diagnoses over time. Health care use among women is often greater than among men and women are more likely to identify a medical home such as primary care provider or reproductive and family planning health care setting.[22] There is no comparable infrastructure for men and often STD clinics serve as a niche for men, especially MSM, for sexual and primary care health services.[23] Second, STD clinics routinely

TABLE 2. Odds Ratios (ORs) With 95% Confidence Intervals (CIs) for Characteristics Significantly Associated With a Diagnosis of GWs, by Sex and Sex of Male Sex Partner, in SSuN STD Clinic Patients, January 1, 2010–December 31, 2011

	Women (n = 2397)		MSW (n = 8451)		MSM (n = 2215)	
	Prevalence, % (n)	OR (95% CI)	Prevalence, % (n)	OR (95% CI)	Prevalence, % (n)	OR (95% CI)
Total	2.4 (98,890)		7.5 (113,206)		7.5 (29,534)	
Race/Ethnicity*						
NH black	1.7 (1019)	Reference	5.1 (3365)	Reference	7.3 (566)	Reference
NH white	4.3 (552)	2.5 (2.3–2.8)	13.6 (2551)	2.9 (2.8–3.1)	7.1 (849)	1.0 (0.9–1.1)
Hispanic	3.1 (573)	1.8 (1.6–2.0)	9.3 (365)	1.9 (1.8–2.0)	8.6 (585)	1.2 (1.0–1.3)
Other	3.2 (166)	1.9 (1.6–2.2)	7.6 (1913)	1.5 (1.4–1.7)	7.0 (153)	1.0 (0.8–1.1)
Age, y						
≤19	2.1 (317)	Reference	3.3 (267)	Reference	9.3 (107)	Reference
20–24	3.0 (900)	1.5 (1.3–1.7)	7.2 (1955)	2.2 (2.0–2.6)	9.6 (591)	1.0 (0.8–1.3)
25–29	2.7 (536)	1.3 (1.1–1.5)	9.8 (2509)	3.2 (2.8–3.6)	8.4 (551)	0.9 (0.7–1.1)
30–39	2.2 (413)	1.1 (1.0–1.3)	9.0 (2517)	2.9 (2.5–3.1)	7.2 (540)	0.8 (0.6–1.0)
≥40	1.7 (231)	0.8 (0.6–0.9)	4.9 (1203)	1.6 (1.3–1.7)	5.2 (426)	0.5 (0.4–0.7)
History of *CT*						
No	2.5 (1875)	Reference	7.9 (6138)	Reference	7.4 (1715)	Reference
Yes	2.4 (314)	1.0 (0.8–1.1)	4.9 (875)	0.6 (0.5–0.7)	8.6 (320)	1.2 (1.0–1.3)
History of *GC*						
No	2.6 (2080)	Reference	7.4 (6973)	Reference	7.6 (1716)	Reference
Yes	1.9 (86)	0.8 (0.6–1.0)	3.5 (316)	0.5 (0.4–0.6)	6.9 (348)	0.9 (0.8–1.0)

*Totals may differ because of rounding or missing data.

collect information on sex of sex partners compared with other data sources. Because the current recommendations for HPV vaccine are framed differently for MSM and MSW, it will be important to evaluate these 2 groups separately.

Despite geographical differences in clinic populations across all SSuN jurisdictions, it is important to note that lower percentages of female STD clinic patients with GWs were consistently seen across all sites compared with percentages of MSM and MSW with GW. At the site (Denver) that had the highest prevalence of GW among women, the prevalence was nearly 3 times among MSM and nearly 4 times higher among MSW compared with women. This finding contrasts with administrative data from previous studies that found the prevalence of GWs to be similar among males and females or higher in females.[24,25] The quadrivalent HPV vaccine was licensed in 2006, so it is plausible that the lower prevalence seen among females in STD clinics is due to vaccination. However, this does not explain why rates are also low among older females not eligible for the vaccine. Differences in rates of GW diagnosis by sex in our analysis may be related to the population that presents to STD clinics. Females with GWs may choose not to present to STD clinics but instead present to other practice settings where they seek reproductive care such as comprehensive family planning services and cervical cancer screening. Future evaluations of health care–seeking behaviors among females with GWs and other STDs may be instrumental in assessing where adolescent girls and adult women choose to go for their sexual and reproductive health needs.

In this study, we examined the characteristics of patients diagnosed as having GWs in STD clinics. Our observations that NH black women and NH black MSW were less likely to have GWs as compared with women and MSW of other racial/ethnic groups in this clinic population, even after adjusting for SSuN site, are in contrast to the racial disparities seen for other STDs. Few studies have investigated racial/ethnic variations in GW diagnoses, but a national study by Dinh et al.[26] indicated that NH whites had a higher prevalence of GWs (self-reported) when compared with other racial/ethnic groups. In contrast, Hariri et al.[27] estimated the prevalence of type-specific HPV DNA and found that NH blacks had the highest prevalence (41.5%) of low-risk HPV when compared with other race/ethnic groups. It is difficult to provide a full explanation for why these racial differences exist. However, it is possible that these differences have more to do with health care–seeking behaviors or regional differences seen across our SSuN sites than differences in innate susceptibility among races, especially because difference by race was not noted among MSM.

This study is subject to several limitations. For one, the study was restricted to persons seeking care at municipal STD clinics within SSuN sites. Although the SSuN STD clinics are urban clinics located in 12 geographically diverse states, they have limited geographical representativeness. In fact, a third of the population of our study was from one geographical setting, New York City. However, there is no reason to suggest that this population would have significant differences in terms of health care–seeking behaviors across the SSuN sites. Second, given the variability in prevalence of GW across sites, it is possible that some of the variability may be due to a lack of uniformity of the diagnosis across and within clinic sites, leading to incorrect diagnoses or underascertainment of GW, as some warts may be subclinical or go undetected. Although this could be a factor, STD clinics are often staffed with providers that have expertise in the diagnosis and treatment of STDs, likely making this a minimal contribution to the overall variability. In addition, there were no policy differences across the clinic sites that would bias the diagnosis of GWs. Lastly, data on the reasons for visit among the patients presenting to the clinic were not available. As with all clinic-based surveillance, the prevalence of one condition in a given clinic may be affected by the prevalence of other conditions or potentially other factors (e.g., the proportion who present with symptoms of STDs vs. those who may come in for family planning or vaccination issues).

Our analysis suggests that STD clinics may be appropriate settings in which to monitor trends in GW among MSM and MSW, especially as uptake of the HPV vaccine among adolescent boys increases. However, it may be difficult to monitor the impact of HPV vaccine among female STD clinic patients given the observed low prevalence of GW in this setting. Many of the ecological studies demonstrating a reduction in GWs have used these trends in health care settings equivalent to US STD clinics. We believe that a major strength of our study is the inclusion of data from sentinel clinics in various US geographical locations that give us the ability in future studies to monitor burden of GW, assess changes in characteristics of patients with GW, and evaluate trends in specific age groups. Since the Advisory Committee on Immunization Practices made its recommendations in the fall of 2011, these data represent baseline rates before implementing strategies for male vaccination. Ascertainment of data on the provision and administration of the quadrivalent HPV vaccine at SSuN sites was not available. As we plan for future studies to evaluate the prevalence of GW, it is critical to have the availability/collection of data regarding HPV vaccination status of individual patients, as well as the provision and administration of the vaccine at the clinic. This information, including timing of the HPV vaccine administration and number of doses received, would lead to a more direct approach to evaluation of the coverage and effectiveness of HPV vaccination to prevent GWs.

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