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Prevalence of Human Papillomavirus, HIV and other sexually transmitted infections among female sex workers in Togo: a national cross-sectional survey

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Running title: HPV and STI among sex workers in Togo

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ABSTRACT

Objectives: Sub-Saharan Africa is a region of both high HIV and cervical cancer incidence. We conducted the first national study in Togo to assess HPV, HIV and other Sexually Transmitted Infections (STIs) prevalence among Female Sex Workers (FSW).

Methods: A multicentric cross-sectional study was conducted among FSW recruited in hot spots (clubs, streets) in four Togolese cities. HPV and STIs were tested from cervical and anal swabs. HIV and syphilis were screened with rapid tests.

Results: 310 FSW were recruited; HIV and cervical high-risk HPV (hrHPV) prevalence were 10.6% (n=33/310) and 32.9% (n=102/310), respectively. The most frequent hrHPV types were HPV58 (13.6%, n=19/140), HPV35 (12.9%, n=18/140), HPV31 (12.1%, n=17/140) and HPV16 (10.7%, n=15/140). hrHPV prevalence and multiple hrHPV infections showed higher rates in HIV-positive than in HIV-negative FSW (48.5% vs 31.0%, p=0.04 and 21.2% vs 9.0%, p=0.03; respectively). Prevalence of hrHPV was higher in cervical than anal swabs (34.1% vs 20.7%, p=0.0004). hrHPV anal infections were more frequent among HIV-positive than HIV-negative FSW (51.9% vs 17.3%, p=2.10⁻⁵). Concomitant anal and cervical hrHPV infections were present in 43.2% (n=41/95) of hrHPV-positive FSW. Overall prevalence in the cervix of *N.gonorrhoeae*, *C.trachomatis*, *M.genitalium*, and *T.vaginalis* were 4.2%, 6.1%, 5.5% and 6.5%, respectively.

Conclusions: This first African study on paired cervical and anal samples showed a high prevalence of genital HPV infections with a rather high rate of concomitant HPV infections but low types concordance. We report an unusual distribution of hrHPV types. These findings highlight the critical need of implementation of a national HPV vaccination strategy.

Key words: HPV, HIV, Togo, female sex workers, STIs

INTRODUCTION

Human papillomavirus (HPV) is the most common sexually transmitted infection (STI) worldwide. Some HPV are low-risk oncogenic (lrHPV), causing papilloma and condyloma acuminata, mainly due to types 6 and 11. On the other hand, high-risk oncogenic HPV (hrHPV) are involved in almost 100% of cervical cancer, in 88% of anal cancer and in some head-and-neck cancer [1]. About 530.000 new female cancer cases per year are attributable to HPV [1], cervix accounting for 83%. Two-thirds occurred in less-developed countries, representing 93.000 cases in Sub-Saharan Africa [1]. Worldwide, the most prevalent types are HPV16 and HPV18, detected in 70% of cervical cancers [1].

Togo is among the countries showing the highest cervical cancer incidence rate with 21.5 per 100.000 [2]. Female sex workers (FSW) have twice as much risk of genital HPV infection as women from the general population [3], due to high number of sexual partners, inconsistent sexual prevention, limited protected effect of condoms against HPV and higher prevalence of Human Immunodeficiency Virus (HIV) infection [4,5]. Only few studies have evaluated HPV prevalence among FSW in Africa. In addition, to date, no data are available on concomitant cervical and anal HPV carriage among African FSW and few worldwide.

The aim of this study was to assess HPV, HIV and other STIs prevalence and HPV types distribution among the FSW key population in Togo. We will also describe concomitant cervical and anal HPV prevalence and HPV types distribution among the two sites.

PATIENTS AND METHODS

Study design and participants

A population-based cross-sectional study was conducted among FSW in four cities of Togo (the capital city Lomé, Kpalimé, Atakpamé and Tsévié). Participants were recruited through the respondent-driven sampling method in hot-spots (bars, clubs and streets) or brothels. A participant was eligible if the following criteria were fulfilled: i) ≥ 18 years, ii) being engaged in prostitution at least once in the last 12 months, iii) living in Togo for more than three months and iv) being able to give a written-informed consent. Participants with sexual ambiguity or identified as transgender were excluded. Socio-demographic characteristics and sexual behavior patterns were collected using a face-to-face standardized questionnaire. Ethical approvals were obtained from the national Bioethics Committee for Health Research in Togo (N°19/2017/CBRS) on June 22, 2017.

101 **HIV and syphilis screening**

102 Blood samples were collected to test HIV and Syphilis in Togo using SD-BIOLINE
103 HIV/Syphilis Duo® (Abbott, Santa Clara, CA, USA). HIV positive tests were
104 confirmed with another rapid test (First Response® HIV 1-2-O Card Test; Premier
105 Medical Corporation Pvt.Ltd., Maharashtra, India).

