Published in final edited form as:

AIDS Behav. 2016 September ; 20(9): 2101–2109. doi:10.1007/s10461-016-1345-6.

Social and Structural Determinants of Cervical Health among Women Engaged in HIV Care

Shalanda A. Bynum¹, Lisa T. Wigfall^{2,3,4}, Heather M. Brandt^{4,5}, Carmen Hampton Julious⁶, Saundra H. Glover^{2,3}, and James R. Hébert^{4,7}

¹Division of AIDS, Behavioral, and Population Sciences, Center for Scientific Review, National Institutes of Health, 6701 Rockledge Drive, Bethesda, MD 20892, USA

²Institute for Partnerships to Eliminate Health Disparities, Arnold School of Public Health, University of South Carolina, Columbia, SC, USA

³Department of Health Services Policy and Management, Arnold School of Public Health, University of South Carolina, Columbia, SC, USA

⁴South Carolina Statewide Cancer Prevention and Control Program, Arnold School of Public Health, University of South Carolina, Columbia, SC, USA

⁵Department of Health Promotion, Education and Behavior, Arnold School of Public Health, University of South Carolina, Columbia, SC, USA

⁶Palmetto AIDS Life Support Services, Inc., Columbia, SC, USA

⁷Department of Epidemiology and Biostatistics, Arnold School of Public Health, University of South Carolina, Columbia, SC, USA

Abstract

Cervical cancer prevention/control efforts among women living with HIV/AIDS (WLH) are socially and structurally challenging. Healthcare access and perceived HIV stigma and discrimination are factors that may challenge risk reduction efforts. This study examined socio-structural determinants of cervical cancer screening among women engaged in HIV care. One hundred forty-five WLH seeking health/social services from AIDS Service Organizations in the southeastern US completed a questionnaire assessing factors related to cervical cancer prevention/control. Ninety percent were African American, mean age 46.15 ± 10.65 years. Eighty-one percent had a Pap test <1 year ago. Low healthcare access was positively associated with having a Pap test <1 year ago, (Odds ratio [OR] 3.80; 95 % Confidence interval [CI] 1.34–10.78). About 36 % reported 2 Pap tests during the first year after HIV diagnosis. Lower educational attainment was positively associated with having 2 Pap tests, OR 3.22; CI 1.08–9.62. Thirty-five percent reported more frequent Pap tests after diagnosis. Lower income was moderately associated with more frequent Pap tests post-diagnosis, OR 2.47; CI .98–6.23. Findings highlight the successes of HIV initiatives targeting socio-economically disadvantaged women and provide evidence that health policy aimed at providing and expanding healthcare access for vulnerable WLH has beneficial health implications.

[✉]Shalanda A. Bynum, shalanda.bynum@nih.gov.

Keywords

Cervical cancer; Papanicolaou test; HIV/AIDS; Health status disparities; Women

Introduction

Early into the HIV/AIDS epidemic, the Centers for Disease Control and Prevention (CDC) identified cervical cancer as an AIDS-defining malignancy [1, 2]. Between 1980 and 2007, the incidence of cervical cancer among women living with HIV/AIDS (WLH) increased approximately 60 % [3]. The growing incidence of cervical cancer is attributed to the increase in HIV acquisition among women and substantial improvements in life expectancy [3, 4]. Compared to uninfected women, WLH have a sixfold increased risk of developing cervical cancer in their lifetime [3, 5]. This disparity is in part the result of persistent infection with high-risk (i.e., oncogenic) types of human papillomavirus (HPV) and the inability to clear HPV infections due to reduced immune function [6]. Although immune function may contribute to cervical cancer development among WLH, gaps in cancer screening also contribute to later stages of diagnosis and concomitantly higher rates of morbidity and mortality [6–13]. The CDC recommends that WLH receive two Pap tests during the first year after diagnosis and annually thereafter [8]. Despite the Ryan White Program provision of medical care, including Pap tests, for uninsured and underinsured WLH, cumulatively 20–40 % of the population do not meet cervical cancer screening recommendations [8, 14–17].

Efforts to prevent and control cervical cancer among WLH are biologically, economically, socially, and behaviorally challenging [5, 7, 13–15, 18–21]. Current scientific evidence suggest that awareness and knowledge [14, 18], health literacy [15], provider recommendation [19], fear [18, 19], and healthcare access [14, 20, 21] influence cervical cancer screening engagement. However, less is known about the impact of perceived stigma and discrimination on cervical cancer screening, factors that have been negatively associated with general health services utilization among WLH [22–26]. Moreover, there is a paucity of literature which attempts to understand the influence of access to care, stigma, and discrimination on care engagement among women engaged in HIV care. Given the vast contribution of healthcare access on cervical cancer disparities, understanding the influence of sociostructural factors on screening among women engaged in HIV care contributes to the scientific knowledgebase by providing valuable insight into the ways by which cervical outcomes can be maximized when access is directly or indirectly intervened upon. Thus, the purpose of this study was to examine social (e.g., perceived stigma and discrimination) and structural (e.g., healthcare access, transportation access, and source of care) determinants of cervical cancer screening engagement among WLH who are engaged in medical care or HIV-related social services.

