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Rectal *Chlamydia trachomatis* and *Neisseria gonorrhoeae* Infections Among Women Reporting Anal Intercourse

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Abstract

OBJECTIVE: To examine the prevalence and treatment of rectal *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections among women reporting receptive anal intercourse in a network of sexually transmitted disease or sexual health clinics and estimate the proportion of missed infections if women were tested at the genital site only.

METHODS: We conducted a cross-sectional analysis of *C trachomatis* and *N gonorrhoeae* test results from female patients reporting receptive anal intercourse in the preceding 3 months during visits to 24 sexually transmitted disease clinics from 2015 to 2016. Primary outcomes of interest were 1) anatomic site-specific *C trachomatis* and *N gonorrhoeae* testing and positivity among women attending selected U.S. sexually transmitted disease clinics who reported receptive anal intercourse and 2) the proportion of rectal infections that would have remained undetected if only genital sites were tested.

RESULTS: Overall, 7.4% (3,743/50,785) of women reported receptive anal intercourse during the 2 years. Of the 2,818 women tested at both the genital and rectal sites for *C trachomatis*, 292 women were positive (61 genital only, 60 rectal only, and 171 at both sites). Of the 2,829 women tested at both the genital and rectal sites for *N gonorrhoeae*, 128 women were positive (31 genital only, 23 rectal only, and 74 at both sites). Among women tested at both anatomic sites, the proportion of missed *C trachomatis* infections would have been 20.5% and for *N gonorrhoeae* infections, 18.0%.

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CONCLUSION: Genital testing alone misses approximately one fifth of *C trachomatis* and *N gonorrhoeae* infections in women reporting receptive anal intercourse in our study population. Missed rectal infections may result in ongoing transmission to other sexual partners and reinfection.

Chlamydia trachomatis and *Neisseria gonorrhoeae* infections are two of the most common bacterial sexually transmitted infections in the United States. In 2016, among women, there were more than 1 million cases of *C trachomatis* (657/100,000) and nearly 200,000 cases of *N gonorrhoeae* (121/100,000) reported.¹ Currently, the U.S. Preventive Services Task Force and the Centers for Disease Control and Prevention recommend routine screening for both *C trachomatis* and *N gonorrhoeae* in all sexually active women aged 24 years and younger and in women 25 years or older who are at increased risk.² Although screening recommendations for women focus on urogenital disease, *C trachomatis* and *N gonorrhoeae* infections may occur at extragenital sites, including the rectum, concurrently with or independent of genital infection.

Numerous studies have highlighted the importance of screening for *C trachomatis* and *N gonorrhoeae* infection in extragenital sites in addition to genital specimens in men who have sex with men.^{3–6} In a cohort of men who have sex with men tested in a network of U.S. sexually transmitted disease (STD) clinics, testing for only genital infections missed 70% of all prevalent *C trachomatis* and *N gonorrhoeae* infections in this population.⁵ Centers for Disease Control and Prevention recommendations include that clinicians use the patient-reported history of sexual exposure to guide site-specific screening (eg, *C trachomatis* and *N gonorrhoeae* rectal testing in men who report receptive anal intercourse during the preceding year).² There are currently no recommendations for extragenital screening among women.

We aimed to examine the prevalence and treatment of rectal *C trachomatis* and *N gonorrhoeae* among women reporting receptive anal intercourse in a network of STD or sexual health clinics and estimate the proportion of missed infections if women were tested at the genital site only.

MATERIALS AND METHODS

This was a cross-sectional analysis using data from the STD Surveillance Network, a sentinel surveillance system comprised of 10 state and local health jurisdictions conducting facility-based surveillance in publicly funded, urban STD or sexual health clinics. Five of the 10 jurisdictions collect and transmit data on self-reported sexual practices among women and contributed data to this analysis: Baltimore, Los Angeles, Multnomah County, New York City, and Philadelphia. Each jurisdiction has between one and 12 STD clinics, which are operated directly by the jurisdiction and have their own protocol for rectal *C trachomatis* and *N gonorrhoeae* testing in women.

The data collected in the STD Surveillance Network include age, race, ethnicity, coinfection with human immunodeficiency virus (HIV; defined as documentation of a positive HIV antibody test or a self-reported history of HIV infection) as well as information on sexual risk behavior. Specifically, clients are asked about anatomic site(s) of sexual exposure and number and sex of sexual partner(s) in the previous 3 months. Results of nucleic acid

amplification tests for *C trachomatis* and *N gonorrhoeae* and treatment are also recorded. Treatment data were analyzed by reviewing antibiotic drug and dose regimens prescribed within 3 weeks of specimen collection on or after the visit where they reported receptive anal intercourse.