106

107 **HPV and STIs testing**

108 Cervical and anal swabs were collected with Cervex-Brush® Combi and Anex-Brush®
109 respectively (Rovers Medical Devices B.V., Netherlands) on BDSurePath™ liquid-
110 based Pap tests (Becton-Dickinson, Franklin Lakes, NJ, USA) between August and
111 October 2017, stored at 4°C and sent at room temperature to France to be analyzed
112 from December 2017 to February 2018. Nucleic acids were extracted using STARMag
113 96X4 Universal Cartridge kit (Seegene, Seoul, Korea) on the MICROLAB NIMBUS
114 automat (Seegene). HPV typing was performed with Anyplex II™ HPV28 Detection
115 test (Seegene) which detects 28 HPV types, 12 were defined as hrHPV following the
116 International Agency for Research on Cancer (IARC): 16, 18, 31, 33, 35, 39, 45, 51, 52,
117 56, 58, 59 ; eight as intermediate risk HPV classified 2A or 2B by IARC: 26, 53, 66, 68,
118 69, 70, 73, 82 and eight as lrHPV or non-classified HPV: 6, 11, 40, 42, 43, 44, 54, 61.
119 Other STIs detection was performed on cervical samples using Allplex™STI Essential
120 Assay (Seegene).

121

122

Statistical analyses

A sample of participants was calculated using a single proportion population formula with a 95% confidence level, 6% margin of error and 70% estimated prevalence of HPV among FSW [3,6]. A 10% non-response rate or non-exploitable swabs was considered and the minimum number of FSW was estimated at 241. Associations between HPV and other STIs or socio-demographic factors were assessed by the Chi-square test or by Fisher's exact test if appropriate. HPV concordance between anal and cervical swabs was assessed using the Kappa statistic (κ). Statistical analyses were performed using STATA software (V14, StataCorp, College Station, TX, USA).

RESULTS

Patients' characteristics

Among the 315 FSW recruited, HPV typing and/or STIs tests failed for five cervical swabs, due to lack of material for two, leading to a successful amplification for 310 samples (98.4%). The median age of the 310 participants was 25 years (Interquartile Range [IQR]=21-32), median ages at first sexual intercourse and at sex working initiation were 17 (IQR=15-18) and 19 years (IQR=17-23), respectively (Table 1). Regarding educational background, 64% of FSW reached at least secondary school

(Supplementary Table 1). Concerning sexual behavior, 77% and 45% used condom at each sexual intercourse with clients and with partners other than clients, respectively (Supplementary Table 2). HIV prevalence was 10.6% (n=33/310; 95% Confidence Interval [95%CI]=7.2-14.1). Syphilis prevalence was 0.6% (n=2/310, upper limit of 95%CI=1.5%).

HPV cervical prevalence and HPV types distribution

Prevalence of any type HPV and of hrHPV cervical infection were 45.2% (n=140/310, 95%CI=39.7-50.8) and 32.9% (n=102/310, 95%CI=27.7-38.1), respectively. Among HPV-positive FSW, the most common hrHPV types were HPV58 (13.6%, n=19/140), HPV35 (12.9%, n=18/140), HPV31 (12.1%, n=17/140). HPV16 was at the fourth rank with a frequency of 10.7% (n=15/140) and HPV18 at the eighth rank (7.1%, n=10/140). HPV6 and HPV11 frequencies were 7.1% (n=10/140) and 1.4% (n=2/140), respectively (Fig. 1). A proportion of 17.1% (n=24/140) of HPV-positive FSW harbored HPV16 and/or HPV18, which are covered by all available vaccines. This proportion rose to 23.6% (n=33/140) and 54.3% (n=76/140) of FSW harboring at least one HPV type included in the quadrivalent and in the nonavalent vaccines, respectively. However, among the hrHPV-positive FSW group (n=102), 53 women (52.0%) were infected by at least one hrHPV not covered by any vaccine.

High-risk HPV prevalence was higher among HIV-positive than HIV-negative FSW (48.5% [n=16/33] vs 31.1% [n=86/277], p=0.04) (Table 2). HIV-positive FSW had more

frequently multiple hrHPV infections than HIV-negative FSW (21.2% [n=7/33] vs 9.0% [n=25/277], p=0.03).

Anal HPV prevalence and HPV types distribution

Both anal and cervical swabs were collected for 295 FSW, HPV results were successfully obtained for 276 (Supplementary Table 3). Any type and hrHPV were detected in 96 and 57 anal samples, leading to a prevalence of 34.8% (95%CI=29.2-40.4) and 20.7% (95%CI=15.9-25.4), respectively. Among HPV-positive FSW, the most common anal hrHPV types were HPV59 (11.5%, n=11/96), HPV56 (10.4%, n=10/96) and HPV18, HPV52 and HPV58 (8.3%, n=8/96 for them all). HPV16 ranked sixth with a frequency of 7.3% (n=7/96).

hrHPV prevalence was lower in anal than in cervical swabs (20.7% vs 34.1% [n=94/276], p=0.0004). hrHPV anal infections were more frequent among HIV-positive than among HIV-negative FSW (51.9% [n=14/27] vs 17.3% [n=43/249], p=2.10⁻⁵). Prevalence of anal hrHPV was relatively stable throughout the different age groups (from 25.0% for the <21 years [n=17/68] to 21.1% for the 31-55 years age group [n=15/71], p=0.73) (Fig. 2). Cervical hrHPV prevalence showed a trend to decrease over age from 43.8% for the <21 years (n=32/73) to 23.5% for the 31-55 years age group (n=20/85, p=0.05).

