



# HHS Public Access

Author manuscript

*Int J STD AIDS*. Author manuscript; available in PMC 2018 October 24.

Published in final edited form as:

*Int J STD AIDS*. 2018 October ; 29(12): 1204–1214. doi:10.1177/0956462418779662.

## Cervical cancer screening among transactional female sex workers in the Dominican Republic

Sheyla D Richards<sup>1</sup>, Samantha Stonbraker<sup>2,3</sup>, Mina Halpern<sup>3</sup>, and Silvia Amesty<sup>1,4,5</sup>

<sup>1</sup>Program for Global and Population Health, Columbia University Vagelos College of Physicians and Surgeons, New York, NY, USA

<sup>2</sup>Columbia University School of Nursing, New York, NY, USA

<sup>3</sup>Clínica de Familia, La Romana, Dominican Republic

<sup>4</sup>Heilbrunn Department of Population and Family Health, Columbia University, Mailman School of Public Health, New York, NY, USA

<sup>5</sup>Center for Family and Community Medicine, Columbia University Vagelos College of Physicians and Surgeons, New York, NY, USA

### Abstract

Cervical cancer is the third leading cause of cancer-related death and the second most diagnosed cancer among women in developing countries. We determined the prevalence of abnormal Papanicolaou (Pap), high-risk HPV (hrHPV), and colposcopy among transactional female sex workers (FSWs) in La Romana, Dominican Republic. The results of 144 FSWs of ages 18–54 years who completed a demographic interview and Pap testing with hrHPV detection between June 2015 and April 2016 were analyzed. Women with abnormal results were referred for colposcopy. Risk factors for abnormal Pap were assessed through bivariate and multivariate analyses. Overall, 36.1% (52/144) of Paps were abnormal and 43.4% (62/143) had hrHPV. Of all women with hrHPV and/or abnormal Pap (68/144; 47.2%), 61 (89.7%) were referred and 16 (26.2) underwent colposcopy. HPV16 and/or 18/45 was detected in 33.3% (15/45) of low-grade Paps. Binge drinking, weekly (AOR 5.1, 95% CI: 1.8–14.5) or daily (AOR 4.9, 95% CI: 1.5–16.6), and age at first sexual relation (AOR 1.2, 95% CI: 1.0–1.5) were significantly associated ( $p < 0.05$ ) with abnormal Pap. Although almost half of participants had abnormal Pap or hrHPV, few underwent colposcopy. Improving access to cervical cancer screening and follow-up for FSWs is imperative.

### Keywords

Human papillomavirus (HPV); screening; cervical dysplasia; sex workers; epidemiology

Reprints and permissions: [sagepub.co.uk/journalsPermissions.nav](http://sagepub.co.uk/journalsPermissions.nav)

**Corresponding author:** Sheyla Richards, Program for Global and Population Health, Columbia University, Vagelos College of Physicians and Surgeons, 60 Haven Avenue, Suite B4, Rm 426, New York 10032, NY, USA. [sheyla.richards@gmail.com](mailto:sheyla.richards@gmail.com).

Declaration of conflicting interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: The author SA received financial support from BioReference Laboratories, where the cervical samples for the study were processed and tested.

## Introduction

Cervical cancer is the third leading cause of cancer-related death and the second most diagnosed cancer among women in developing countries, where approximately 80% of cervical cancer deaths occur.<sup>1,2</sup> In the Dominican Republic (DR), cervical cancer is the most common cancer among women of ages 15–44<sup>3</sup> and an estimated 1507 cervical cancer diagnoses and 600 related deaths occur annually.<sup>4</sup> Risk factors for cervical cancer are early sexual debut, multiple concurrent sexual partners, and lifetime number of sexual partners.<sup>5</sup> Factors contributing to the disproportionate cancer burden in developing countries may include a lack of effective cytology-based screening programs that emphasize patient education, diagnostic treatment centers, and established national vaccination programs to prevent human papillomavirus (HPV).<sup>6</sup>

HPV is the most common sexually transmitted infection (STI) worldwide.<sup>7,8</sup> Persistent infection with high-risk HPV (hrHPV) subtypes can lead to cervical dysplasia and cancer. Globally, HPV subtypes 16 and 18 account for approximately 66% of cervical cancers.<sup>9</sup> The worldwide prevalence of HPV is 11–12% among women without cervical abnormalities, highest among younger women.<sup>10</sup> The Caribbean has the greatest estimated prevalence of HPV globally, affecting 35.4% of women.<sup>10</sup> In the DR, the prevalence of HPV 16 and/or 18 among women in the general population with low-grade cervical changes is approximately 7.6%.<sup>11</sup>

Papanicolaou (Pap) testing is essential for early detection and treatment of pre-cancerous changes and has led to a decline in cervical cancer mortality since its consistent implementation in developed settings;<sup>12</sup> however, this trend is absent in developing countries lacking routine screening.<sup>13</sup> DR's most recent national guidelines from 2007 recommend Pap testing every one to three years for high-risk groups including women of ages 35–64 and those who report multiple sexual partners and/or early sexual debut.<sup>14</sup> Clínica de Familia La Romana (CFLR) providers, where this study takes place, recommend annual Pap at sexual debut. A national survey in the DR from 2013 indicated 68% of women of ages 15–49 had ever had a Pap and 39% reported testing within the last year.<sup>3</sup> There is no corresponding data for transactional female sex workers (FSWs). FSWs are at greater risk of acquiring HPV and progressing to cervical cancer than women in the general population.<sup>15</sup> To our knowledge, no studies on the rates of HPV or cervical cancer among FSWs in the Caribbean exist. Thus, this study sought to determine the prevalence of abnormal Pap results, hrHPV, and treatment follow-up among FSWs in La Romana (LR), DR.