We identified all visits from January 2015 to December 2016 in which a female patient reported receptive anal intercourse in the preceding 3 months. To minimize overrepresentation of women who presented for care multiple times, we included only the first visit at which rectal intercourse was reported in the analysis. For each visit, we determined whether there was a documented *C trachomatis* or *N gonorrhoeae* test on the visit in which receptive anal intercourse was reported and estimated anatomic site-specific testing coverage (eg, number of women for whom a rectal *C trachomatis* or *N gonorrhoeae* test was recorded/total number of women in whom receptive anal intercourse was reported). We estimated anatomic site-specific *C trachomatis* and *N gonorrhoeae* positivity (eg, number of positive rectal *C trachomatis* or *N gonorrhoeae* tests divided by the total number of positive or negative rectal *C trachomatis* or *N gonorrhoeae* tests); genital positivity was based on a positive result from a test conducted on an endocervical, vaginal, or urine specimen. We determined the proportion of rectal infections that would be missed if only genital screening was performed by calculating the number of women with a positive rectal-only test/total number tested at both the rectal and genital anatomic sites.

All laboratories serving the participating STD clinics completed verification studies per Clinical Laboratory Improvement Amendments specifications to demonstrate adequate nucleic acid amplification performance on rectal specimens. Only positive and negative nucleic acid amplification results were included in the overall analysis. Data analysis was performed using SAS 9.3. The STD Surveillance Network project was reviewed by the Centers for Disease Control and Prevention and was determined not to be research, so institutional review board review was not required.

RESULTS

Between January 2015 and December 2016, 94,094 visits were made by 50,785 women to STD clinics in the five jurisdictions included in this analysis. Visits when receptive anal intercourse was reported (n=4,245) were made by 3,743 unique women, or 7.4% of the total women presenting for care during the 2-year period. The majority (89.8%) of women had only one such visit during the 2-year observation period; 8.2% (n=307) of women had two visits when receptive anal intercourse was reported and 1.8% (n=74) had three to 10 visits when receptive anal intercourse was reported. The proportion of women who reported receptive anal intercourse varied across the five STD Surveillance Network jurisdictions: 572 (10.2%) in Baltimore, 690 (9.0%) in Los Angeles, 116 (8.8%) in Multnomah County, 487 (5.9%) in Philadelphia, and 1,878 (6.7%) in New York City. Nearly two thirds were older than 24 years of age, and almost half of the women were of black race (Table 1). Less than 1% (n=26) of the women were known to be living with diagnosed HIV and the majority (92%) reported only male sex partners (data not shown).

In the period of 2015–2016, 94.1% (n=3,523) of female patients were tested at the urogenital site for *C trachomatis* and 94.5% for *N gonorrhoeae* (Fig. 1). The overall proportion of women tested at the rectal site for *C trachomatis* and *N gonorrhoeae* was 76.9% (n=2,878). Testing at the rectal site for *C trachomatis* and *N gonorrhoeae* differed by jurisdiction, ranging from 49.1% to 91.4%. Among women tested only at the genital site, *C trachomatis* positivity was 9.1% (median 7.1%; jurisdiction range 4.4–12.1%) and *N gonorrhoeae* positivity was 5.4% (median 4.4%; jurisdiction range 0.0–7.1%). Less than 0.1% of the urogenital tests performed for *C trachomatis* or *N gonorrhoeae* had invalid results. Among women tested at the rectal site only, *C trachomatis* positivity was 26.7% (median 16.0%; jurisdiction range 0–41.7%) and *N gonorrhoeae* positivity was 6.1% (median 4.2%; jurisdiction range 0–17.0%). Less than 0.3% of the rectal tests performed for *C trachomatis* or *N gonorrhoeae* had invalid results.

Of the 3,743 women who reported receptive anal intercourse, the majority (n=3,585) were *C trachomatis* and *N gonorrhoeae* tested at the genital or rectal site. Although most women were tested for *C trachomatis* and *N gonorrhoeae* at the genital site, there were a few more women tested for *N gonorrhoeae* when compared with *C trachomatis* only (3,523 vs 3,536). The *C trachomatis* and *N gonorrhoeae* genital testing rate was near 90% or above across all age and race and Hispanic ethnicity groups (except for unknown race). However, there was considerable variation by STD Surveillance Network jurisdiction in the proportion of women tested at the rectal site when receptive anal intercourse was reported (Table 1).

