Sexually Transmitted Infection Testing of Adult Film Performers: Is Disease Being Missed?

Cristina Rodriguez-Hart, MPH, Rohit A. Chitale, PhD, MPH,† Robert Rigg, MD,‡ Binh Y. Goldstein, PhD,* Peter R. Kerndt, MD, MPH,* and Paula Tavrow, PhD§*

Background: Undiagnosed sexually transmitted infections (STIs) may be common in the adult film industry because performers frequently engage in unprotected oral and anal intercourse, STIs are often asymptomatic, and the industry relies on urine-based testing.

Methods: Between mid-May and mid-September 2010, a consecutive sample of adult film industry performers recruited from a clinic in Los Angeles, California, that provides medical care to performers was offered oropharyngeal, rectal, and urogenital testing for *Gonorrhea*, and rectal and urogenital testing for *Chlamydia*.

Results: During the 4-month study period, 168 participants were enrolled: 112 (67%) were female and 56 (33%) were male. Of the 47 (28%) who tested positive for *Gonorrhea* and/or *Chlamydia*, 11 (23%) cases would not have been detected through urogenital testing alone. *Gonorrhea* was the most common STI (42/168; 25%) and the oropharynx the most common site of infection (37/47; 79%). Thirty-five (95%) oropharyngeal and 21 (91%) rectal infections were asymptomatic. Few participants reported using condoms consistently while performing or with their personal sex partners.

Conclusions: Adult film industry performers had a high burden of STIs. Undiagnosed asymptomatic rectal and oropharyngeal STIs were common and are likely reservoirs for transmission to sexual partners inside and outside the workplace. Performers should be tested at all anatomical sites irrespective of symptoms, and condom use should be enforced to protect workers in this industry.

Adult film production was established in California as a legal activity in 1988, after the California Supreme Court ruled that filming sexual activity for sale did not meet the criminal definitions of pandering or prostitution and therefore should be protected under the First Amendment.[1] Since this ruling, Los Angeles County (LAC) has become a worldwide center for the production of adult films. In 2005, an estimated 80% of all adult film production occurred in LAC,[2] where an estimated 200 production companies currently employ 2000 to 3000 performers, of whom approximately 75% are female.[3–5]

Adult film industry (AFI) performers face a myriad of risks to their emotional and physical health, suggesting a lack of adequate measures to protect this occupational group. One study found that the risks performers face are very similar to that of sex workers in illegal industries such as in prostitution.[6] A study of the mental health of female performers concluded that they have significantly worse mental health than do female nonperformers of a similar age living in California.[7] Adult film industry performers are routinely exposed to extreme and unhealthy working conditions including prolonged unprotected vaginal and/or anal intercourse with multiple partners over short periods, often resulting in traumatic mucosal injury and direct exposures to potentially infectious bodily fluids from blood, semen, and fecal pathogens.[3,8] Performers' use of condoms on adult film sets is rare. In a systematic review of condom use among a randomly selected sample of adult films released between 2005 and 2006, penile-vaginal and penile-anal intercourses were protected in just 3% and 10% of heterosexual scenes, respectively.[9]

During the 1990s, there were multiple anecdotal reports of HIV infection among performers, and in 1998, the Adult Industry Medical Health Care Foundation was founded to provide HIV testing for the industry after 1 performer allegedly infected 5 female performers.[10] In April 2004, a male performer infected 3 of 14 female performers with HIV within days after testing negative for HIV DNA by polymerase chain reaction.[4,8] After an investigation of this outbreak, the California Occupational Safety and Health Administration determined that the Bloodborne Pathogen Standard applied to the industry and created a Web site to inform AFI workers of their rights and employers of their responsibilities, including having an exposure control plan, an injury and illness prevention plan, providing worker training and any required medical monitoring or vaccination.[11] Despite this determination, the industry has not adopted the required measures, and the California Occupational Safety and Health Administration has begun a process to promulgate regulations specific to the industry.

The Adult Industry Medical Health Care Foundation, which was founded to provide monthly testing for HIV to the heterosexual AFI, added urine-based screening for *Gonorrhea* (*GC*) and *Chlamydia* (*CT*) in 2003.[8] However, owing to the voluntary nature of the screening, the extent to which it is performed or the results checked before employment in the industry is unknown. Screening for HIV and other sexually transmitted infections (STIs) occurs even less frequently in the homosexual AFI, and screening for rectal or oropharyngeal STIs has not been established to date as a routine part of any preemployment medical monitoring in the industry.