Anal hrHPV prevalence was higher among FSW having a cervical hrHPV infection than among FSW without cervical hrHPV infection (41.5% [n=39/94] vs 9.9% [n=18/182], $p<10^{-5}$).

Concordance between cervical and anal samples results

For 41 FSW, we detected at least one hrHPV or HPV6 or HPV11 both in cervical and anal samples (Fig. 3). Thus, concomitant anal and cervical HPV infections were present in 43.2% of hrHPV/HPV6/HPV11-positive FSW (n=41/95), with a higher frequency among HIV-positive than HIV-negative FSW (78.6% [n=11/14] vs 37.0% [n=30/81], $p=0.004$). Concordance between hrHPV types present at the two anatomical sites was fair with a kappa coefficient of 0.35. HIV-positive FSW had more frequently concordant hrHPV/HPV6/HPV11 types between the two sites than HIV-negative FSW (57.1% [n=8/14] vs 29.6% [n=24/81], $p=0.04$).

Other STIs prevalence

Overall prevalence of *N.gonorrhoeae*, *C.trachomatis*, *M.genitalium*, and *T.vaginalis* were 4.2% (n=13/310, 95%CI=1.9-6.4), 6.1% (n=19/310, 95%CI=3.4-8.8), 5.5% (n=17/310, 95%CI=2.9-8.0) and 6.5% (n=20/310, 95%CI=3.7-9.2), respectively. No significant differences in STIs prevalence were observed depending on HIV serological status. However, prevalence of HIV and *N.gonorrhoeae* were higher among hrHPV-positive than among hrHPV-negative FSW (15.7% [n=16/102] vs 8.2% [n=17/208], $p=0.04$ and

7.8% [n=8/102] vs 2.4% [n=5/208], p=0.03, respectively) and there was a trend for *M.genitalium* (8.8% [n=9/102] vs 3.9% [n=8/208], p=0.07) (Table 2). Prevalence of HPV any type, *M.genitalium*, and *T.vaginalis* were higher among FSW recruited in Lomé than those recruited in other cities: 51.1% (n=91/178) vs 37.1% (n=49/132, p=0.02), 7.9% (n=14/178) vs 2.3% (n=3/132, p=0.04), and 9.0% (n=16/178) vs 3.0% (n=4/132, p=0.04), respectively. In multivariate analysis, HIV and *N.gonorrhoeae* were the only independent factors associated with cervical hrHPV infection (aOR: 3.02 [95%CI: 1.39-6.58], p=0.005 and aOR: 3.27 [95%CI: 1.02-10.43], p=0.045, respectively).

DISCUSSION

In this study evaluating the global burden of STIs among 310 FSW in Togo, we showed HIV and hrHPV cervical infection prevalence of 10.6% and 32.9%, respectively; with an unusual distribution of hrHPV types. Assessment of both cervical and anal HPV infections reported a high rate of concomitant hrHPV infections but low concordance regarding HPV types. Two previous studies conducted in Kenya have estimated prevalence of cervical hrHPV infection among FSW and showed infection rates of 29.0% and 57.7% [7,8]. Other studies have been conducted among FSW in various regions of the world

(Netherlands, Cambodia, Iran, Caribbean, Senegal), showing HPV cervical infection prevalence ranging between 25.0% and 72.5% [9–14]. These studies differed regarding: (i) HIV prevalence (from 1% to 31.2%); (ii) age of the participants, the FSW of our study being rather young; (iii) number of sexual partners and (iv) HPV typing assays [7–9].

In the present study, HIV prevalence of 10.6% was comparable to that reported by UNAIDS among FSW Togolese population in 2016 (11.7%) [15].

Our study evidenced an unusual HPV types distribution with HPV58 being the most common, while HPV16 was only at the fourth rank. Similar results were reported among FSW in Amsterdam with HPV16 being also at the fourth rank [9]. In a meta-analysis of HPV types prevalence, based on 35 studies conducted among FSW, HPV16 was the most prevalent (38.9%) followed by HPV18 (23.1%) with no differences depending on the study region [3]. The particular epidemiology we describe has been reported at cervical cancer stage in a large retrospective study in which HPV16 had the lowest attributable part in Africa (48%) compared to 72% in North America and 66% in Europe [16]. Interestingly, HPV35 ranking second in our study, has been reported as the most prevalent HPV type in studies conducted in Africa among Men having Sex with Men (MSM) populations in Togo, Central Africa Republic and in Nigeria [17,18]. In the current study, 52.0% of the hrHPV positive FSW are infected by at least one hrHPV not covered by any currently available vaccine. However, some evidence of cross protection have been recently described [19]. Thus, studies conducted in Africa to evaluate the possible cross-protection with

the nonavalent vaccine against HPV35 and other hrHPV types should be warmly encouraged. Meanwhile, these findings should not be a hindrance to HPV vaccination program implementation.