Methods

Between March 2011 and April 2012, 145 WLH seeking healthcare from Ryan White-funded clinics and social services from community-based AIDS Service Organizations

(ASOs) in two cities located in the southeastern United States (US) were recruited to participate in this study. Ryan White-funded clinics provide healthcare services to WLH, including Pap tests. ASOs refer WLH to health and social services, but do not provide direct clinical care. The recruitment sites were chosen because of the high HIV disease burden in the geographical areas [27]. Further, the selected areas are designated as medically underserved by the US Department of Health and Human Services, Health Resources and Services Administration [28]. As such, additional efforts to address health among WLH in these areas is of national importance.

Women were approached at the end of their visit at the respective recruitment site to discuss study participation and eligibility. Eligibility criteria included: (1) being female; (2) having an HIV/AIDS diagnosis; and (3) being 18 years of age. Women who provided consent to participate in the study were asked to complete an interviewer-administered questionnaire. The questionnaire assessed cervical cancer prevention knowledge, attitudes, beliefs, behaviors and social and structural level factors associated with care engagement. All interviews were conducted in a private room at the respective recruitment site. This study was approved by the University of South Carolina Institutional Review Board.

Measures

Cervical Cancer Screening Engagement—Our primary outcomes of interest, all associated with cervical cancer screening engagement, were adapted from the literature and previous work of the authors [15, 29, 30]. Three items were used to assess cervical cancer screening engagement: (1) “When did you have your most recent Pap test?” (<1 year ago/ 1 year ago/Don’t Know); (2) “How many Pap tests did you have during the first year after being diagnosed HIV-positive? (2/<2/Don’t Know)”; and (3) “Would you say that you have Pap tests more often, less often, or about as often as you did before you were diagnosed HIV positive?”. Responses were collapsed into two categories, “more often” versus “less often/about as often”.

Perceived HIV Stigma—To assess HIV stigma, we used a modified version of the HIV Cost and Services Utilization Study stigma scale [31–33]. Women were asked, “Since you have had HIV, has anyone: (1) been uncomfortable with you, (2) treated you as an inferior, (3) preferred to avoid you, and (4) refused you service(s)” (Cronbach’s $\alpha = .84$). Response options were Yes/No. For this study, a “Yes” response to at least one item was coded “perceived stigma” and a “No” response to all items was coded “no perceived stigma”.

Perceived Healthcare Discrimination—To assess perceived healthcare discrimination, we adapted Williams et al. Everyday Discrimination Scale [34]. Participants were asked, “How often has someone at your HIV treatment provider’s office made you feel inferior or uncomfortable, treated you with disrespect, or given you poor care due to your: (1) Race or ethnicity?; (2) Income or education level?; (3) Health insurance?; and (4) HIV status?” (Cronbach’s $\alpha = .72$). Response options were on a 5-point Likert scale: 1 = “never” to 5 = “all of the time”. Items were summed to create a composite score with a maximize score of 20. Higher scores indicate greater perceived healthcare discrimination.

Healthcare Access—A seven-item scale adapted from the HIV Cost and Services Utilization Study was used to assess healthcare access covering the domains of affordability, availability, convenience, and accessibility, Cronbach's $\alpha = .83$ [31–33]. Participants were asked to state their agreement with the following statements: (1) “I have never gone without the medical care needed because it was too expensive”; (2) “Places where I can get medical care are very conveniently located”; (3) “I am able to get medical care whenever I need it”; (4) “I have easy access to the medical specialists that I need”, (5) “It is easy for me to get medical care in an emergency”; and (6) “If I need hospital care, I can get admitted without any trouble”. Response options were on a 4-point Likert scale, “1 = strongly agree” to “4 = strongly disagree”. Items were dichotomized into two categories, “high healthcare access” and “low healthcare access”.

Transportation Access—To assess access to transportation, women were asked, How would you describe being able to get to medical appointments? Response option were on a 4-point Likert scale (i.e., very easy, easy, hard, very hard) and dichotomized into two categories, “easy” versus “hard”.

Regular Source of Care—To assess non-HIV disease specific regular source of care, a modified version of the behavioral risk factors and surveillance system (BRFSS) healthcare access item was used [35], “Do you have someone else that you think of as your personal doctor or healthcare provider (that is, someone other than who you go to for your HIV care)?” Response options were yes, no, and don't know. Response options were collapsed into two categories, “Yes” and “No/Don't Know”.