The LAC Department of Public Health receives reports of positive cases of STIs in the AFI[5] but does not receive reports on the total number of performers tested, and most cases are identified through urine-based screening. Given these limitations, we undertook the present study (1) to estimate the amount of *GC* and *CT* being missed by urine-based testing alone and (2) to assess

From the *Sexually Transmitted Disease Program, Division of HIV and STD Program, Los Angeles County Department of Public Health, Los Angeles, CA; †Department of International Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD; ‡West Oaks Urgent Care Center, Canoga Park, CA; and §Department of Community Health Sciences, UCLA Fielding School of Public Health, Los Angeles, CA

We thank the University of California, Los Angeles Bixby Center on Population and Reproductive Health for funding the first author's research mentorship with the Los Angeles County Department of Health Sexually Transmitted Disease Program.

Conflicts of interest and source of funding: Cristina Rodriguez-Hart received a grant from the University of California, Los Angeles Bixby Center in Population and Reproductive Health to conduct this. The authors have no conflicts of interest to declare.

Correspondence: Cristina Rodriguez-Hart, MPH, Sexually Transmitted Disease Program, Division of HIV and STD Program, Los Angeles County Department of Public Health, 2615 S Grand Ave, Rm 500, Los Angeles, CA 90007. E-mail: Cristina_Rodriguez-Hart@doh.state.fl.us.

Received for publication July 2, 2012, and accepted August 28, 2012.
DOI: 10.1097/OLQ.0b013e3182716e6e

the prevalence of symptomatic and asymptomatic *CT* and *GC* infections at oropharyngeal, rectal, and urogenital anatomical sites, among a sample of AFI performers.

MATERIALS AND METHODS

The study used a clinic-based, cross-sectional design. Study participants were recruited from a primary care clinic that serves performers in the AFI. All performers who sought care at the clinic between mid-May and mid-September 2010 and were employed in an adult film production in the previous 12 months were offered enrollment. Participants provided written informed consent and completed an interviewer-administered questionnaire that included information on frequency of adult film work, STI history, symptoms, and condom use in adult film productions and with sex partners outside their employment. Results from the participants' first screening were used in the analysis. Site-specific symptoms were elicited either by self-report at the time of enrollment or obtained later through review of their clinic medical records. Estimates for "time since last worked in an adult film" and "years since first beginning adult film work" were based on self-reported month and year since first employment in the AFI and the time since their last production.

Swabs of the oropharynx and rectal mucosa were offered to all participants. In addition, a first-catch urine specimen was collected from all male participants, and a clinician-collected vaginal swab was obtained from all female participants. All specimens were tested for *GC* and *CT*, with the exception of the oropharyngeal swabs, which were only tested for *GC*. All testing was voluntary, and participants could refuse screening of any anatomical site. Specimens were tested for *GC* and *CT* using the GenProbe APTIMA Combo 2 nucleic acid amplification test (GenProbe AC2, San Diego, CA).

All participants diagnosed as having *GC* or *CT* infection were either treated in the clinic or referred for treatment to another facility by clinic staff. The study was approved by the

TABLE 1. Demographic Characteristics and *GC* and *CT* Test Results of Adult Film Performers: Los Angeles, CA; May to September 2010

	Total		Female		Male	
Participant Characteristics	**No.**	**%**	**No.**	**%**	**No.**	**%**
Total participants	168	100	112	67	56	33
Age, y						
18–19	17	10	17*	15	0	0
20–24	48	29	46*	41	2	4
25–29	37	22	26	23	11	20
30–34	27	16	16	14	11	20
35+	39	23	7*	6	32	57
Median (range)	27 (18–54)		23* (18–42)		36 (22–54)	
Race/Ethnicity[†]						
White	128	79	85	79	43	77
Latino	13	8	8	7	5	9
Black	9	6	3*	3	6	11
Asian	6	4	6	6	0	0
Other[‡]	7	4	5	5	2	4
GC and/or *CT*	47	28	30	27	17	30
GC only	39	23	26	23	13	23
CT only	5	3	4	4	1	2
CT + *GC*	3	2	0	0	3	5
Years in the AFI						
1	41	24	31	28	10	18
2–3	47	28	40*	36	7	13
4–7	41	24	26	23	15	28
8+	39	23	15*	13	24	43
Median (range)	3 (1–18)		3* (1–18)		7 (1–18)	
Time since last worked in an adult film, d[§]						
<30	115	69	80	72	35	64
30–60	34	20	20	18	14	26
>60	17	10	11	10	6	11
Condoms on adult film sets[¶]						
Never	46	27	25*	22	21	38
Sometimes	121	72	86[‖]	77	35	63
Always	1	1	1	1	0	0
Condoms off adult film sets[¶]						
Never	38	23	23	21	15	27
Sometimes	122	73	81	72	41	73
Always	8	5	8[‖]	7	0	0