## Methods

### Design and setting

This research was conducted at CFLR in LR, the third largest city in the DR. Our study was part of an ongoing study, *Risk Factors for Infections in DR in Key Populations*, which aims to document the rates and risk factors of STI among five key populations in LR and Santo Domingo: FSWs, pregnant adolescents, people living with HIV, men who have sex with men, and residents of bateyes (communities of majority Haitian sugarcane workers). CFLR

offers general services and STI prevention counseling, testing, and treatment; providers recommend FSWs have monthly clinical visits, quarterly government-mandated HIV and syphilis testing, and annual Pap. In 2016, of approximately 20,000 clinic visits at CFLR, 1586 were to the FSWs' program. This study was approved by the Columbia University Medical Center Institutional Review Board, the Ethics Committee at the Instituto Dermatológico de Cirugía y Piel Huberto Bogaert Diaz, and the Dominican Bioethics Committee, *Consejo Nacional de Bioética en Salud*, prior to data collection.

### Study population and recruitment

The FSW industry in the DR involves about 60,000 to 100,000 women.<sup>16</sup> Data collection occurred between June 2015 and April 2016. Initially, LR was mapped by venue and establishment type such as beer centers, bars or cabarets, restaurants, brothels, night clubs, and street-based sites where FSWs worked independently.<sup>17</sup> The total number of FSWs working in LR was estimated ( $N = 779$ ). The number of FSWs to be recruited from each establishment type was calculated using the estimated number of FSWs per establishment type and the target sample size ( $N = 200$ ). Thirty mapped venues were randomly selected for inclusion from which women of ages 18–60 years who self-identified as sex workers and had exchanged sexual services for payment or gifts within the last six months were eligible to participate. The number of participants per venue was variable, ranging from 5 to 48 women. CFLR staff recruited until the target sample size was reached. All study procedures (written informed consent, structured interview, sample collection) occurred at CFLR during the initial enrollment visit.

**Data collection**—Structured interviews covered sociodemographics, behaviors (health, sexual, transactional sexual, drug use), STI/HIV knowledge, symptoms, and history, and mental health. Cervical samples were collected from enrolled FSWs using a cytobrush and liquid-based cytology regardless of age. Samples were sent to BioReference Laboratories in New Jersey, United States for Pap and hrHPV co-testing. The Aptima HPV test detected the following hrHPV sub-types by transcription-mediated amplification (TMA): 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66, and 68. HPV16 and HPV18/45 were specifically reported when present, while the presence of hrHPV types other than 16 and 18/45 was noted, without indicating the specific type. Paps were screened by a cytotechnologist using the CYTYC ThinPrep(TM) Imaging System. Gen-Probe Aptima assay for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* and Endpoint PCR technology for *Mycoplasma genitalium*, *Trichomonas vaginalis*, and *Ureaplasma urealyticum* was used.

**Participant management**—Study team members provided STI risk reduction counseling at enrollment and follow-up appointments (one or two depending on colposcopy referral). FSWs with symptoms consistent with STI infection were treated. After the enrollment visit, CFLR FSW program staff contacted participants via phone and in-person to remind them of follow-up appointments where results and referrals would be shared. Women positive for hrHPV and/or abnormal Pap were referred to the clinic's gynecologist for colposcopy, regardless of age. Follow-up with colposcopy for women of all ages with abnormal Pap is standard practice at CFLR; this was reflected in the research protocol. All services, including transportation to and from study visits, were compensated.

## Measures

The dependent variable was Pap result (normal/abnormal). Abnormal Pap results included: (1) atypical glandular cells (AGC), (2) atypical squamous cells of unknown significance (ASCUS) with positive hrHPV testing, (3) atypical cells of unknown significance, cannot exclude high-grade intraepithelial lesion (ASCH), (4) low-grade intraepithelial lesion (LSIL), and (5) high-grade intraepithelial lesion (HSIL).

Independent variables for the present analysis include sociodemographics and behaviors (health, sexual, transactional sexual, drug use).

**Statistical analyses**—Our analysis consists of data from 144 participants who completed interviews and Pap testing. Statistical analyses were performed using STATA (StataCorp. 2015. *Stata Statistical Software: Release 14*. College Station, TX: StataCorp LP). Descriptive statistics summarized the analytic sample. Means and standard deviations characterized continuous variables. Frequencies characterized categorical variables. For bivariate analyses, potential significant associations between dependent variable and independent variables were tested using two-sample *t*-tests or Wilcoxon-Mann-Whitney tests for continuous variables and Chi-square or Fisher's exact tests for categorical variables. Independent variables ( $p < 0.1$ ) in bivariate analysis were included in binary logistic regression models to calculate crude and adjusted odds ratios and confidence intervals.<sup>18</sup> Variables were added to the model in a forward selection step-wise fashion to assess their associations with the dependent variable and in the presence of other variables. A final model was selected based on its strength with or without certain variables and was evaluated with likelihood-ratio testing. A variable was considered significant in multivariate analysis at a significance level of  $p < 0.05$ .

## Results

### Sociodemographics

The mean age of FSWs was 27.3 years (Table 1). Most were single (83.3%), born in the DR (97.2%), and had a high school education or above (68%). Their primary source of income was work, including, but not limited to transactional sex where irregular, temporary, or seasonal work (49.3%) was slightly more predominant than regular, fixed work (41.0%). The majority (62.4%) earned the equivalent of US\$122–407 per month as of March 2018.

### Papanicolaou

Over 70% of women reported a history of Pap testing, of whom 54.1% had testing over a year ago (Table 1). Of all Paps, 36.1% (52/144) were abnormal, divided between LSIL (27/52; 51.9%) and ASCUS (22/52; 42.3%). The remaining 5.8% (3/52) corresponded to single cases of ASCH, HSIL and AGC. Cervical cancer was not detected.