Sociodemographics—Race, ethnicity, age, employment status (full time/part time vs. unemployed), income (<\$10k/year vs. \$10k/year), education (no high school/GED, high school diploma/GED, some college), and relationship status (single vs. married/living with partner) were obtained.

Data Analysis

Descriptive statistics summarized sociodemographic characteristics of study participants. Multivariable logistic regression was used to model the probability of having: (1) a Pap test <1 year ago; (2) 2 Pap tests after being diagnosed with HIV; and (3) having Pap test more often post HIV diagnosis. First, multivariable logistic regressions were conducted to determine sociodemographic (i.e., age, education, income, employment, and relationship status) predictors of the three cervical cancer screening outcome variables. Any sociodemographic variables significant at $p = .20$ in the first models were included in the final multivariable logistic regression models along with the main outcomes of interest (i.e., perceived HIV stigma, perceived healthcare discrimination, healthcare access, transportation access, and source of care). We understand that a p value of $.20$ deviates from the statistical significance standard of $.05$. However, to more effectively address confounding, we followed Vittinghoff et al. criterion for model building [36, 37]. Vittinghoff recommends retaining variables at the $.20$ level because a variable can be a confounder even if it does not reach statistical significance as an independent predictor of the outcome [36, 37]. A 95 % confidence interval (CI) for odds ratios (OR) indicated statistical significance. Nagelkerke

R^2 values provided an indication of the amount of variation in cervical cancer screening engagement explained by each multivariable regression model and Hosmer–Lemeshow Test indicated a good model fit. All analyses were conducted in 2015 using SPSS 22.0.

Results

Sample Characteristics

One hundred forty-five participants completed the questionnaire. The majority were African American (90 %, $n = 131$) and non-Hispanic (96 %, $n = 139$), mean age 46.15 ± 10.65 ; range 20–68 years. About 26 % ($n = 38$) of participants were married/living with partner, 45 % ($n = 65$) completed some college, and 26 % ($n = 38$) were full or part-time employed. See Table 1 for a complete list of sociodemographic characteristics of the sample.

The majority (64 %, $n = 93$) of participants did not have a personal healthcare provider other than their HIV care provider. Half ($n = 72$) reported low access to healthcare and 15 % ($n = 21$) reported difficulties accessing transportation to get to medical appointments. About 43 % ($n = 62$) reported perceived HIV stigma and the mean score on the 20-point perceived healthcare discrimination scale was 4.80 ± 1.86 .

Cervical Cancer Screening Engagement

The majority of participants (81 %, $n = 118$) reported having a Pap test <1 year ago. In the first logistic regression model including only sociodemographic variables, no variable was associated with most recent Pap and thus, none were included in the final regression model (Table 2). Low healthcare access was positively associated with having a Pap test <1 year ago (OR 3.80; CI 1.34–10.78) in the final logistic regression model, $\chi^2 (7, n = 122) = 3.93$, $p = .79$ (Table 3). The final model explained 13 % of the variance in most recent Pap test.

Thirty-six percent ($n = 52$) of participants reported having 2 Pap tests during the first year after being diagnosed with HIV. Education and relationship status were associated with having 2 Pap tests at $p = .20$ in the first regression model and were subsequently included in the final regression model (Table 2). In the final regression model, not having a high school diploma/GED (OR 3.22; CI 1.08–9.62) was the only significant association of having 2 Pap tests in the first year after being diagnosed with HIV, $\chi^2 (8, n = 121) = 10.68$, $p = .22$ (Table 3). The model explained 10 % of the variance in Pap test utilization in the first year after diagnosis.

Thirty-five percent of participants ($n = 50$) reported having Pap tests more often after being diagnosed with HIV. Education and income were the only sociodemographic variables associated at $p = .20$ with change in cervical cancer screening engagement post-diagnosis in the first regression model and thus, were included in the final regression model (Table 2). In the final model, having an income <\$10k/year (OR 2.47; CI .98–6.23) was moderately associated with having more frequent Pap tests after being diagnosed with HIV, $\chi^2 (7, n = 107) = 10.45$, $p = .17$ (Table 3). The final model explained 10 % of the variance in Pap test frequency.

Discussion

This study aimed to understand the influence of social and structural factors on cervical cancer screening engagement among women engaged in HIV care. The majority of women reported meeting the Medicine Association of the Infectious Diseases Society of America annual cervical cancer screening recommendation [8]. The screening prevalence among women in this study is comparable to other studies examining screening behaviors among WLH [21, 38]. Despite the high prevalence of screening, about 20 % did not meet the annual screening recommendation. As these women are already engaged in HIV care through Ryan White-funded clinics and ASOs, this finding is particularly troubling. Improvements in health outcomes for WLH can only be fully realized if women access the services necessary to prolong and sustain a good quality of life. Identifying innovative communication channels and psychoeducational approaches to engage WLH who are connected to care, but not engaged in cervical cancer screening are central to impacting cervical cancer health disparities among women at highest risk for poor outcomes [30].