In the subsample of women who were tested at both the genital and rectal sites for *C trachomatis* (n=2,818), 292 (10.4%) women with infections were identified. Of these 292 women, 61 (20.9%) were positive for genital *C trachomatis*-only infections, 171 (58.6%) were positive for *C trachomatis* at both the rectal and genital sites, and 60 (20.5%) were positive at the rectal site only (Fig. 1). Rectal testing increased the number of *C trachomatis* cases detected by 25.9% from 232 to 292 chlamydia cases.

In the subsample of women who were tested at both the genital and rectal sites for *N gonorrhoeae* (n=2,830), a total of 128 (4.5%) *N gonorrhoeae* infections were identified (Fig. 1). There were 31 (24.2%) women with genital *N gonorrhoeae*-only infections, 74 (57.8%) were positive for *N gonorrhoeae* at both the rectal and genital sites, and 23 (18.0%) were exclusively rectal infections. Rectal testing increased the number of *N gonorrhoeae* cases by 21.9% from 105 to 128 *N gonorrhoeae* cases.

The proportion of rectal infections in the group of women tested at both anatomic sites that would have been missed if only genital testing had been done could potentially be extrapolated to the women tested at the genital site only. From Figure 1, there were women who were *C trachomatis* tested (n=705) and for *N gonorrhoeae* (n=707) at the genital site only and, hence, there is no way to know precisely how many of these women would have tested positive for either pathogen at the rectal site. Assuming infection rates were the same among women reporting receptive anal intercourse (regardless of whether or not they had a rectal test), one can estimate how many of these women (urogenital testing only) would have been positive for a rectal-only infection had they been tested at the rectal and urogenital sites. In the case of *C trachomatis*, 60 of 2,818 women (95% CI 2.1%, 0.5–4.9%) were

positive for *C trachomatis* rectal only and if applied to the women who were tested at the genital site only, presumably 4–34 more women might have had a rectal *C trachomatis* infection despite possibly being negative at the urogenital site. In the case of *N gonorrhoeae*, another 2–14 (95% CI 0.8%, 0.3–2.0%) more women might have had a rectal *N gonorrhoeae* infection identified.

Of the 247 women with rectal *C trachomatis* infections, 178 had documented treatment; 170 (68.8%) were treated with 1 g azithromycin (single dose) and eight (3.2%) were treated with oral doxycycline (100 mg twice daily for 14 days) within 21 days of a positive laboratory test. The majority (79%) were treated within 1 week of diagnosis. Treatment information was not available for the remaining 28.0% of the patients. The proportion treated with doxycycline and those treated with azithromycin did not significantly differ by anatomic site of infection (rectal only vs genital and rectal) (data not shown). Of the 100 women with rectal *N gonorrhoeae* infections, 74 (74.0%) were treated with 250 mg ceftriaxone and 1 g azithromycin within 21 days of a positive laboratory test; the majority (86%) were treated within 1 week of diagnosis. Treatment information was not available for the remaining 26.0% of the patients.

DISCUSSION

Using routinely collected STD clinic data, our analysis demonstrates a high proportion of rectal *C trachomatis* or *N gonorrhoeae* infections among women reporting anal sex, similar to the proportion with genital infections. Overall, 20.5% of *C trachomatis* rectal infections and 18.0% of *N gonorrhoeae* infections would have been missed and untreated by genital screening alone. Our findings are consistent with other studies that suggest that 20–40% of *N gonorrhoeae* infections and 10–25% of *C trachomatis* infections in women would be missed if rectal sites were not tested.^{7–14} Although STD clinics may routinely ask questions about receptive anal intercourse in clinical assessments, the practice of testing at the rectal sites in STD clinics varied considerably by jurisdiction.

One of the primary goals of routine screening for *C trachomatis* and *N gonorrhoeae* is to prevent long-term morbidity such as infertility and ectopic pregnancy in women. These sequelae usually result from genital infections ascending to the upper genital tract, explaining why testing efforts have traditionally focused on genital sites. However, rectal infections may affect upper genital tract disease by autoinoculation, a process in which the vaginal site is inoculated with an infection in the rectum.^{15,16} Although the contribution of this suspected transmission has yet to be quantified, more research is needed to gain insight into the relevance of rectal infections in women in terms of sequelae. Even without obvious associated morbidity, it remains important to identify missed rectal infections that can spread to male sex partners who pose additional risk to their female partners.