**High-risk HPV**—High-risk HPV DNA was detected in 43.4% (62/143) of women. One sample had insufficient quantity for hrHPV testing. Over 90% (46/51) of FSWs with abnormal Pap tested positive for hrHPV, half of whom were younger than 24 years old. When stratified by age, the frequency of hrHPV decreased with increasing age. Positive

hrHPV results were subtyped as 16 and/or 18/45 (22/62; 35.5%). HPV18/45 (17/62; 27.4%) was more common than HPV16 (7/62; 11.3%). Two women (2/62; 3.2%) were positive for HPV16 and HPV18/45; their Pap results were ASCUS and HSIL. Among FSWs with HPV16 and/or 18/45, 72.3% (16/22) had abnormal Pap results: LSIL (10/22; 45.5%), ASCUS (5/22; 22.7%), and HSIL (1/22; 4.5%). A third (15/45; 33.3%) of women with low-grade cervical changes were positive for HPV16 and/or HPV18/45.

### Colposcopy

Under a quarter (16/61; 26.2%) of the women referred to the clinic's gynecologist underwent colposcopy. Cervical squamous intraepithelial neoplasia 1 (CIN1) was reported in 43.8% (7/16) of women. The remaining 56.2% (9/16) demonstrated cervicitis or squamous dysplasia within normal limits. No cases of cervical squamous intraepithelial neoplasia 2 or 3 were identified.

### Bivariate analyses

FSWs with abnormal Pap (Table 2) were younger than those with negative results ( $p = 0.027$ ) and had earlier sexual debuts ( $p = 0.067$ ). Women with abnormal Pap had slightly more mixed responses to ease of access to condoms, whereas FSWs with negative Pap almost all indicated that condoms were easy to access ( $p = 0.134$ ). Binge drinking (6 drinks per day) occurred more frequently in FSWs with abnormal Pap ( $p = 0.017$ ). Drinking before sex was common among both groups ( $p = 0.539$ ); however, drug use before sex occurred more frequently in those with normal Pap ( $p = 0.153$ ), although responses were few. Inconsistent condom use was higher among FSWs who reported binge drinking at least monthly (26/46; 56.5%) compared to FSWs who did not (20/46; 43.6%;  $p = 0.017$ ). Infection with hrHPV ( $p < 0.001$ ) and/or *U. urealyticum* ( $p = 0.052$ ) was more prevalent among FSWs with abnormal Pap. Frequency of doctor's visits within the last year, condom use, and number of sexual partners within the last six months were not significantly different.

### Regression analyses

Results of the binary logistic regression model (Table 3) showed binge drinking, weekly (AOR 5.1, 95% CI: 1.8–14.5) or daily (AOR 4.9, 95% CI: 1.5–16.6), and age at first sexual relation (AOR 1.2, 95% CI: 1.0–1.5) were significantly associated with risk of abnormal Pap. Age (AOR 0.9, 95% CI: 0.9–1.0) showed a non-significant trend with abnormal Pap; it was retained in the final model since it is a known risk factor for cervical cancer. Given that in the DR condom use is considered the primary form of contraception despite low access,<sup>19</sup> the variable 'ease of access to condoms' was included in our initial regression. In many developing countries, self-reported condom use hinges on access to condoms which may serve as a proxy for understanding condom use.<sup>20</sup> Self-reported condom use was not included in our model as frequencies among women with abnormal Pap and those with normal Pap were similar. The final model ( $N = 120$ ) approached significance (LR  $\chi^2 = 21.8$ ,  $p = 0.001$ ).

## Discussion

This paper presents the first analysis of Pap results and hrHPV among FSWs in the DR. Almost half of participants had abnormal Pap and hrHPV, suggesting greater HPV burden and cervical cancer risk among FSWs than in the general population.<sup>21</sup> For example, among FSWs in Peru, HPV and hrHPV were detected in 50.6% and 35.6% of women, respectively.<sup>22</sup> In Mexico, HPV prevalence was 48.9% (43% hrHPV) among FSWs.<sup>23</sup> In Latin America, including the DR, recent doctor's visits were positively associated with recent Pap.<sup>24</sup> In contrast, 73.9% of our sample had seen a doctor multiple times in the last year, yet 76.8% had not received a Pap. Although all were sexually active, 23.2% had never had a Pap. Lack of Pap testing may relate to associated costs, insufficient reinforcement of clinical guidelines, or weak understanding of the relationship between hrHPV and cervical cancer.

A global review of HPV among FSWs estimated that the median overall prevalence was 42.7%, with great variability based on geographic location.<sup>21</sup> Our finding that 43.4% FSWs had hrHPV adds to the review as data from the Caribbean were not included. A 2017 report on HPV and related diseases in the DR indicated that the prevalence of concurrent HPV16 and/or 18 and LSIL in the general population was 7.6%, appreciably lower than the prevalence of HPV 16 and/or 18/45 among FSWs with LSIL in our study (33.3%).<sup>11</sup> In the literature and our analysis, hrHPV infection and abnormal Pap were most common among younger participants, likely due to more frequent metaplastic change of cervical epithelium in youth which increases risk of HPV infection. Cervical cancer is rare among young women because HPV infection is usually transient.<sup>25</sup> However, chronic hrHPV infection acquired in youth has the potential to progress to invasive cervical cancer which validates efforts to vaccinate youth against HPV before sexual initiation. The implementation of the DR's first vaccination campaign with Cervarix, the bivalent vaccine against HPV16/18, began on 28 April 2017 through a collaboration of the Ministries of Public Health and Education. The vaccine was offered nationwide to 9- and 10-year-old girls at no cost. In our study, we detected an array of high-risk subtypes which could support the utility of implementing the Gardasil 9-valent vaccine for greater protection and coverage at similar cost.<sup>26</sup>

Several obstacles to treatment follow-up for abnormal Pap among FSWs exist and are more pronounced in developing countries. A study among FSWs in Peru reported follow-up of only 30% of women with abnormal Pap results; not being informed of abnormal test results was a barrier.<sup>27</sup> Likewise in our analysis, some FSWs (7/61; 10.3%) who qualified for referral were never informed. Of those informed, poor follow-up may have been related to difficulties in communication resulting from the transient nature of FSWs who may frequently migrate between cities in search of anonymity that may reduce sex work-related stigma<sup>28</sup> or for more desirable employment opportunities. National guidelines for the DR, although out of date, recommend colposcopy follow-up for women positive for hrHPV or non-negative Pap with the exception of ASCUS,<sup>14</sup> however, the standard of care at CFLR is colposcopy referral for any non-negative Pap so any woman with precancerous lesions or cancer may be treated while they are present. Among our FSW population, implementing age-dependent cytology and HPV screening strategies<sup>29</sup> ultimately designed for women in the general population in developed settings leads to remarkable loss of follow-up. HPV testing is unavailable on-site and analysis off-site is prohibitively expensive. Based on the

financial constraints of complementing cytology with HPV testing, colposcopy is the default form of follow-up for abnormal Pap.