Healthcare access, transportation access, perceived HIV stigma and healthcare discrimination, and source of care did not consistently predict cervical cancer screening engagement across screening behaviors. The only screening behavior associated with the aforementioned factors was having an annual Pap test. Women who reported having low access to healthcare were four times more likely to report meeting the annual screening recommendation. This finding is in contrast to other studies that have found a negative association between low healthcare access and health services utilization [39, 40]. However, in the current study this finding is not surprising given the recruitment of women already engaged in HIV care. Further, we found that WLH with lower educational attainment were three times and lower income were two times more likely to report meeting the recommended Pap test guidelines. We postulate that socio-economically disadvantaged women have more resources available to them through community outreach efforts and free or low cost health services. Further, these women may be continually forced to identify viable healthcare resources and thus, may be more familiar with the bureaucracy of obtaining care and better able to overcome such barriers. Despite reporting difficulties with healthcare affordability, availability, convenience, and accessibility, these women were able to overcome such obstacles and engaged in screening. Such findings are promising and suggest that HIV medical and social services intended to reach the most vulnerable population of WLH are empowering and better enabling women to reach their full health potential.

The sociodemographic profile of WLH in this study was primarily African American, under-educated, and economically disadvantaged. At the state level, African Americans women comprise 81 % of all WLH [27]. As such, the racial profile of WLH in this study is similar to state level trends. State level data on other sociodemographic characteristics of people living with HIV/AIDS (PLWHA) are not readily available. However, data from the CDC's HIV Medical Monitoring Project suggest similar trends in educational attainment, with 21 % reporting no high school degree/GED in the current study compared to 22 % at the national level [41, 42]. Similarly, 65 % of participants in the current study reported being unemployed compared to 62 % of PLWHA at the national level [41]. A higher proportion of

participants in the current study reported an income <10K compared to national data, 58 versus 35 % respectively [41]. Largely, the sociodemographic characteristics of women in this study is comparable to the national profile. The profile of PLWHA in the US reinforces the need to address the social determinants of health with increased emphasis on health services utilization. Undoubtedly, multi-level efforts will have the greatest impact on reducing the burden of HIV infection and improving health outcomes.

There are limitations to the study that should be considered when interpreting the results. First, all data were self-reported, which may have introduced recall bias and reporting error. Specifically, cervical cancer screening behaviors were not verified by medical chart review, therefore subject to recall bias. Some studies have found lower rates of cervical cancer screening utilization when assessed through a review of medical charts [43–45], whereas others have found dependable agreement [46]. Second, we did not assess human papillomavirus (HPV) testing. As the higher incidence of cervical cancer among WLH is related to persistent infection with high-risk (i.e., oncogenic) types of HPV [6], understanding and addressing barriers to HPV-testing and vaccination are equally important to combating cervical cancer disparities. Third, the measures used to assess HIV stigma and healthcare discrimination may not have fully captured these complex constructs, despite acceptable reliability. Identifying alternative measures or expanding upon currently available measures in attempts to more fully capture complex social constructs has substantial public health value. Fourth, this study was conducted among a predominantly African American sample of WLH residing in the southeastern US. As such, findings may not be generalizable to other racial/ethnic groups of WLH or geographical regions. However, given the comparable sociodemographic profile as noted above, we are confident about the generalizability of our study findings both at the state and national level. Lastly, we recruited WLH from Ryan White funded-clinics and ASOs. Given the sample size, we were unable to conduct separate analyses by clinic and non-clinic recruitment. Thus, our ability to fully capture the influence of healthcare access on cervical cancer screening engagement among women engaged in care versus connected to care was limited. Further, we did not collect information on the sociocultural environment of the clinical recruitment site. Thus, we were unable to assess the preexisting sociocultural climate of the clinics with regard to stigma and discrimination, which may directly or indirectly influence cervical cancer screening engagement.

Conclusions

The Pap test is a public health innovation that has drastically reduced cervical cancer incidence and mortality. However, this innovation can only be realized if women consistently engage in recommended screening in a supportive environment conducive to such engagement. Identifying mechanisms to engage WLH who are not engaged in cervical screening offers a public health opportunity to maximize the innovation of the Pap test. Overall, HIV stigma and discrimination did not predict cervical cancer screening engagement and the influence of healthcare access as a predictor of engagement, although reasonable given our recruitment methodology, contrasted with the available literature. Study findings suggest that additional efforts should focus on WLH who have adequate access to care to ensure that the innovation of the Pap is not merely realized by some, but all

WLH. Utilizing community health workers to promote cervical cancer screening and continued health services utilization for WLH should prove most effective [47].