Missed rectal infections in women is also problematic for prevention messages, especially given that receptive anal intercourse is a relatively common practice among heterosexual populations. In a recent nationally representative survey of more than 10,000 men and women in the United States, approximately 13.2% of women aged 15–44 years reported hetero-sexual anal intercourse in the year before the survey, with women aged 20–29

reporting the highest prevalence at 15.9%.¹⁷ In 2008, a study conducted in three public STD clinics reported 18.7% of women had heterosexual receptive anal intercourse in a given 3-month interval.¹⁸ Receptive anal intercourse is also a highly efficient mode of HIV transmission because it is associated with higher rates of HIV transmission than vaginal intercourse.^{19,20} Previous studies have also reported condom use with receptive anal intercourse among heterosexuals is frequently low.^{18,21–23} The practice of anal sex is often discussed in the context of homosexuality but remains underreported and often associated with stigma among women who report this practice.²⁴ Public health research on women's engagement in receptive anal intercourse remains relatively scarce, resulting in a missed opportunity to advance the field of women's sexual health and in controlling the spread and sequelae of STDs and preventing HIV.

Our study has important limitations. First, our findings may not be generalizable to all female STD clinic attendees or the general female population. Second, the design of our study deliberately selected women reporting receptive anal intercourse, potentially missing women with rectal infections who did not report receptive anal intercourse and underestimating the prevalence of rectal *C trachomatis* and *N gonorrhoeae*. Third, previous investigators have suggested the possibility that rectal *C trachomatis* and *N gonorrhoeae* in women represent false-positive results or cross-contamination or both.^{15,25,26} Although concordance between results of genital and rectal testing in women is strong, given our observed findings, a sizeable proportion is positive for rectal infection while simultaneously negative at the genital site. This would argue for more screening at the rectal site, even among women attending STD clinics who do not report receptive anal intercourse. Lastly, there were no data available for condom use or rectal symptoms to stratify positivity by screening compared with diagnostic testing.

Our data reveal that a sizeable burden of *C trachomatis* and *N gonorrhoeae* infections would have been missed and untreated if only genital testing was performed, supporting rectal screening among women reporting receptive anal intercourse seeking care in STD clinics. Future studies describing the clinical consequences of rectal *C trachomatis* and *N gonorrhoeae* infections and the cost-benefit of rectal screening are needed to inform future sexually transmitted infection screening guidelines. Although our data might not have included a low-risk heterosexual population, nationally representative data suggest that receptive anal intercourse is common among sexually active women, including those not seen in STD clinics. Unprotected receptive anal intercourse with an infected partner can present a risk for HIV and sexually transmitted infection acquisition, underscoring the importance of discussing receptive anal intercourse and its risks to patients in various health care settings, particularly among settings with a focus on women's health.