Binge drinking among Dominican FSWs has been reported elsewhere<sup>30</sup> and was significantly associated with abnormal Pap in our study. Binge drinking has been significantly associated with an increased risk of HPV infection<sup>31</sup> and/or low-grade dysplasia in the general population.<sup>32</sup> Additionally, intoxication may increase the likelihood of high-risk sexual behavior and therefore, STI acquisition.<sup>33,34</sup> A study of FSW sexual risk behavior in Sosua, DR described pressure to drink excessively with clients, resulting in impaired judgment, intimate partner violence, and compromised family dynamics.<sup>35</sup> Inconsistent condom use, sexual violence, and curable STI diagnoses have been demonstrated among FSWs who binge drink and/or drink before sex.<sup>36,37</sup> Inconsistent condom use is associated with greater risk of HPV infection and, in turn, cervical dysplasia, as demonstrated in our analysis. Dominican cultural practices that normalize heavy or frequent alcohol use may be more pronounced among FSWs. A comparison of drinking patterns among Caribbean FSWs showed that 84% of Dominican FSWs were heavy drinkers (six or more drinks daily), more so than Puerto Rican (49.7%) and Haitian (2.7%) FSWs.<sup>38</sup> Also, certain types of transactional sex establishments may facilitate alcohol consumption such as beer centers, from which the majority (63.2%) of our study participants were recruited. In addition to how risky sexual behavior influenced by binge drinking may increase risk of an STI, a pathophysiological mechanism for the relationship between alcohol, HPV infection, and cervical carcinogenesis has been proposed.<sup>39</sup> Acute alcohol intake, as occurs in binge drinking, prevents cells of the innate immune system from effectively detecting, presenting and/or destroying pathogenic antigens.<sup>40</sup> This may modulate humoral and cellular immune responses against HPV antigens and compromise cervical lesion regression.<sup>41,42</sup> The relationship between binge drinking and STI risk is complex and may be a focus of alcohol risk management.

## Limitations

This analysis has a number of limitations. Self-reported interview responses may be subject to recall and response bias. Participants may have been hesitant to share sensitive details because of stigma or social desirability. Our sample size was small and there were few responses for certain questions. Collapsing variables maximized the number of responses per question but resulted in information loss. Lastly, some participants may have been active within CFLR's FSWs' program and would, in that case, represent FSWs already integrated within a clinical network. Their responses and cervical screening results may differ from FSWs who are disconnected from clinical services.

## Conclusion

Our results play a critical role in improving the framework for clinical services and strengthening the foundation for future research on hrHPV and cervical cancer among FSWs. Strategies for more effective delivery of results, consistent disclosure of diagnoses, and an emphasis on ensuring follow-up should be developed since loss to follow-up rates were high despite recent contact with the healthcare system. The binge drinking patterns

observed in our analysis highlight the importance of addressing alcohol consumption among FSWs in clinical settings. Lastly, research and evaluation of the recent implementation of the first nationwide vaccination campaign is warranted given its potential to prevent HPV infection in youth.

## Acknowledgments

We thank the study participants, CFLR clinicians and research team, and the Program for Global and Population Health of Columbia University Vagelos College of Physicians and Surgeons. Jimmy Duong, Sheila Nemeth and Patrick Wong provided statistical guidance.

### Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: During this research, the author SS was supported by the Reducing Health Disparities through Informatics (RHeadI) training grant (T32NR007969) funded by the National Institute of Nursing Research, National Institutes of Health. The author SA received financial support from BioReference Laboratories.

## References

1. Torre LA, Bray F, Siegel RL, et al. Global Cancer Statistics. *Ca Cancer J Clin* 2012. 2015; 65: 87–108.
2. Villa LL. Cervical cancer in Latin America and the Caribbean: the problem and the way to solutions. *Cancer Epidemiol Biomarkers Prev* 2012; 21: 1409–1413. [PubMed: 22956726]
3. Achécaringo MM, Ramirez MN, Polanco JJ, et al. Encuesta demográfica y de salud 2013. Santo Domingo, <http://dominicanrepublic.unfpa.org/sites/default/files/pub-pdf/DRDHS2013-Final02-10-2013.pdf> 2013 (accessed 20 April 2017).
4. Bruni L, Barrionuevo-Rosas L, Albero G, et al. Dominican Republic: human papillomavirus and related cancers – fact sheet 2016. Barcelona, [http://www.hpvcentre.net/statistics/reports/KEN\\_FS.pdf](http://www.hpvcentre.net/statistics/reports/KEN_FS.pdf) 2016 (accessed 21 April 2017).
5. Ragin CC, Watt A, Markovic N, et al. Comparisons of high-risk cervical HPV infections in Caribbean and US populations. *Infect Agents Cancer*. 2009; 4: S9. [PubMed: 19208214]
6. Murillo R, Almonte M, Pereira A, et al. Cervical cancer screening programs in Latin America and the Caribbean. *Vaccine* 2008; 26: L37–L48. [PubMed: 18945401]
7. Bosch FX, Burchell AN, Schiffman M, et al. Epidemiology and natural history of human papillomavirus infections and type-specific implications in cervical neoplasia. *Vaccine* 2008; 26: K1–K16. [PubMed: 18847553]
8. Sanjosé S, Díaz M, Castellsagué X, et al. Worldwide prevalence and genotype distribution of cervical HPV in women with normal cytology. *Lancet Infect Dis*. 2007; 7: 453–459. [PubMed: 17597569]
9. Petrosky E, Jr, Bocchini JA, Hariri S, et al. Use of 9-valent human papillomavirus (HPV) vaccine: updated HPV vaccination recommendations of the Advisory Committee on Immunization Practices 2015; 64: 300–304. DOI:mm6411a2 [pii].
10. Forman D, de Martel C, Lacey CJ, et al. Global burden of human papillomavirus and related diseases. *Vaccine* 2012; 30: F12–F23. [PubMed: 23199955]
11. Bruni L, Barrionuevo-Rosas L, Albero G, et al. Human papillomavirus and related diseases in Dominican Republic: Summary Report, <http://www.hpvcentre.net/statistics/reports/DOM.pdf> 2017 (accessed 6 June 2017).
12. Shepherd JP, Frampton GK and Harris P. Interventions for encouraging sexual behaviours intended to prevent cervical cancer. *Cochrane Database Syst Rev* 2014; Art. No.: CD001035. DOI: 10.1002/14651858.CD001035. pub.; 1–185.
13. Sankaranarayanan R HPV screening for cervical cancer in rural India. *N Engl J Med* 2009; 360: 1385–1394. [PubMed: 19339719]