Percentages are rounded up to the nearest whole number.
*χ^2, Fisher exact, or Wilcoxon rank sum test for sex, $P < 0.05$.
[†]n = 163 for race/ethnicity.
[‡]Other includes any participants of more than 1 race/ethnicity.
[§]n = 166 for time since last worked in an adult film; employment in an adult film production in the previous 12 months was an inclusion criterion.
[¶]This includes sex for both vaginal and anal intercourses while excluding oral intercourse, in the previous 12 months.
[‖]χ^2, Fisher exact, or Wilcoxon rank sum test for sex, $P \leq 0.05$.

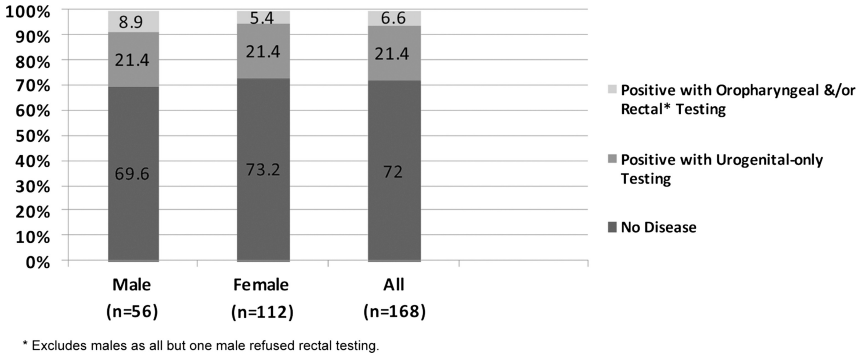

Figure 1. Classification of study participants' disease status based on urogenital-only screening: Los Angeles, CA; May to September 2010.

LAC Department of Public Health institutional review board. All analyses were conducted using STATA 9.0 (College Station, TX).

RESULTS

Participant Characteristics and *GC* and *CT* Positivity

Between mid-May and mid-September 2010, 188 consecutive performers were offered enrollment into the study and 172 (92%) consented to participate. Eight performers were rescreened once, and 1 performer was rescreened twice. Laboratory test results were inconclusive for 4 participants, who were excluded from analysis. Only 1 male performer consented to rectal testing; therefore, men were excluded from any analysis of infections in the rectum.

In total, 168 participants were included in the analysis: 112 (67%) women and 56 (33%) men (Table 1). More than half of participants were younger than 30 years; women were more likely to be younger than 30 years, whereas men were more likely to be older than 30 years ($P < 0.05$). Most participants were white (79%). Years of experience working in the AFI ranged broadly (a median of 3 years for women and 7 years for men, $P < 0.05$), and most performers (69%) had recently worked in an adult film production within the past 30 days. The use of condoms always for vaginal and anal intercourse on- and off-set was low: 1% and 5%, respectively.

Forty-seven (28%) participants had at least 1 infection of *CT* and/or *GC*, with the most common infection among participants being *GC*. Eleven (7% of participants, 23% of cases) *GC* cases would have been missed if urogenital testing alone was conducted: 6 (5%) women and 5 (9%) men (Fig. 1). No *CT* cases would have been missed with urogenital testing alone.

Distribution of *GC* and *CT* Infections Across Anatomical Sites

There were a total of 47 participants diagnosed as having *CT* and/or *GC* infection: 30 (64%) women and 17 (36%) men (Table 2). *Chlamydia*-only infection accounted for 5 (11%) cases: 4 (13%) women and 1 (6%) men. *Gonorrhea*-only infection accounted for 39 (83%) cases: 26 (87%) women and 13 (77%) men. Both *CT* and *GC* coinfections accounted for 3 (6%) cases, with all coinfections among male performers. Among women, all *CT* infections were both urogenital and rectal. Most *GC* infections among women were in all 3 anatomical sites (60%), although some were oropharyngeal only (17%).

Figure 2 shows the overlap in anatomical sites infected with *CT* and/or *GC*. No cases had a rectal-only infection. Thirty-one (19%) cases were infected at more than one anatomical site. Oropharyngeal testing identified the most infections (22%), with urogenital testing close behind (21%). Infection at all 3 sites was the most common infection pattern (38% of positives).