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REFERENCES

1. Centers for Disease Control and Prevention. Sexually transmitted disease surveillance 2016. Atlanta (GA): Department of Health and Human Services; 2017.
2. Workowski KA, Bolan GA; Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines, 2015 [published erratum appears in MMWR Recomm Rep 2015;64:924]. MMWR Recomm Rep 2015;64:1–137.
3. Kent CK, Chaw JK, Wong W, Liska S, Gibson S, Hubbard G, et al. Prevalence of rectal, urethral, and pharyngeal chlamydia and gonorrhea detected in 2 clinical settings among men who have sex with men: San Francisco, California, 2003. Clin Infect Dis 2005;41:67–74. [PubMed: 15937765]
4. Schachter J, Moncada J, Liska S, Shayeveich C, Klausner JD. Nucleic acid amplification tests in the diagnosis of chlamydial and gonococcal infections of the oropharynx and rectum in men who have sex with men. Sex Transm Dis 2008;35:637–42. [PubMed: 18520976]
5. Patton ME, Kidd S, Llata E, Stenger M, Braxton J, Asbel LE, et al. Extragenital gonorrhea and chlamydia testing and infection among men who have sex with men—STD Surveillance Network, United States, 2010–2012. Clin Infect Dis 2014;58:1564–70. [PubMed: 24647015]
6. Anschuetz GL, Paulukonis E, Powers R, Asbel LE. Extragenital screening in men who have sex with men diagnoses more Chlamydia and gonorrhea cases than urine testing alone. Sex Transm Dis 2016;43:299–301. [PubMed: 27100766]
7. Barry PM, Kent CK, Philip SS, Klausner JD. Results of a program to test women for rectal chlamydia and gonorrhea. Obstet Gynecol 2010;115:753–9. [PubMed: 20308835]
8. Hunte T, Alcaide M, Castro J. Rectal infections with chlamydia and gonorrhoea in women attending a multiethnic sexually transmitted diseases urban clinic. Int J STD AIDS 2010;21:819–22. [PubMed: 21297090]
9. van Liere GA, Hoebe CJ, Wolffs PF, Dukers-Muijters NH. High co-occurrence of anorectal chlamydia with genital chlamydia in women visiting an STI clinic revealed by routine universal testing in an observational study; a recommendation towards a better anorectal chlamydia control in women. BMC Infect Dis 2014;14:274. [PubMed: 24885306]
10. Bazan JA, Carr Reese P, Esber A, Lahey S, Ervin M, Davis JA, et al. High prevalence of rectal gonorrhea and chlamydia infection in women attending a sexually transmitted disease clinic. J Womens Health (Larchmt) 2015;24:182–9. [PubMed: 25692800]
11. Javanbakht M, Gorbach P, Stirland A, Chien M, Kerndt P, Guerry S. Prevalence and correlates of rectal Chlamydia and gonorrhea among female clients at sexually transmitted disease clinics. Sex Transm Dis 2012;39:917–22. [PubMed: 23191945]
12. Trebach JD, Chaulk CP, Page KR, Tuddenham S, Ghanem KG. Neisseria gonorrhoeae and Chlamydia trachomatis among women reporting extragenital exposures. Sex Transm Dis 2015; 42:233–9. [PubMed: 25868133]
13. Danby CS, Cosentino LA, Rabe LK, Priest CL, Damare KC, Macio IS, et al. Patterns of extragenital chlamydia and gonorrhea in women and men who have sex with men reporting a history of receptive anal intercourse. Sex Transm Dis 2016; 43:105–9. [PubMed: 26766527]
14. Gratrix J, Singh AE, Bergman J, Egan C, Plitt SS, McGinnis J, et al. Evidence for increased chlamydia case finding after the introduction of rectal screening among women attending 2 Canadian sexually transmitted infection clinics. Clin Infect Dis 2015;60:398–404. [PubMed: 25336625]
15. Rank RG, Yeruva L. Hidden in plain sight: chlamydial gastrointestinal infection and its relevance to persistence in human genital infections. Infect Immun 2014;82:1362–71. [PubMed: 24421044]
16. Hocking JS, Kong FY, Timms P, Huston WM, Tabrizi SN. Treatment of rectal chlamydia infection may be more complicated than we originally thought. J Antimicrob Chemother 2015;70:961–4. [PubMed: 25480490]
17. Benson LS, Martins SL, Whitaker AK. Correlates of heterosexual anal intercourse among women in the 2006–2010 National Survey of Family Growth. J Sex Med 2015;12: 1746–52. [PubMed: 26289541]
18. Tian LH, Peterman TA, Tao G, Brooks LC, Metcalf C, Malotte CK, et al. Heterosexual anal sex activity in the year after an STD clinic visit. Sex Transm Dis 2008;35:905–9. [PubMed: 18685549]

19. Halperin D Heterosexual anal intercourse: prevalence, cultural factors, and HIV infection and other health risks, Part 1. *AIDS Patient Care STDS* 1999;13:717–30. [PubMed: 10743535]
20. Boily MC, Baggaley RF, Wang L, Masse B, White RG, Hayes RJ, et al. Heterosexual risk of HIV-1 infection per sexual act: systematic review and meta analysis of observational studies. *Lancet Infect Dis* 2009;9:118–29. [PubMed: 19179227]
21. Baldwin JI, Baldwin JD. Heterosexual anal intercourse: an understudied, high-risk sexual behavior. *Arch Sex Behav* 2000;29:357–73. [PubMed: 10948725]
22. Houston AM, Fang J, Husman C, Peralta L. More than just vaginal intercourse: anal intercourse and condom use patterns in the context of ‘main’ and ‘casual’ sexual relationships among urban minority adolescent females. *J Pediatr Adolesc Gynecol* 2007;20:299–304. [PubMed: 17868897]
23. Gross M, Holte SE, Marmor M, Mwatha A, Koblin BA, Mayer KH. Anal sex among HIV-seronegative women at high risk of HIV exposure. *J Acquir Immune Defic Syndr* 2000;24: 393–8. [PubMed: 11015157]
24. McBride KR, Fortenberry JD. Heterosexual anal sexuality and anal sex behaviors: a review. *J Sex Res* 2010;47:123–36. [PubMed: 20358456]
25. Yeruva L, Spencer N, Bowlin AK, Wang Y, Rank RG. Chlamydial infection of the gastrointestinal tract: a reservoir for persistent infection. *Pathog Dis* 2013;68:88–95. [PubMed: 23843274]
26. Dukers-Muijters NH, Schachter J, van Liere GA, Wolffs PF, Hoebe CJ. What is need to guide testing of anorectal and pharyngeal Chlamydia trachomatis and Neisseria gonorrhoeae in women and men? Evidence and opinion. *BMC Infect Dis* 2015; 15:533. [PubMed: 26576538]