14. Rojas Gómez B, Rodríguez Monegro N, Rodríguez Aybar J, et al. Normas de prevención, diagnóstico temprano y tratamiento de cáncer cérvico-uterino. Santo Domingo, <http://www.msp.gov.do/oai/documentos/Normas/ENFERMEDADES%20NO%20TRANSMISIBLES/CANCER-CERVICOUTERINO.pdf> 2007 (accessed 5 May 2017).
15. Mak R Cervical smears and human papillomavirus typing in sex workers. *Sex Transm Infect* 2004; 80: 118–120. [PubMed: 15054172]
16. COPRESIDA. Segunda Encuesta de Vigilancia de Comportamiento con Vinculacion Serologica en Poblaciones Claves República Dominicana. Santo Domingo, <http://www.mcr-comisca.org/sites/all/modules/ckeditor/ckfinder/userfiles/files/ECVC%20Republica%20Dominicana%202012.pdf> 2012 (accessed 21 April 2017).
17. Barrington C, Latkin C, Sweat MD, et al. Talking the talk, walking the walk: social network norms, communication patterns, and condom use among the male partners of female sex workers in La Romana, Dominican Republic. *Soc Sci Med* 2009; 68: 2037–2044. [PubMed: 19356834]
18. Lang T Documenting research in scientific articles: guidelines for authors: 3. Reporting multivariate analyses. *Chest* 2007; 131: 628–632. [PubMed: 17296672]
19. Ross J and Hardee K. Access to contraceptive methods and prevalence of use. *J Biosoc Sci* 2013; 45: 761–778. [PubMed: 23151399]
20. Kerrigan D, Moreno L, Rosario S, et al. Environmental-structural interventions to reduce HIV/STI risk among female sex workers in the Dominican Republic. *Am J Public Health* 2006; 96: 120–125. [PubMed: 16317215]
21. Soohoo M, Blas M, Byraiah G, et al. Cervical HPV infection in female sex workers: a global perspective. *Open AIDS J* 2013; 7: 58–66. [PubMed: 24511334]
22. Montano SM, Hsieh EJ, Calderón M, et al. Human papillomavirus infection in female sex workers in Lima, Peru. *Sex Transm Infect* 2011; 87: 81–82. [PubMed: 20813720]
23. Juarez-Figueroa LA, Wheeler CM, Uribe-Salas FJ, et al. Human papillomavirus: a highly prevalent sexually transmitted disease agent among female sex workers from Mexico City. *Sex Transm Dis* 2001; 28: 125–130. [PubMed: 11289192]
24. Soneji S and Fukui N. Socioeconomic determinants of cervical cancer screening in Latin America. *Rev Panam Salud Publica* 2013; 33: 174–182. [PubMed: 23698136]
25. Burd EM. Human papillomavirus and cervical cancer. *Clin Microbiol Rev* 2003; 16: 1–17. [PubMed: 12525422]
26. Monie A, Hung C-F, Roden R, et al. Cervarix™: a vaccine for the prevention of HPV 16, 18-associated cervical cancer. *Biol Targets Ther* 2008; 2: 107–113.
27. Aharon D, Calderon M, Solari V, et al. Barriers to follow-up for abnormal papanicolaou smears among female sex workers in Lima, Peru. *PLoS One* 2017; 12: 4–11.
28. Tagliaferri Rael C and Davis A. Elevated depression symptoms and key associated factors in female sex workers and women living with HIV/AIDS in the Dominican Republic. *Int J STD AIDS* 2017; 28: 433–440. [PubMed: 27189491]
29. Saslow D, Solomon D, Lawson HW, et al. NIH Public Access. *J Low Genit Tract Dis* 2012; 16: 175–204. [PubMed: 22418039]
30. Donastorg Y, Barrington C, Perez M, et al. Abriendo Puertas: Baseline findings from an integrated intervention to promote prevention, treatment and care among FSW living with HIV in the Dominican Republic. *PLoS One* 2014; 9: e92480.
31. Ho GYF, Bierman R, Beardsley L, et al. Natural history of cervicovaginal papillomavirus infection in young women. *N Engl J Med* 1998; 338: 423–428. [PubMed: 9459645]
32. Minnis A, Marchi K, Ralph L, et al. Limited socioeconomic opportunities and Latina teen childbearing: a qualitative study of family and structural factors affecting future expectations. *J Immigrant Minority Health* 2013; 15: 334–340.
33. Fisher JC, Cook PA, Sam NE, et al. Patterns of alcohol use, problem drinking, and HIV infection among high-risk African women. *Sex Transm Dis* 2008; 35: 537–544. [PubMed: 18418292]
34. Li Q, Li X and Stanton B. Alcohol use among female sex workers and male clients: an integrative review of global literature. *Alcohol Alcohol* 2010; 45: 188–199. [PubMed: 20089544]
35. Guilamo-Ramos V, Padilla M, Cedar AL, et al. HIV sexual risk behavior and family dynamics in a Dominican tourism town. *Arch Sex Behav* 2013; 42: 1255–1265. [PubMed: 23436038]