To our knowledge, the present study is the first assessing paired anal and cervical samples among FSW in Africa, reporting hrHPV anal and cervical infection prevalence of 20.7% and 34.1%, respectively. Contrary to these results, in two studies, one conducted among FSW in Amsterdam and the other carried out in a French HIV-infected antiretroviral treated women population, hrHPV prevalence reported were higher in anus than in cervix (55% vs 46% and 47.6% vs 26.4%, respectively) [9,20]. These different findings could be explained by differences in sexual practices, by different HIV prevalence and by different median age of participants, the population of our study being rather young may have not yet reached a complete cervical clearance [9,20]. Nevertheless, in all these studies hrHPV anal infection prevalence was higher in HIV-positive than in HIV-negative women. In addition, similarly to the French study, we showed that anal hrHPV infection was more frequent among women with concurrent cervical hrHPV infection [20].

Natural clearance of HPV is well-documented in cervical infection while it has been scarcely studied in anal infection and only in male populations, particularly among MSM. In the Hawaiian HPV cohort, anal HPV clearance among young women was quite rapid with 87.0% of infections cleared at one year, faster than cervical clearance [21]. However, in this same cohort, a steady prevalence of anal HPV infections alone (*i.e.* without concomitant cervical infection) was observed at all age groups, in

272 accordance with our findings among FSW suggesting a relatively low rate of anal
273 clearance [22]. However, a longer prospective study among female from general
274 population would be necessary to further examine anal HPV clearance.

275 We observed a higher rate of concomitant HPV shedding at both anatomical sites
276 among HIV-positive than HIV-negative FSW, in accordance with the results of a US
277 study [23]. The rate of concordance between hrHPV types was relatively low.
278 However, concordance rate was higher among HIV-positive than HIV-negative FSW,
279 similarly to the Hessol et al. study results [23].

280 Regarding STIs prevalence, results are comparable to those described in a meta-
281 analysis conducted in Sub-Saharan Africa showing *C.trachomatis*, *N.gonorrhoeae* and
282 *T.vaginalis* prevalence of 6.2%, 5.2% and 10.0%, respectively [24]; compared to 6.1%,
283 4.2% and 6.5% in our population. A lower prevalence of Syphilis was observed in the
284 present study than in the meta-analysis (0.6% vs 2.8%) [24], findings also observed in
285 another key population of MSM in Togo [25]. Regarding *M.genitalium* prevalence
286 among FSW in Africa, only two studies have been conducted before, reporting
287 prevalence of 26.3% and 12.9%, respectively [11,12]; much higher than the prevalence
288 of 5.5% found in the present study. However, in one of these studies, the recruitment
289 was carried out among FSW consulting for symptomatic STIs [26].

290

291 Finally, we did not find any significant association between socio-demographic
292 characteristics or sexual behavioral markers and cervical hrHPV infection. Only HIV

293 and *N.gonorrhoeae* were found independently associated with hrHPV cervical
294 shedding.

295 This study has some limitations. Firstly, no cytological analysis was conducted,
296 preventing cytological lesions detection. Secondly, no questions about detailed
297 sexual practices (such as vaginal and anal sex practices) were included in the
298 behavioral questionnaire, which limits the interpretation of the concomitant HPV
299 shedding at the cervical and anal sites. Finally, this study was conducted among a
300 high-risk population and should be widened to general female population so as to
301 assess global HPV prevalence in Togo.

302

303 In conclusion, we reported a high prevalence of HIV and hrHPV with an unusual
304 HPV types distribution. In addition, we observed a high prevalence of hrHPV anal
305 shedding, especially among HIV-positive and among cervical hrHPV-positive
306 women. Taking into account a recent modeling study, a rapid scale up of HPV
307 vaccination and cervical lesion screening would avert three-quarter of around 13
308 million cases in low and medium Human Development Index countries [27]. As
309 neither cervical lesion screening program nor HPV detection screening program are
310 available in Togo for now, the implementation of a national HPV vaccination
311 strategy is critical.

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CONFLICT OF INTEREST

The authors report no conflict of interest with the submitted work.

MEETINGS PRESENTATION

This work has been presented as an oral presentation at the EUROGIN International Multidisciplinary HPV Congress 2018 (Abstract FC20-7) and at the French RICA 2018 conference (Abstract P-274).

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417

TABLES

418 **Table 1: Socio-demographic characteristics and sexual behavior patterns of female**
 419 **sex workers participants in Togo (n = 310)**