Distribution of Site-Specific Symptomatic and Asymptomatic Infections

Overall, 45% of the 47 *GC* and/or *CT* cases were asymptomatic at all sites (40% of female and 53% of male cases). By anatomical site, rectal and oropharyngeal infections were more likely to be asymptomatic (91% of rectal and 92% of female and 100% of male oropharyngeal infections) compared with urogenital infections (39% of female and 33% of male urogenital infections) (Fig.3). With only urogenital testing and symptoms,

TABLE 2. Chlamydial and Gonoccocal Infections Among AFI Performers by Anatomical Site and Sex: Los Angeles, CA; May to September 2010

	Female		Male*	
Positive Cases†	**No.**	**%**	**No.**	**%**
Total positives (n = 47)	30	100	17	100
CT only (n = 5)				
Urogenital only	0	0	1	6
Urogenital and rectal	4	13	—	—
Subtotal	4	13	1	6
GC only (n = 39)				
Urogenital only	1	3	3	18
Oropharyngeal only	5	17	5	29
Rectal and oropharyngeal	1	3	—	—
Urogenital and oropharyngeal	1	3	5	29
Urogenital, rectal, oropharyngeal	18	60	—	—
Subtotal	26	87	13	77
CT + *GC* (n = 3)				
Urogenital only	0	0	1	6
Urogenital and oropharyngeal	0	0	2	12
Subtotal	0	0	3	18

Percentages are rounded up to the nearest whole number.

*Numbers were not shown for men at rectal anatomical sites because all but 1 man refused rectal testing.

†Only sites where at least 1 participant was positive are shown. Sites where no participants were positive include the following: rectal (*CT* only, *GC* only, and *CT* and *GC* coinfection) and rectal and urethral/vaginal (*GC* only, *CT* and *GC* coinfection).

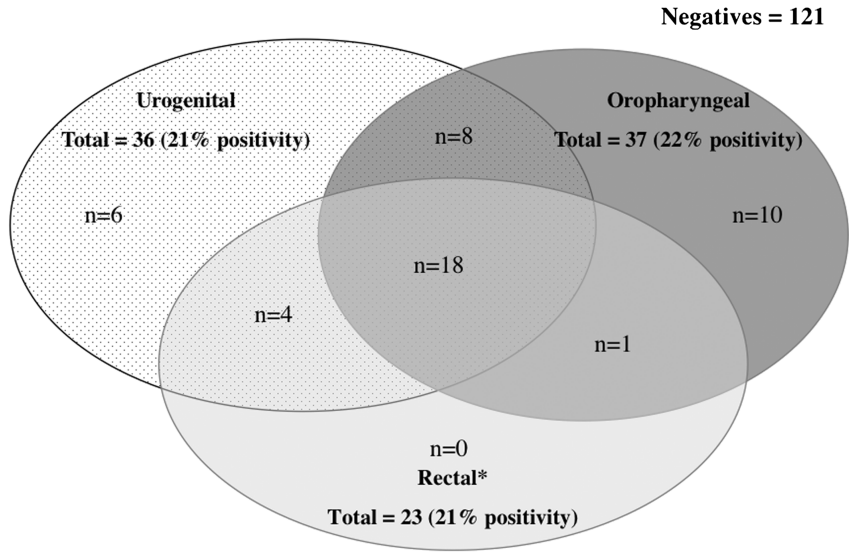

Figure 2. *CT* and/or *GC* positivity (n = 47) among AFI workers by anatomical site: Los Angeles, CA; May to September 2010.

85% (n = 40) of cases would have been identified. Although additional rectal testing among women did not identify any additional cases, additional oropharyngeal testing among men and women detected 7 more cases (15% of cases; data not shown).