36. Chersich MF, Luchters SMF, Malonza IM, et al. Heavy episodic drinking among Kenyan female sex workers is associated with unsafe sex, sexual violence and sexually transmitted infections. *Int J STD AIDS* 2007; 18: 764–769. [PubMed: 18005511]
37. Verma RK, Saggurti N, Singh AK, et al. Alcohol and sexual risk behavior among migrant female sex workers and male workers in districts with high in-migration from four high HIV prevalence states in India. *AIDS Behav* 2010; 14: 31–39. [PubMed: 19997971]
38. Deschamps MM, Zorrilla CD, Morgan CA, et al. Recruitment of Caribbean female commercial sex workers at high risk of HIV infection. *Rev Panam Salud Publica* 2013; 34: 92–98. [PubMed: 24096973]
39. Min K-J, Lee J-K, Lee S, et al. Alcohol consumption and viral load are synergistically associated with CIN1. *PLoS One* 2013; 8: e72142 [PubMed: 23977233]
40. Goral J, Karavitis J and Kovacs EJ. Exposure-dependent effects of ethanol on the innate immune system. *Alcohol* 2008; 42: 237–247. [PubMed: 18411007]
41. Woodworth CD, Lichti U, Simpson S, et al. Leukoregulin and gamma-interferon inhibit human papillomavirus type 16 gene transcription in human papillomavirus-immortalized human cervical cells. *Cancer Res* 1992; 52: 456–463. [PubMed: 1345813]
42. Hausen H Zur Papillomaviruses and cancer: from basic studies to clinical application. *Nat Rev Cancer* 2002; 2: 342–350. [PubMed: 12044010]

**Table 1.**

Sociodemographic characteristics, health, sexual, and drug use behavior, and cervical STI results of FSWs in La Romana.

	Frequency (%) (N = 144)
<b>Sociodemographic characteristics<sup>a</sup></b>	
<i>Age, mean years (SD)</i>	27.3 (6.3)
<i>Age groups, years</i>	
18–24	55 (38.2)
25–34	74 (51.4)
35–44	12 (8.3)
45–54	3 (2.1)
<i>Country of birth</i>	
Dominican Republic	140 (97.2)
Haiti	2 (1.4)
Other	2 (1.4)
<i>Civil status</i>	
Single	120 (83.3)
Stable partnership with a woman	5 (3.5)
Married or stable partnership with a man	15 (10.4)
Separated or divorced	2 (1.4)
Widowed	1 (0.7)
Refused	1 (0.7)
<i>Education</i>	
Primary or below	46 (32.0)
Secondary	82 (56.9)
University	16 (11.1)
<i>Sources of income</i>	
Work, regular or fixed	59 (41.0)
Work, irregular, temporary, or seasonal	71 (49.3)
Money from family or friends	5 (3.5)
Multiple sources	9 (6.2)
<i>Income, monthly (RD pesos)<sup>b,c</sup></i>	
3500 or less	9 (8.3)
3501–6000	13 (11.9)
6001–10,000	36 (33.0)
10,001–20,000	32 (29.4)
20,001 or more	19 (17.4)
<b>Health behavior</b>	
<i>Frequency of visits to the doctor, last year</i>	
2–3 times a month	4 (2.9)
Once a month	25 (18.1)

	<b>Frequency (%)</b> <b>(N = 144)</b>
Once every 2–6 months	73 (52.9)
Once a year	27 (19.6)
Less than once a year	9 (6.5)
<i>History of Pap?</i>	
No	33 (23.2)
Yes	109 (76.8)
<i>Last Pap</i>	
Over a year ago	59 (54.1)
Less than a year ago	47 (43.1)
Don't know	3 (2.8)
<b>Sexual behavior</b>	
<i>Age at first sexual relation, mean years (SD)</i>	15.2 (2.1)
<i>Condom use in vaginal and/or anal sex, last six months</i>	
Not always	59 (42.1)
Always	81 (57.9)
<i>Ease of access to condoms</i>	
Easy	140 (97.2)
Difficult	3 (2.1)
Don't know	1 (0.7)
<i>Most common type of sexual practice, last six months</i>	
Vaginal +/- oral	125 (88.7)
Anal receptive +/- oral	11 (7.8)
Oral only	5 (3.5)
<i>Total number of sexual partners, last six months</i>	
0	4 (2.8)
1	12 (8.4)
2–10	50 (34.9)
11–50	35 (24.5)
51–100	6 (4.2)
Don't know	33 (23.1)
Refused	3 (2.1)
<b>Transactional sexual behavior</b>	
<i>Recruitment site</i>	
Beer center	91 (63.6)
Bar or cabaret	8 (5.6)
Restaurant	9 (6.3)
Brothel	3 (2.1)
Night club	11 (7.7)
Independent	21 (14.7)
<i>Age at first transactional sexual relation, mean years (SD)</i>	20.4 (5.1)
<i>Average number of transactional sexual partners per month, mean persons (SD)<sup>d</sup></i>	5.9 (5.0)