Fig. 1.

Anatomic site distribution of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infection testing in women attending STD Surveillance Network sexually transmitted disease clinics who reported receptive anal intercourse. *The number of women tested for gonorrhea was not equal to the number of women tested for chlamydia infection; two patients were tested for gonorrhea only.

Table 1.

Chlamydia and Gonorrhea Testing and Positivity Among Women Who Reported Anal Intercourse (n=3,743), by Selected Characteristics, STD Surveillance Network, 2015–2016

Characteristic	n	Chlamydia				Gonorrhea			
		Genital Testing		Rectal Testing		Genital Testing		Rectal Testing	
		No. Tested (%)	No. Positive (%)	No. Tested	No. Positive (%)	No. Tested	No. Positive (%)	No. Tested	No. Positive (%)
Missing									
24 or fewer	1,049	985 (93.9)	154 (15.6)	820 (74.2)	133 (16.2)	989 (94.3)	56 (5.7)	820 (74.2)	43 (5.2)
25–34	1,543	1,469 (95.2)	97 (6.6)	1,230 (82.4)	79 (5.4)	1,470 (95.3)	50 (3.4)	1,230 (82.4)	31 (2.5)
35 or greater	964	916 (95.0)	28 (3.1)	738 (79.1)	24 (3.3)	924 (95.9)	22 (2.4)	738 (79.1)	14 (1.9)
Missing	187	153 (81.8)	17 (11.1)	90 (48.1)	11 (12.2)	153 (81.8)	15 (9.8)	90 (48.1)	12 (13.3)
Race–ethnicity									
White, non-Hispanic	562	532 (94.7)	34 (6.4)	424 (75.4)	28 (6.6)	532 (94.7)	20 (3.8)	424 (75.4)	11 (2.6)
Black, non-Hispanic	1,744	1,653 (94.8)	118 (7.1)	1,441 (82.6)	109 (7.6)	1,663 (95.4)	64 (3.9)	1,441 (82.6)	51 (3.5)
Hispanic	893	848 (95.0)	94 (11.1)	667 (74.7)	68 (10.2)	850 (95.2)	33 (3.9)	667 (74.7)	19 (2.9)
Asian	97	90 (92.8)	8 (8.9)	82 (84.5)	11 (13.4)	90 (92.8)	0 (0)	82 (84.5)	0 (0)
Other	151	146 (96.7)	13 (8.9)	111 (73.5)	13 (11.7)	147 (97.4)	8 (5.4)	111 (73.5)	4 (3.6)
Unknown	296	254 (85.8)	29 (11.4)	153 (51.6)	18 (11.8)	254 (85.8)	18 (7.1)	153 (51.6)	15 (9.8)
Jurisdiction									
Baltimore	572	521 (91.1)	39 (7.5)	523 (91.4)	42 (8.0)	534 (93.4)	26 (4.9)	523 (91.4)	25 (4.8)
Los Angeles	690	623 (90.3)	72 (11.6)	339 (49.1)	39 (11.5)	623 (90.3)	44 (7.1)	339 (49.1)	25 (7.4)
Multnomah County	116	109 (94.0)	8 (7.3)	67 (57.7)	5 (7.5)	109 (94.0)	5 (4.6)	67 (57.7)	2 (3.0)
New York City	1,878	1,809 (96.3)	129 (7.1)	1,528 (81.4)	112 (7.3)	1,809 (96.3)	48 (2.7)	1,528 (81.4)	30 (2.0)
Philadelphia	487	461 (94.7)	48 (10.4)	421 (86.4)	49 (11.6)	461 (94.7)	20 (4.3)	421 (86.4)	18 (4.3)