DISCUSSION

By examining multiple anatomical site *GC* and *CT* infections, this study found considerable missed STIs among adult film performers in LAC. The prevalence of *CT* and/or *GC* was high, with nearly 30% of participants being infected at 1 or more sites. Compared with the brothel workers of Nevada, another legal sex worker population in the United States, *GC* and *CT* prevalence in this study is significantly higher. As of the late 1980s, brothel workers in Nevada have been required by state law to use condoms for every type of sex act and to be tested weekly for STIs.[12] Since the implementation of these regulations, these brothel workers have not had a single case of HIV, and their STI rates are negligible. Our participant characteristics were similar to that of Goldstein et al.,[5] but our sample had a much higher ratio of *GC* to *CT*. This can be partly explained by the fact that our study tested everyone for oropharyngeal *GC*, which is generally not done in screening programs in the United States, and the different time frames of the studies.[13]

One important finding of this study is that performers had more undiagnosed infections than previously thought and were thus more likely to transmit these infections despite compliance with screening standards common to the industry. In

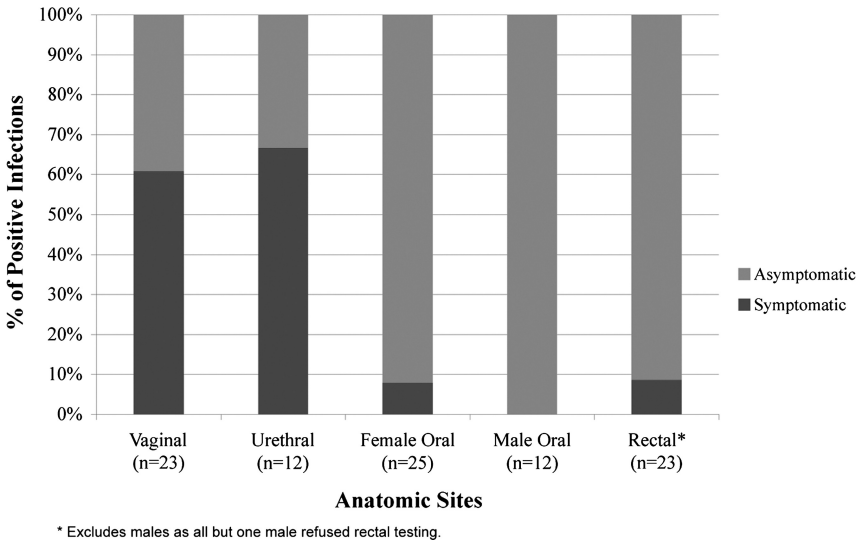

Figure 3. Distribution of site-specific symptomatic and asymptomatic gonoccocal and/or chlamydial infections among AFI workers by anatomical site: Los Angeles, CA; May to September 2010.

the study of Goldstein et al.,[5] the annual cumulative incidence of *CT* and *GC* among performers was more than 14% and 5%, respectively, which may be as high as 8.5 times that of LAC residents for *CT* and 34 times for *GC*. Although the incidence reported by Goldstein et al. is high, it is based on urine-only testing. Given urine-only testing as the industry standard,[8] our study found a considerable amount of missed infection (23% of cases). This result was also found in a study of AFI performers in the United Kingdom, where 60% of *GC* infections were detected only through oropharyngeal and/or rectal testing.[14] In addition, three quarters of the UK performers had at least 1 sexual partner outside work, with whom 90% reported inconsistent condom use. The AFI claims that performers are cleared to work based on a negative urine test result within the previous 30 days. Therefore, these undiagnosed oropharyngeal and rectal infections likely serve as a reservoir for STI transmission to sexual partners inside and outside the AFI.

Approximately a third (34%) of positive cases were infected at only 1 site. The amount of discordance in positivity between anatomical sites suggests several points: (1) expanding the number of anatomical sites tested for STIs could reduce the amount of missed infections; (2) the current lack of condoms in heterosexual adult film production is more dangerous than previously thought because a number of performers positive for an STI are being missed; and (3) the practice of male performers penetrating multiple anatomical sites of women during a given scene potentially promotes undetected disease transmission. Despite our finding that performers positive for STIs are being missed by current testing standards, our results most likely remain underestimates because we did not test for *CT* in the oropharynx and were unable to obtain consent for rectal testing among male performers.

Although men represent a smaller proportion of the performer population, they may serve as an important reservoir of STI transmission. Among male participants, 12 (21%) had an oropharyngeal *GC* infection. Discussion with the recruiting physician at the time of enrollment suggests that most of these men considered themselves heterosexual. Self-identification as heterosexual was the main reason male participants refused rectal testing; that is, they did not acknowledge or believe that they were at risk for rectal infection owing to their heterosexual status. This study provides insufficient evidence to more conclusively understand the high prevalence of oropharyngeal infection among men. Given the widespread refusal of men to consent to rectal testing and the presence of only 1 rectal infection in a woman that was not accompanied by a urogenital infection, we do not have sufficient data to know the importance of rectal infections in spreading STIs among performers and their sexual partners.