	<b>Frequency (%)</b> <b>(N = 144)</b>
<i>Types of gifts received in exchange for sex, last six months</i>	
None	5 (3.5)
Money	132 (91.7)
Money and other gift <sup>e</sup>	7 (4.8)
<i>Condom use in transactional sex, last six months</i>	
Not always	14 (11.3)
Always	110 (88.7)
<b>Drug use behaviors</b>	
<i>Frequency of alcohol use</i>	
Never	20 (13.9)
Once or less a month	16 (11.1)
2–4 times a month	16 (11.1)
2–3 times a week	35 (24.3)
Four or more times a week	52 (36.1)
Refused	5 (3.5)
<i>Frequency of 6 or more drinks per day</i>	
Never	66 (53.2)
Once or less a month	12 (9.7)
Weekly	26 (21.0)
Daily or almost daily	17 (13.7)
Didn't understand	1 (0.8)
Refused	2 (1.6)
<i>Alcohol use before sex, last six months</i>	
No	12 (9.8)
Yes	111 (90.2)
<i>Drug use, last six months</i>	
No	109 (75.7)
Yes	35 (24.3)
<i>Drug use before or during sex, last six months</i>	
No	14 (40.0)
Yes	21 (60.0)
<b>Cervical STI results</b>	
<i>High-risk human papillomavirus</i>	
Negative	81 (56.6)
Positive	62 (43.4)
<i>Chlamydia trachomatis</i>	
Negative	134 (93.7)
Positive	9 (6.3)
<i>Neisseria gonorrhoeae</i>	
Negative	140 (97.2)
Positive	3 (2.1)

	<b>Frequency (%)</b> <b>(N = 144)</b>
<i>Mycoplasma genitalium</i>	
Negative	140 (97.2)
Positive	4 (2.8)
<i>Trichomonas vaginalis</i>	
Negative	132 (92.7)
Positive	12 (8.3)
<i>Ureaplasma urealyticum</i>	
Negative	54 (38.0)
Positive	88 (62.0)

<sup>a</sup>Section headings from the qualitative interview appear in bold.

<sup>b</sup>As of March 2018, one Dominican peso equated to \$0.02 US dollars.

<sup>c</sup>Response total that does not sum to 144 has missing values.

<sup>d</sup>There were 95 responses total; one large outlier was excluded.

<sup>e</sup>Other gift was defined as services, goods, food, drugs, or rent.

**Table 2.**

Bivariate analyses between Pap results, sociodemographic characteristics, health, sexual, and drug use behavior, and cervical STI results of FSWs in La Romana.

	Abnormal Pap <i>N</i> = 52 (36.1%)	Normal Pap <i>N</i> = 92 (63.9%)	<i>p</i> -Value
<b>Sociodemographic characteristics<sup>a</sup></b>			
<i>Age, years<sup>b</sup></i>			
mean ( <i>SD</i> )	26.4 (7.2)	27.9 (5.7)	0.027
median ( <i>Q1, Q3</i> )	25 (21.5, 29.5)	27 (23, 32)	
<i>Age groups, years</i>			
18–24	25 (48.1)	30 (32.6)	0.148
25–34	22 (42.3)	52 (56.5)	
35–44	3 (5.8)	9 (9.7)	
45–54	2 (3.8)	1 (1.2)	
<i>Country of birth</i>			
Dominican Republic	51 (98.1)	89 (96.7)	0.785
Haiti	0 (0)	2 (2.2)	
Other	1 (1.9)	1 (1.1)	
<i>Civil status</i>			
Single	41 (78.9)	79 (85.9)	0.274
Stable partnership with a woman	1 (1.9)	4 (4.3)	
Married or stable partnership with a man	9 (17.3)	6 (6.5)	
Separated or divorced	1 (1.9)	1 (1.1)	
Widowed	0 (0)	1 (1.1)	
Refused	0 (0)	1 (1.1)	
<i>Education</i>			
Primary or below	14 (26.9)	32 (34.8)	0.370
Secondary	30 (57.7)	52 (56.5)	
University	8 (15.4)	8 (8.7)	
<i>Sources of income</i>			
Work, regular or fixed	21 (40.4)	38 (41.3)	0.639
Work, irregular, temporary, or seasonal	24 (46.1)	47 (51.1)	
Money from family or friends	3 (5.8)	2 (2.2)	
Multiple sources	4 (7.7)	5 (5.4)	
<i>Income, monthly (RD pesos)<sup>c,d</sup></i>			
3,500 or less	3 (7.1)	6 (9.0)	0.748
3501–6000	3 (7.1)	10 (14.9)	
6001–10,000	16 (38.1)	20 (29.8)	
10,001–20,000	13 (31.0)	19 (28.4)	
20,001 or more	7 (16.7)	12 (17.9)	
<b>Health behavior</b>			

	<b>Abnormal Pap</b> <i>N</i> = 52 (36.1%)	<b>Normal Pap</b> <i>N</i> = 92 (63.9%)	<i>p</i> -Value
<i>Frequency of visits to the doctor, last year</i>			0.369
2–3 times a month	3 (6.1)	1 (1.1)	
Once a month	10 (20.4)	15 (16.9)	
Once every 2–6 months	22 (44.9)	51 (57.3)	
Once a year	10 (20.4)	17 (19.1)	
Less than once a year	4 (8.2)	5 (5.6)	
<i>History of Pap?</i>			0.430
No	14 (26.9)	19 (21.1)	
Yes	38 (73.1)	71 (78.9)	
<i>Last Pap</i>			0.266
Over a year ago	17 (44.8)	42 (59.2)	
Less than a year ago	20 (52.6)	27 (38.0)	
Don't know	1 (2.6)	2 (2.8)	
<b>Sexual behavior</b>			
<i>Age at first sexual relation, mean years (SD)</i>	14.9 (2.1)	15.6 (2.2)	0.067
<i>Condom use in vaginal and/or anal sex, last 6 months</i>			0.399
Not always	23 (46.9)	36 (39.6)	
Always	26 (53.1)	55 (60.4)	
<i>Ease of access to condoms</i>			0.134
Easy	49 (94.2)	91 (98.9)	
Difficult	2 (3.8)	1 (1.1)	
Don't know	1 (2.0)	0 (0)	
<i>Most common type of sexual practice, last 6 months</i>			0.914
Vaginal +/- oral	44 (89.8)	81 (88.0)	
Anal receptive +/- oral	3 (6.1)	8 (8.7)	
Oral only	2 (4.1)	3 (3.3)	
<i>Total number of sexual partners, last six months</i>			0.871
0	2 (3.9)	2 (2.2)	
1	5 (9.6)	7 (7.7)	
2–10	18 (34.6)	32 (35.1)	
11–50	15 (28.8)	20 (22.0)	
51–100	2 (3.9)	4 (4.4)	
Don't know	9 (17.3)	24 (26.4)	
Refused	1 (1.9)	2 (2.2)	
<b>Transactional sexual behavior</b>			
<i>Recruitment site</i>			0.966
Beer center	35 (67.3)	56 (61.5)	
Bar or cabaret	3 (5.8)	5 (5.5)	
Restaurant	2 (3.8)	7 (7.7)	
Brothel	1 (1.9)	2 (2.2)	
Night Club	4 (7.8)	7 (7.7)	