	hrHPV-positive FSW		hrHPV-negative FSW		Total		p-value
	n		n		n		
Median age, years (IQR)	102	24 (20-30)	208	26 (22-32)	310	25 (21-32)	p=0.011
Median age at first sexual intercourse, years (IQR)	99	17 (15-18)	197	17 (15-18)	296	17 (15-18)	p=0.38
Median age at first paid sexual intercourse, years (IQR)	99	19 (17-22)	202	20 (17-24)	301	19 (17-23)	p=0.29
Marital status, n (%)	94		192		286		p=0.007
Married		6 (6%)		35 (18%)		41 (14 %)	
Single		88 (94%)		157 (82%)		245 (86 %)	
Education, n (%)	102		208		310		p=0.85
Never schooled		12 (12%)		29 (14%)		41 (13 %)	
Primary school		22 (21%)		50 (24%)		72 (23 %)	
Secondary school		60 (59%)		116 (56%)		176 (57 %)	
University		8 (8%)		13 (6%)		21 (7 %)	
Median number of sexual partners during the past seven days, n (IQR)	100	5 (3-10)	204	6 (3-9)	304	5 (3-9)	p=0.67
Use of condoms with clients, n (%)	97		205		302		p=0.62
Each time		76 (78%)		157 (77%)		233 (77 %)	
Often		17 (18%)		33 (16%)		50 (17 %)	
Rarely		2 (2%)		11 (5%)		13 (4 %)	
Never		2 (2%)		4 (2%)		6 (2 %)	
Use of condoms with sexual partners other than clients, n (%)	81		170		251		p=0.27
Each time		35 (43%)		77 (45%)		112 (45 %)	
Often		15 (19%)		43 (25%)		58 (23 %)	
Rarely		12 (15%)		26 (15%)		38 (15 %)	
Never		19 (23%)		24 (14%)		43 (17 %)	
Healthcare worker consultation in case of sexually transmitted infection symptoms, n (%)	76		170		246		p=0.90
No		40 (53%)		88 (52%)		128 (52 %)	
Yes		36 (47%)		82 (48%)		118 (48 %)	

Table 2: Prevalence of Sexually Transmitted Infections (STIs) according to HIV serological status or high-risk Human Papillomavirus (hrHPV) cervical shedding among Female Sex Workers (FSW) in Togo

	Overall (n = 310)	HIV+ FSW (n = 33)	HIV- FSW (n = 277)	p-value	hrHPV+ FSW (n = 102)	hrHPV- FSW (n = 208)	p-value
HIV	33 (10.6 %)	-	-	-	16 (15.7 %)	17 (8.2 %)	0.04
hrHPV	102 (32.9 %)	16 (48.5 %)	86 (31.1 %)	0.04	-	-	-
<i>N.gonorrhoeae</i>	13 (4.2 %)	0 (0.0 %)	13 (4.7 %)	0.37	8 (7.8 %)	5 (2.4 %)	0.03
<i>C.trachomatis</i>	19 (6.1 %)	0 (0.0 %)	19 (6.9 %)	0.24	8 (87.8 %)	11 (5.3 %)	0.37
<i>M.genitalium</i>	17 (5.5 %)	2 (6.1 %)	15 (5.4 %)	0.70	9 (8.8 %)	8 (3.9 %)	0.07
<i>T.vaginalis</i>	20 (6.5 %)	1 (3.0 %)	19 (6.9 %)	0.70	9 (8.8 %)	11 (5.3 %)	0.23
Syphilis	2 (0.6 %)	0 (0.0 %)	2 (0.7 %)	1.0	0 (0.0 %)	2 (1.1 %)	0.50

FIGURE LEGENDS

Figure 1: Human Papillomavirus (HPV) types distribution in cervical specimens obtained from HPV-positive Female Sex Workers (FSW) participants in Togo

(A) HPV types distribution among HPV-positive FSW, n = 140. (B) HPV types distribution according to FSW HIV serological status.

hrHPV = high-risk Human Papillomavirus. lrHPV = encompassing low-risk Human Papillomavirus and non-classified HPV types. HIV = Human Immunodeficiency Virus.

Figure 2: Prevalence by age groups of at least one high-risk Human Papillomavirus (hrHPV) at the cervical and at the anal site among Female Sex Workers (FSW) participants in Togo

Cervix samples are represented in blue and anal canal samples are represented in green.

Figure 3: Different types frequency of Human Papillomavirus (HPV) according to the anatomical site sampling and HIV serological status among HPV-positive Female Sex Workers (FSW) participants in Togo

(A) Among all FSW. (B) Among HIV-negative FSW. (C) Among HIV-positive FSW.