Consistent condom use on-set and off-set for vaginal and anal intercourse in the past 12 months was very low among participants. The AFI claims that condoms are unnecessary for performers because they are regularly tested for STIs. However, the high prevalence of STIs in this sample indicates that regular STI screening is not sufficient to protect performers from occupational exposures. In addition, the infrequent use of condoms in the personal lives of performers creates an opportunity for STIs to enter the performer population and, likewise, to enter the larger community with whom performers have sexual intercourse.

Performers may rely on the presence of STI symptoms to seek out testing, and health care providers serving performers may look for symptoms to administer presumptive treatment. Based on these results, however, relying on symptoms would not have captured a third of urogenital infections and nearly all oropharyngeal and rectal infections. This reinforces the point that performers must be tested for STIs at all anatomical sites and that treatment given to performers should be appropriate for clearing oropharyngeal infections as well as urogenital and rectal infections.

The high prevalence of STI infections and the discordance between anatomical sites are especially concerning because the potential for rapid STI transmission within this group is great. The attack rate for the 2004 outbreak of HIV in the AFI was 23%, and 61 primary and secondary sexual contacts were exposed in 23 days.[8] A male performer diagnosed as having HIV in 2010 had 16 primary sexual contacts within the 8 weeks before his HIV and oropharyngeal *GC* diagnosis, 2 of whom were discovered later to have had HIV at the time of filming. In addition to the large number of sexual contacts, the high geographic mobility of performers contributes to the increasing potential for disease transmission. Of the 161 participants with valid zip codes, 20 (12%) designated 7 states other than California as their home of record, and among these, 5 (25%) had an STI (data not shown). If they reside in the states they listed, there is a significant possibility of STIs acquired in LAC being spread to individuals in cities to which performers return.

Our study findings agree with much of the literature on extragenital STIs, which has largely focused on the men who have sex with men (MSM) community. Studies of extragenital infections among MSM reveal an alarming prevalence of such infections, often at greater levels than urethral infections, and for which most individuals are asymptomatic.[15–21] There is also evidence that oropharyngeal infections can be transmitted to the urethra in the absence of other forms of sexual intercourse.[22] Studies assessing extragenital infections among MSM reveal that a significant proportion of STIs are missed by urethral-only testing, in some cases, as much as 60% to 80% of infections.[16,18,21] A study of extragenital infections among female participants in the Netherlands found that testing at the oropharynx and rectum increased the prevalence of *CT* by 9.5% and *GC* by 31%, as compared with only conducting endocervical testing.[23]

Because performers in the AFI are a highly stigmatized population and are a difficult population to identify for any study, we used a convenience sample of performers who sought services at a trusted primary care clinic, which may have introduced selection bias. In addition, nearly all male participants refused rectal screening; thus, the site-specific prevalence of rectal *GC* and *CT* for male performers was unable to be assessed. We collected no information on the sexual partners of participants and therefore cannot account for the surprisingly high prevalence of oropharyngeal infections or the sexual networks of performers. In addition, we do not know why each participant was seeking care when he/she was recruited. Our sample could therefore represent a group who felt that they were at high risk for STIs or specifically seeking treatment of a known STI, thus overestimating positivity. If care seeking was based on the presence of symptoms, we could potentially have missed asymptomatic cases. This seems unlikely, however, because nearly half of our cases were asymptomatic. The median number of years worked in the AFI was 3. Therefore, we may have a sample of more established performers. This could be a group more likely to be infected and/or to know where they can seek care. Despite these limitations, this study is the first to look at multiple anatomical site *GC* and *CT* infections among performers in the United States.

The results of this study suggest that many performers in the AFI are not safe on the job from acquiring and transmitting STIs at multiple anatomical sites. The current standard

of urine-only testing is insufficient for protecting performers. Repeated and chronic infection with STIs can lead to infertility, chronic pelvic pain, and ectopic pregnancies and can facilitate HIV infection.[13] For health care providers serving performers, our results indicate that screening of the oropharynx and rectum should be routine, and performers found to be positive should be appropriately treated to clear infection from all infected sites. For occupational health policy considerations, results of this study indicate that barrier protection is needed on adult film sets for all penetrative sexual acts, and unprotected sexual intercourse with multiple anatomical sites within a single scene should be discouraged within this industry. Performers need worksite safety and health information to better understand their risks and to know that they may acquire and transmit STIs for which they have no symptoms. Adult film industry performers in California are workers in a legal industry and should be subject to the same workplace safety standards from which workers in other industries benefit.

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