	Abnormal Pap N = 52 (36.1%)	Normal Pap N = 92 (63.9%)	p-Value
Independent	7 (13.4)	14 (15.4)	
<i>Age at first transactional sexual relation, year<sup>b</sup></i>			0.957
Mean (SD)	20.4 (5.1)	20.4 (5.2)	
Median (Q1, Q3)	19 (17, 23)	19 (16, 24)	
<i>Average number of transactional sexual partners per month, individuals<sup>b,e</sup></i>			0.539
Mean (SD)	6.4 (6.3)	5.6 (3.8)	
Median (Q1, Q3)	4 (2, 10)	5 (3, 7)	
<i>Types of gifts received in exchange for sex, last six months</i>			0.149
None	1 (1.9)	4 (4.3)	
Money	46 (88.5)	86 (93.5)	
Money and other gift <sup>f</sup>	5 (9.6)	2 (2.2)	
<i>Condom use in transactional sex, last six months</i>			0.483
Not always	4 (8.7)	10 (12.8)	
Always	42 (91.3)	68 (87.2)	
<b>Drug use behaviors</b>			
<i>Frequency of alcohol use</i>			0.591
Never	8 (15.4)	12 (13.0)	
Once or less a month	3 (5.8)	13 (14.1)	
2–4 times a month	4 (7.7)	12 (13.1)	
2–3 times a week	14 (26.8)	21 (22.8)	
Four or more times a week	21 (40.4)	31 (33.7)	
Refused	2 (3.9)	3 (3.3)	
<i>Frequency of 6 or more drinks per day</i>			0.017
Never	15 (34.1)	51 (63.8)	
Once or less a month	5 (11.4)	7 (8.8)	
Weekly	14 (31.8)	12 (15.0)	
Daily or almost daily	9 (20.4)	8 (10.0)	
Didn't understand	0 (0)	1 (1.2)	
Refused	1 (2.3)	1 (1.2)	
<i>Alcohol use before sex, last six months</i>			0.539
No	3 (7.0)	9 (11.3)	
Yes	40 (93.0)	71 (88.7)	
<i>Drug use, last six months</i>			0.796
No	40 (76.9)	69 (75.0)	
Yes	12 (23.1)	23 (25.0)	
<i>Drug use before or during sex, last six months</i>			0.153
No	7 (58.3)	7 (30.4)	
Yes	5 (41.7)	16 (69.6)	
<b>Cervical STI results</b>			
<i>High-risk human papillomavirus</i>			<0.001

	<b>Abnormal Pap</b> <i>N</i> = 52 (36.1%)	<b>Normal Pap</b> <i>N</i> = 92 (63.9%)	<i>p</i> -Value
Negative	5 (9.8)	76 (82.6)	
Positive	46 (90.2)	16 (17.4)	
<i>Chlamydia trachomatis</i>			0.281
Negative	46 (90.2)	88 (95.7)	
Positive	5 (9.8)	4 (4.3)	
<i>Neisseria gonorrhoeae</i>			0.289
Negative	49 (96.1)	91 (98.9)	
Positive	2 (3.9)	1 (1.1)	
<i>Mycoplasma genitalium</i>			0.134
Negative	49 (94.2)	91 (98.9)	
Positive	3 (5.8)	1 (1.1)	
<i>Trichomonas vaginalis</i>			0.212
Negative	50 (96.2)	82 (89.1)	
Positive	2 (3.8)	10 (10.9)	
<i>Ureaplasma urealyticum</i>			0.052
Negative	14 (27.5)	40 (44.0)	
Positive	37 (72.5)	51 (56.0)	

<sup>a</sup>Section headings from the qualitative interview appear in bold.

<sup>b</sup>Wilcoxon-Mann-Whitney test was used.

<sup>c</sup>Response total by Pap result that does not sum to 52 and 92 for Abnormal Pap and Normal Pap, respectively, have missing values.

<sup>d</sup>As of March 2018, one Dominican peso equated to \$0.02 US dollars.

<sup>e</sup>There were 95 responses total; one large outlier was excluded.

<sup>f</sup>Other gift was defined as services, goods, food, drugs, or rent.

**Table 3.**

Multivariate associations between abnormal Pap results, sociodemographic factors, sexual, and drug use behavior, and cervical STI results of FSWs in La Romana ( $N=120$ ).

Sociodemographic factors and behavior	Crude odds ratio (95% CI)	<i>p</i> -value	Adjusted odds ratio (95% CI)	<i>p</i> -Value
<i>Age, years</i>	1.0 (0.9–1.0)	0.166	0.9 (0.9–1.0)	0.111
<i>Age at first sexual relation</i>	1.2 (1.0–1.4)	0.070	1.2 (1.0–1.5)	0.039
<i>Frequency of six or more drinks per day</i>		0.015		0.006
Never	Ref		Ref	
Once or less a month	2.4 (0.7–8.8)		3.1 (0.8–12.8)	
Weekly	4.0 (1.5–10.4)		5.1 (1.8–14.5)	
Daily or almost daily	3.8 (1.3–11.6)		4.9 (1.5–16.6)	
<i>Ureaplasma urealyticum, positive</i>	2.1 (1.0–4.4)	0.054	2.2 (0.9–5.3)	0.080