Additionally, follow-up research among women who did not meet the annual cervical cancer screening recommendation would better enable the medical and public health communities to address screening determinants among WLH who are most at risk for poor cervical cancer outcomes. Given the study's methodological design, we cannot conclude with certainty that HIV stigma and healthcare discrimination do not influence cervical cancer screening engagement among WLH. However, understanding the ways in which HIV stigma and discrimination exists and is perpetuated in communities and healthcare infrastructure can largely aid efforts to promote and sustain health services utilization. Lastly, capitalizing on opportunities to promote comprehensive health among women engaged in HIV care, but not cancer screening, should be a pivotal focus for the public health and medical communities. Cumulatively, study findings highlight the potential and successes of HIV initiatives to reach and engaged socioeconomically disadvantaged women with suboptimal access to healthcare. Nonetheless, public health initiatives must continue to target vulnerable women and identify way to reengaged those that are not receiving comprehensive healthcare.

Acknowledgments

This work was supported by Grant Number 3U01 CA114601-05S4 [Hébert, JR (PI)] from the National Cancer Institute, Center to Reduce Cancer Health Disparities (Community Networks Program) to the South Carolina Cancer Disparities Community Network-II (SCCDCN-II). Dr. Hébert was supported by an Established Investigator Award in Cancer Prevention and Control from the Cancer Training Branch of the National Cancer Institute (K05 CA136975). Dr. Wigfall was supported by a National Cancer Institute Mentored Research Scientist Award to Promote Diversity (K01 CA175239). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health, Department of Health and Human Services, or the United States Government.

References

1. Schneider E, Whitmore S, Glynn KM, Dominguez K, Mitsch A, McKenna MT, et al. Revised surveillance case definitions for HIV infection among adults, adolescents, and children aged <18 months and for HIV infection and AIDS among children aged 18 months to <13 years—United States, 2008. *MMWR Recomm Rep.* 2008; 57(RR-10):1–12.
2. Centers for Disease Control and Prevention. 1993 revised classification system for HIV infection and expanded surveillance case definition for AIDS among adolescents and adults. *MMWR Recomm Rep.* 1992; 41(RR-17):1–19.
3. Shiels MS, Pfeiffer RM, Hall HI, Li J, Goedert JJ, Morton LM, et al. Proportions of Kaposi sarcoma, selected non-Hodgkin lymphomas, and cervical cancer in the United States occurring in persons with AIDS, 1980–2007. *JAMA.* 2011; 305(14):1450–9. [PubMed: 21486978]
4. Shiels MS, Pfeiffer RM, Gail MH, Hall HI, Li J, Chaturvedi AK, et al. Cancer burden in the HIV-infected population in the United States. *J Natl Cancer Inst.* 2011; 103(9):753–62. [PubMed: 21483021]
5. Grulich AE, van Leeuwen MT, Falster MO, Vajdic CM. Incidence of cancers in people with HIV/AIDS compared with immunosuppressed transplant recipients: a meta-analysis. *Lancet.* 2007; 370(9581):59–67. [PubMed: 17617273]
6. Sun XW, Kuhn L, Ellerbrock TV, Chiasson MA, Bush TJ, Wright TC Jr. Human papillomavirus infection in women infected with the human immunodeficiency virus. *N Engl J Med.* 1997; 337(19):1343–9. [PubMed: 9358128]