Figure 1

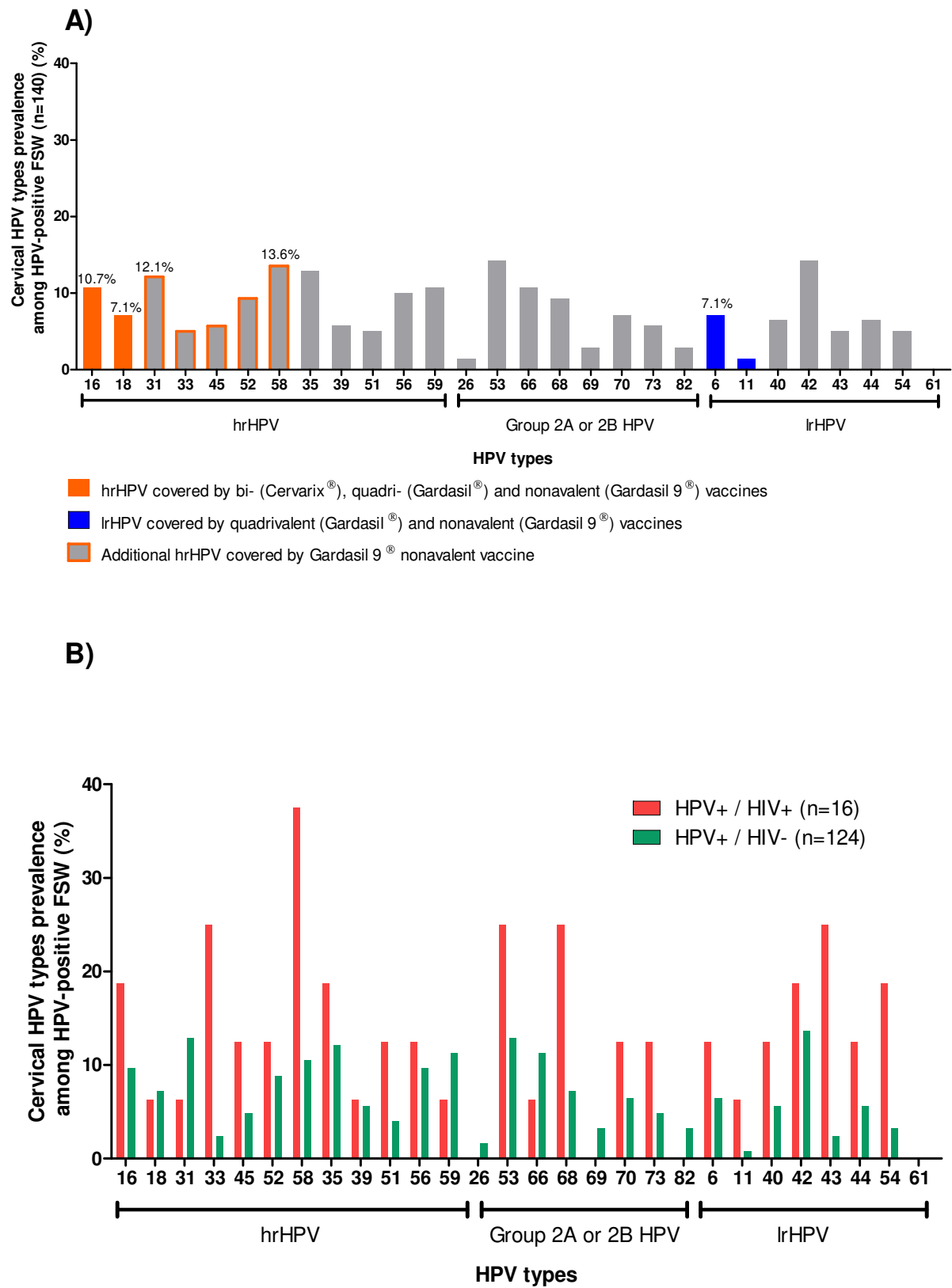


Figure 2

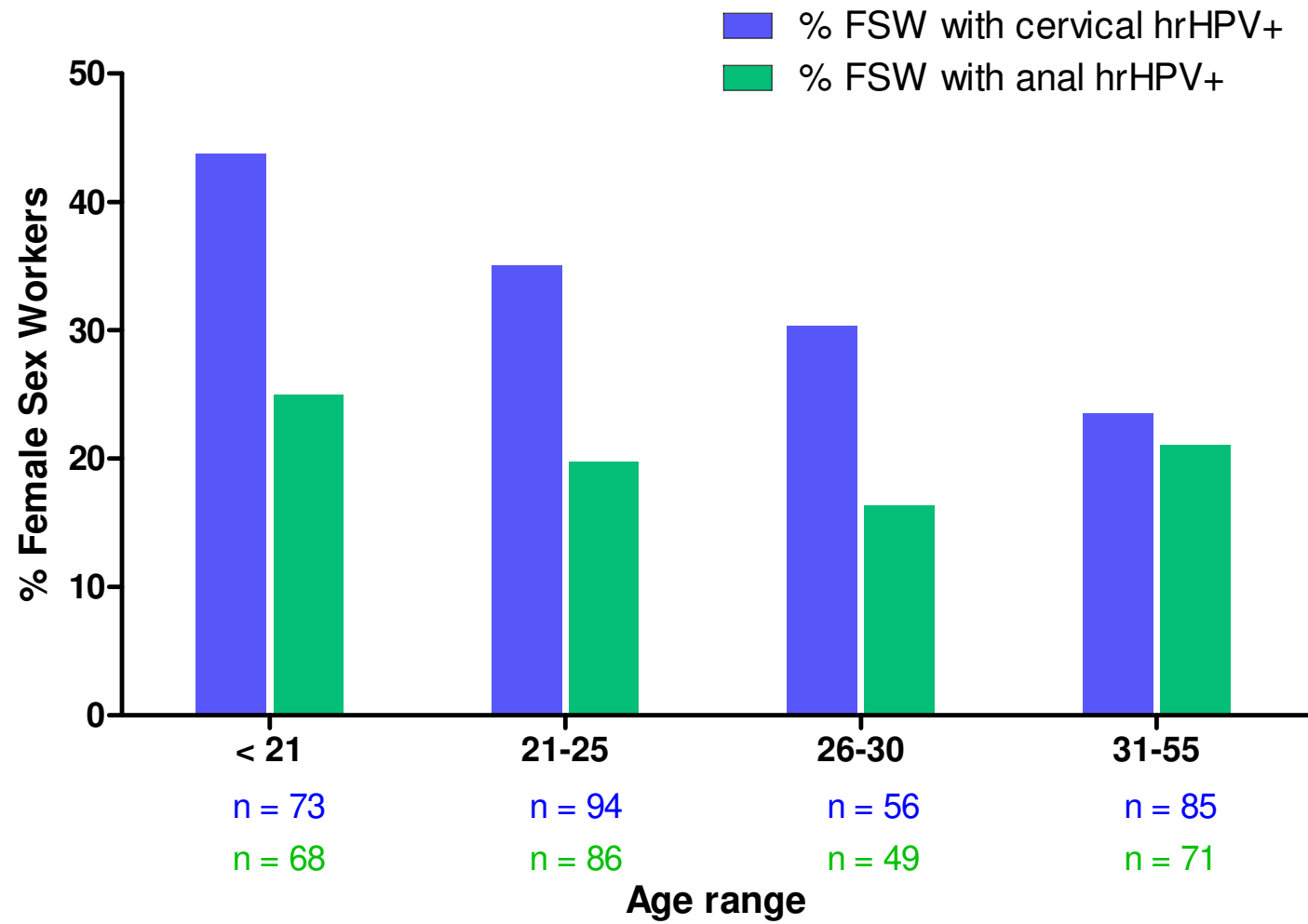
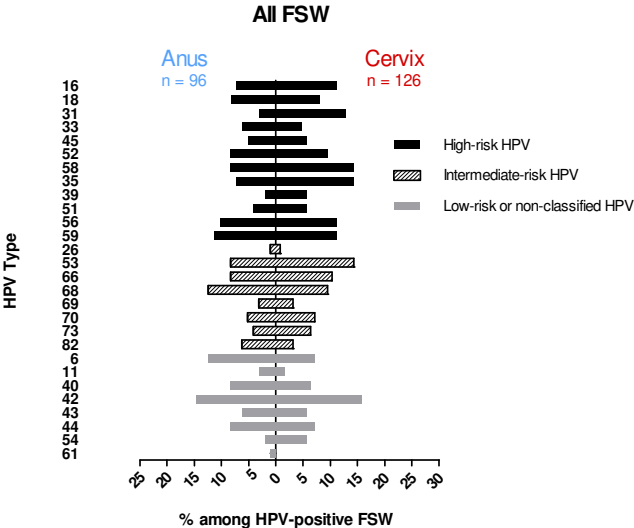