7. Chaturvedi AK, Madeleine MM, Biggar RJ, Engels EA. Risk of human papillomavirus-associated cancers among persons with AIDS. *J Natl Cancer Inst.* 2009; 101(16):1120–30. [PubMed: 19648510]
8. Kaplan JE, Benson C, Holmes KH, Brooks JT, Pau A, Masur H. Guidelines for prevention and treatment of opportunistic infections in HIV-infected adults and adolescents: recommendations from CDC, the National Institutes of Health, and the HIV Medicine Association of the Infectious Diseases Society of America. *MMWR Recomm Rep.* 2009; 58(RR-4):1–207. quiz CE1–4.
9. Silverberg MJ, Abrams DI. AIDS-defining and non-AIDS-defining malignancies: cancer occurrence in the antiretroviral therapy era. *Curr Opin Oncol.* 2007; 19(5):446–51. [PubMed: 17762569]
10. Engels EA, Biggar RJ, Hall HI, Cross H, Crutchfield A, Finch JL, et al. Cancer risk in people infected with human immunodeficiency virus in the United States. *Int J Cancer.* 2008; 123(1):187–94. [PubMed: 18435450]
11. Engels EA, Pfeiffer RM, Goedert JJ, Virgo P, McNeel TS, Scoppa SM, et al. Trends in cancer risk among people with AIDS in the United States 1980–2002. *AIDS.* 2006; 20(12):1645–54. [PubMed: 16868446]
12. Angeletti PC, Zhang L, Wood C. The viral etiology of AIDS-associated malignancies. *Adv Pharmacol.* 2008; 56:509–57. [PubMed: 18086422]
13. Palefsky J. Human papillomavirus-related disease in people with HIV. *Curr Opin HIV AIDS.* 2009; 4(1):52–6. [PubMed: 19339939]
14. Fletcher FE, Buchberg M, Schover LR, Basen-Engquist K, Kempf MC, Arduino RC, et al. Perceptions of barriers and facilitators to cervical cancer screening among low-income, HIV-infected women from an integrated HIV clinic. *AIDS Care.* 2014; 26(10):1229–35. [PubMed: 24635664]
15. Bynum SA, Wigfall LT, Brandt HM, Richter DL, Glover SH, Hebert JR. Assessing the influence of health literacy on HIV-positive women's cervical cancer prevention knowledge and behaviors. *J Cancer Educ.* 2013; 28(2):352–6. [PubMed: 23564430]
16. Simonsen SE, Kepka D, Thompson J, Warner EL, Snyder M, Ries KM. Preventive health care among HIV positive women in a Utah HIV/AIDS clinic: a retrospective cohort study. *BMC Womens Health.* 2014; 14(1):37. [PubMed: 24592813]
17. Leece P, Kendall C, Touchie C, Pottie K, Angel JB, Jaffey J. Cervical cancer screening among HIV-positive women. Retrospective cohort study from a tertiary care HIV clinic. *Can Fam Physician.* 2010; 56(12):e425–31. [PubMed: 21375064]
18. Andrasik MP, Rose R, Pereira D, Antoni M. Barriers to cervical cancer screening among low-income HIV-positive African American women. *J Health Care Poor Underserved.* 2008; 19(3):912–25. [PubMed: 18677078]
19. Abercrombie PD. Factors affecting abnormal Pap smear followup among HIV-infected women. *J Assoc Nurses AIDS Care.* 2003; 14(3):41–54.
20. Ackerson K, Gretebeck K. Factors influencing cancer screening practices of underserved women. *J Am Acad Nurse Pract.* 2007; 19(11):591–601. [PubMed: 17970859]
21. Logan JL, Khambaty MQ, D'Souza KM, Menezes LJ. Cervical cancer screening among HIV-infected women in a health department setting. *AIDS Patient Care STDS.* 2010; 24(8):471–5. [PubMed: 20653483]
22. Wyatt GE, Carmona JV, Loeb TB, Williams JK. HIV-positive black women with histories of childhood sexual abuse: patterns of substance use and barriers to health care. *J Health Care Poor Underserved.* 2005; 16(4 Suppl B):9–23. [PubMed: 16327104]
23. Beer L, Fagan JL, Valverde E, Bertolli J. Health-related beliefs and decisions about accessing HIV medical care among HIV-infected persons who are not receiving care. *AIDS Patient Care STDS.* 2009; 23(9):785–92. [PubMed: 19645620]
24. Sayles JN, Wong MD, Kinsler JJ, Martins D, Cunningham WE. The association of stigma with self-reported access to medical care and antiretroviral therapy adherence in persons living with HIV/AIDS. *J Gen Intern Med.* 2009; 24(10):1101–8. [PubMed: 19653047]
25. Zuniga ML, Blanco E, Martinez P, Strathdee SA, Gifford AL. Perceptions of barriers and facilitators to participation in clinical trials in HIV-positive Latinas: a pilot study. *J Womens Health (Larchmt).* 2007; 16(9):1322–30. [PubMed: 18001189]

26. Edwards LV. Perceived social support and HIV/AIDS medication adherence among African American women. *Qual Health Res.* 2006; 16(5):679–91. [PubMed: 16611972]
27. South Carolina Department of Health and Environmental Control. South Carolina's STD/HIV/AIDS Data: Surveillance Report. Dec 31.2013
28. US Department of Health and Human Services Health Resources and Services Administration. Medically Underserved Areas/Populations. South Carolina: 2015.
29. Bynum SA, Wright MS, Brandt HM, Burgis JT, Bacon JL. Knowledge, beliefs, and attitudes related to human papillomavirus infection and vaccination, Pap tests, and cervical intraepithelial neoplasia among adolescent girls and young women. *J S C Med Assoc.* 2009; 105(7):267–72. [PubMed: 20108716]
30. Wigfall LT, Bynum SA, Brandt HM, Friedman DB, Bond SM, Lazenby GB, et al. Cervical cancer prevention knowledge and abnormal Pap test experiences among women living with HIV/AIDS. *J Cancer Educ.* 2014; 30:213–9.
31. Shapiro MF, Morton SC, McCaffrey DF, Senterfitt JW, Fleishman JA, Perlman JF, et al. Variations in the care of HIV-infected adults in the United States: results from the HIV Cost and Services Utilization Study. *JAMA.* 1999; 281(24):2305–15.
32. Frankel MR, Shapiro MF, Duan N, Morton SC, Berry SH, Brown JA, et al. National probability samples in studies of low-prevalence diseases. Part II: designing and implementing the HIV cost and services utilization study sample. *Health Serv Res.* 1999; 34(5 Pt 1):969–92. [PubMed: 10591268]
33. Kinsler JJ, Wong MD, Sayles JN, Davis C, Cunningham WE. The effect of perceived stigma from a health care provider on access to care among a low-income HIV-positive population. *AIDS Patient Care STDS.* 2007; 21(8):584–92. [PubMed: 17711383]
34. Williams DR, Yu Y, Jackson JS, Anderson NB. Racial differences in physical and mental health: socio-economic status, stress and discrimination. *J Health Psychol.* 1997; 2:335–51. [PubMed: 22013026]
35. Centers for Disease Control and Prevention. Behavioral risk factor surveillance survey data. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2012.
36. Vittinghoff, E. Regression methods in biostatistics : linear, logistic, survival, and repeated measures models. New York: Springer; 2005.
37. Vittinghoff, E. Regression methods in biostatistics : linear, logistic, survival, and repeated measures models. 2. New York: Springer; 2012.
38. Rahangdale L, Sarnquist C, Yavari A, Blumenthal P, Israelski D. Frequency of cervical cancer and breast cancer screening in HIV-infected women in a county-based HIV clinic in the Western United States. *J Womens Health (Larchmt).* 2010; 19(4):709–12. [PubMed: 20201703]
39. Boehme AK, Davies SL, Moneyham L, Shrestha S, Schumacher J, Kempf MC. A qualitative study on factors impacting HIV care adherence among postpartum HIV-infected women in the rural southeastern USA. *AIDS Care.* 2014; 26(5):574–81. [PubMed: 24116662]
40. Sarnquist CC, Soni S, Hwang H, Topol BB, Mutima S, Maldonado YA. Rural HIV-infected women's access to medical care: ongoing needs in California. *AIDS Care.* 2011; 23(7):792–6. [PubMed: 21287418]
41. Blair JM, Fagan JL, Frazier EL, Do A, Bradley H, Valverde EE, et al. Behavioral and clinical characteristics of persons receiving medical care for HIV infection - Medical Monitoring Project, United States, 2009. *MMWR Surveill Summ.* 2014; 63(Suppl 5):1–22.
42. Weiser J, Beer L, Frazier EL, Patel R, Dempsey A, Hauck H, et al. Service delivery and patient outcomes in ryan white HIV/AIDS program-funded and-nonfunded health care facilities in the United States. *JAMA Intern Med.* 2015; 175(10):1650–9. [PubMed: 26322677]
43. Fletcher FE, Vidrine DJ, Tami-Maury I, Danysh HE, King RM, Buchberg M, et al. Cervical cancer screening adherence among HIV-positive female smokers from a comprehensive HIV clinic. *AIDS Behav.* 2014; 18(3):544–54. [PubMed: 23605155]
44. Howard M, Agarwal G, Lytwyn A. Accuracy of self-reports of Pap and mammography screening compared to medical record: a meta-analysis. *Cancer Causes Control.* 2009; 20(1):1–13. [PubMed: 18802779]

45. McGovern PG, Lurie N, Margolis KL, Slater JS. Accuracy of self-report of mammography and Pap smear in a low-income urban population. *Am J Prev Med.* 1998; 14(3):201–8. [PubMed: 9569221]
46. Fowles JB, Fowler E, Craft C, McCoy CE. Comparing claims data and self-reported data with the medical record for Pap smear rates. *Eval Health Prof.* 1997; 20(3):324–42. [PubMed: 10183327]
47. Pittman, M., Sunderland, A., Broderick, A., Barnett, K. Bringing community health workers into the mainstream of U.S. health care. Discussion Paper IoM. , editor. Washington, DC: 2015.