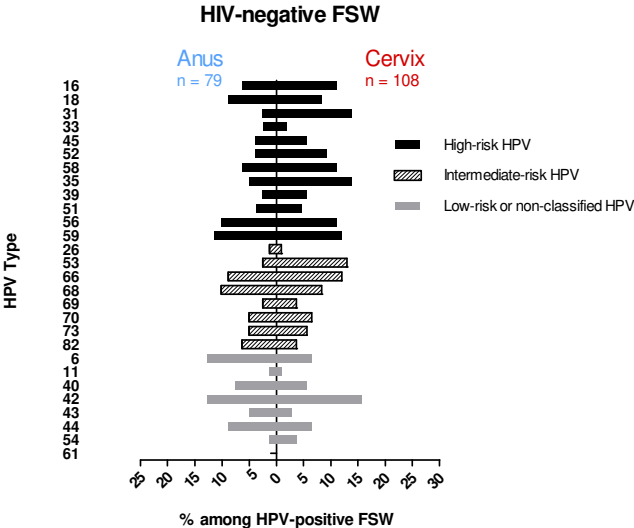


Figure 3

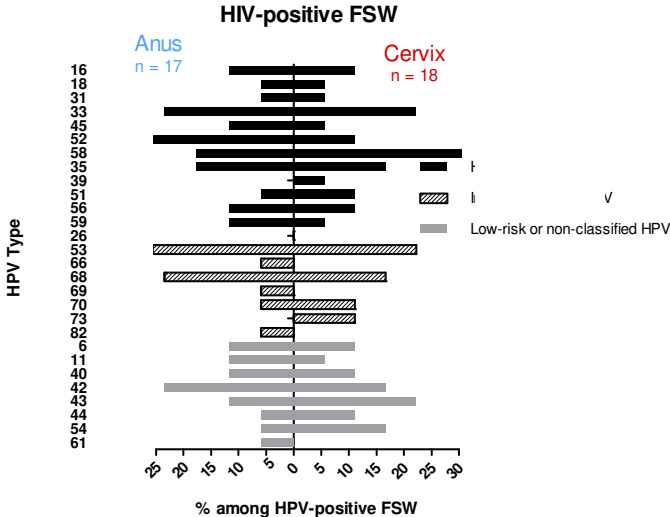
a)



b)



c)



Supplementary Data

Table 1: Educational background of Female Sex Workers (FSW) depending on their HIV-status

Educational background	HIV-positive (n=27)		HIV-negative (n=277)	
	n	%	n	%
Never schooled	6	18.2	35	12.6
Primary school	13	39.4	59	21.3
Secondary school	14	42.4	162	58.5
University	0	0.0	21	7.6

Table 2: Condom use by Female Sex Workers (FSW) depending on their educational background

Educational Background	Condom use with customer					Condom use outside of transactional sex				
	Total	Always	Often	Rarely	Never	Total	Always	Often	Rarely	Never
Never schooled	40	35 (87.5%)	5 (12.5%)	0 (0.0%)	0 (0.0%)	25	14 (56.0%)	7 (28.0%)	3 (12.0%)	1 (4.0%)
Primary school	71	55 (77.5%)	13 (18.3%)	2 (2.8%)	1 (1.4%)	61	30 (49.1%)	13 (21.3%)	9 (14.8%)	9 (14.8%)
Secondary school	171	129 (75.4%)	31 (18.1%)	6 (3.5%)	5 (2.9%)	144	62 (43.0%)	35 (24.3%)	20 (13.9%)	27 (18.8%)
University	20	14 (70.0%)	1 (5.0%)	5 (25.0%)	0	21	6 (28.6%)	3 (14.3%)	6 (28.6%)	6 (28.6%)

Table 3: HPV types detected in Female Sex Workers (FSW) anal and/or cervical samples.

FSW number	Cervical HPV type	Anal HPV type
5102	42	42
5109		6
5111	42,53,35,33,59,45	33
5112	70	45
5117	35	
5118	59	
5124	16	
5127	52	
5131	56	
5141	44	44
5143		44
5146	56	
5152	42,58	42
5155	16,59	51
5157		73
5163	16	16
4101		59
4104	53	
4108	56	11,56,39
4109		52,16
4112	44,53,59	44
4114	39	
4115	52	
4118	18	
4121	44,6,43,42,53,56,52,33,16,59	11,44,6,43,42,53,56,52,33,16,59
4122	58	
4123	45	

4130	40,66,56,18	56,18
4131		54
4132	6,68,58,45	6,58
4134	40,59,58	40
4135	82,35	82,35
4137	53	16
4142		66
4143		53,52
4144		66
4145	42	
4146	52	
4147	59	59
4148	35,52,58	
4153		44,6,59
4155		68
4156		6,52
4158	44,82,18	40,6,82,73,18
4164		68
1100	6,56,39,16,59	56
1102	53,68,31,52	52
1105	16,45	40
1106	31	
1107	68,16	68
1108	73,58	
1109	82,73,26,66,68	6,26,68,66
1111	82,69	
1112	42,35	42,56
1113		40,58
1114	73	

1115	73	
1116	70,42,53,52	
1118	6,53,66,39,51	39,51
1121		43
1122	54,42,58	
1127	70,66,31,16,51	70,66,16
1128	6,69,66,56,59	6,70,69,66,56,59
1200	31,58	58
1201	70	
1203	53	56
1205	39	70,42,53,58
1207	44,18,35	
1211	18,35,51	35
1214	42,73,51,58	42,51
1215	31,35	
1221	53,56,39	56
1224	44	
1225	70	70
1233	66	
1243	43	
1244	6,42,59	
1249	40,44,53,18,59,51	44,18
1251	39	40,70,69,68,31,45
1258	59	6,59
1262	58	
1264	42,31,59	42,31,59
1265		73
1268	43	68
1270	52,59	

1271	58	6
1276	6,66,31	6
1279	73,66,31,18,39,16	44,73,18
1281	54,56	
1283	66	66
1284	40,6,18,35	18
1291	42,66	42,66
1292	56	
1298	54,58	
1304	42,69,68,16	68
1305	70,42,18,35,45	42,68
1306	35	35
1317	69,56,16	
1319	43	82
1320		53,18
1325	42,68	42,68
1329	31,33	61,42,53,18,33
1330		82
1334	31	
1335	42	
1342	56	
1343	35	
1351	53,35,16	44,56,33
1622		59
1626	31	
1640	33	43
1644	18	
1647	54,31	
1653	66	

1661	53,56	
1669		68
1672	44,43,35,58	
1680	52	
1681	44,73,45	
1683		40,82
1725	40,35	40,52
1727	58	43
1741	11,58	
1758	70	
1762	66	
1771	53	59
1772	70,53	
1782	54,53,73,58	53,82,66,59,58
1823		45
1824	51	
1827	35	
1881	35	
1887	70,53,68,16	35,52
1889	68	68
1894		69,31
1896		53
1897	40,42	18
1940	68	
3106		16,58
3113	35	35
3115	31,52,58	59,58
3119	40	35,52,16
3121	11,54,43,53,68,56,33,58,	11,54,43,53,68,56,33,58

3122	43,68,31	43,35
3125		45
3132	6	
3133	54,42,66,31	42
3134	33	42,33
3135	42,16,51,45	51,45
3141		6
3145	52	
3150	42,68,31	42
3163		40
3164	40,52	