Table 1

Sociodemographic characteristics of women engaged in HIV Care

Variable	Pap test <1 year n = 118 (%)	2 Pap tests n = 52 (%)	Change in Pap n = 50 (%)	Total n = 145 (%)
Mean age	46.64 ± 11.14	45.10 ± 10.64	45.83 ± 9.61	46.15 ± 10.65
Race				
AA/Black	108 (91.5)	50 (96.2)	47 (94.0)	131 (90.3)
AI/AN	1.0 (0.8)	0	1.0 (2.0)	1.0 (0.7)
White	6.0 (5.1)	0	1.0 (2.0)	8.0 (5.5)
Other	1.0 (0.8)	1.0 (1.9)	0 1.0 (2.0)	3.0 (2.1)
Missing	2.0 (1.8)	1.0 (1.9)		2.0 (1.4)
Ethnicity				
Hispanic	4.0 (3.4)	1.0 (1.9)	0	4.0 (2.8)
Non-Hispanic	113 (95.8)	51 (98.1)	49 (98.0)	139 (95.8)
Missing	1.0 (0.8)	0	1.0 (2.0)	2.0 (1.4)
Education				
No high school/GED	24 (20.3)	16 (30.8)	14 (28.0)	31 (21.4)
High school/GED	39 (33.1)	18 (34.6)	14 (28.0)	48 (33.1)
Some college	54 (45.8)	18 (34.6)	21 (42.0)	65 (44.8)
Missing	1.0 (0.8)	0	1.0 (2.0)	1.0 (0.7)
Income				
<10k	69 (59)	35 (67.3)	33 (66.0)	84 (57.9)
10k	37 (31)	14 (26.9)	10 (20.0)	48 (33.1)
Missing	12 (10)	3.0 (5.8)	7.0 (14.0)	13.0 (9.0)
Employment status				
Full/part employed	30 (25.4)	12 (23.1)	9.0 (18.0)	38 (26.2)
Unemployed	75 (63.6)	35 (67.3)	34 (68.0)	94 (64.8)
Missing	13 (11.0)	5.0 (9.6)	7.0(14.0)	13 (9.0)
Relationship status				
Married/Partner	29 (24.6)	10 (19.2)	11 (22)	38 (26.2)
Single	88 (74.6)	42 (80.8)	38 (76)	106 (73.1)
Missing	1.0 (0.8)	0	1.0 (2.0)	1.0 (0.7)

AA African American, AI/AN American Indian/Alaska Native

Table 2

Sociodemographic predictors of cervical cancer screening among women engaged in HIV care

Variable	Pap test <1 year ORs (95 % CI) p-value	2 Pap tests ORs (95 % CI) p-value	Change in Pap test ORs (95 % CI) p-value
Age	1.03 (.98–1.07) p = .28	.99 (.95–1.02) p = .45	.98 (.94–1.02) p = .30
Education			
No high school/GED	1.66 (.47–5.87) p = .43	.91 (.31–2.66) p = .87	.39 (.13–1.20) * p = .10
High school/GED	1.47 (.44–4.94) p = .53	.29 (.10–.84) * p = .02	.56 (.19–1.65) p = .29
Some college (reference)	1.00	1.00	1.00
Income			
<10k	1.53 (.56–4.16) p = .40	1.24 (.50–3.09) p = .64	2.17 (.83–5.70) * p = .12
10k (reference)	1.00	1.00	1.00
Employment status			
Unemployed	.92 (.32–2.62) p = .87	.94 (.35–2.48) p = .89	1.90 (.67–5.41) p = .23
Full/part-time employed	1.00	1.00	1.00
Relationship status			
Single	1.47 (.54–3.99) p = .38	2.89 (1.07–7.81) * p = .04	1.57 (.58–4.24) p = .46
Married/living with partner (reference)	1.00	1.00	1.00

CI confidence interval, *OR* odds ratio

* Significant at p = .020

Table 3

Social and structural predictors of cervical cancer screening among women engaged in HIV care

Variable	Pap test < 1 year ORs (95 % CI) p-value	2 Pap tests ^a ORs (95 % CI) p-value	Change in Pap test ^b ORs (95 % CI) p-value
Healthcare access			
Low access	3.80 (1.34–10.78) * p = .01	1.08 (.46–2.53) p = .87	1.58 (.61–4.08) p = .35
High access (reference)	1.00	1.00	1.00
Transportation: getting to medical appointments			
Hard	.70 (.21–2.35) p = .56	.84 (.26–2.66) p = .76	.69 (.19–2.50) p = .57
Easy (reference)	1.00	1.00	1.00
Perceived HIV Stigma			
Stigma	1.25 (.45–2.35) p = .67	.73 (.31–1.74) p = .48	1.64 (.61–4.44) p = .33
No stigma (reference)	1.00	1.00	1.00
Perceived discrimination	1.22 (.86–1.74) p = .27	1.09 (.86–1.40) p = .47	.86 (.62–1.20) p = .36
Personal healthcare provider			
No	.67 (.21–2.06) p = .48	.53 (.22–1.25) p = .14	.86 (.35–2.11) p = .75
Yes (reference)	1.00	1.00	1.00
Education			
No high school/GED		3.22 (1.08–9.62) * p = .04	2.03 .59–6.98 p = .26
High school/GED		1.76 (.70–4.40) p = .23	.83 .31–2.21 p = .71
Some college (reference)		1.00	
Income			
<10k			2.47 (.98–6.23) p = .06
10k (reference)			1.00
Relationship status			
Single		1.66 (.67–4.11) p = .27	
Married/living with partner (reference)		1.00	

CI confidence interval, *OR* odds ratio

* Significant at p = .05

^a Adjusted for education and relationship status^b Adjusted for education and income