**Table 4. Prospective associations between hormonal contraceptive use and Human Papillomavirus (HPV) (N=13).**

| **Study** | **N, study sample** | **Length of follow-up; frequency STI assessment** | **STI diagnostic test** | **Covariates** | **Reference Group** | **OCP**a | **Injectable** | **IUD or Combined HC** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Borgdorff, 2015 [37] | 166, HIV negative sex workers in Kigali Rwanda ages 18-49; *N=47 incident HPV (any type) cases* | 24M; 0M, 6M, 24M | Linear Array HPV genotyping test (Roche) | Age, education, years worked as sex worker, breast-feeding, consistent condom use, antibiotic use past 14 d, ever used antibiotics, time between assessments | Non-pregnant non-hormonal user | OCP on HPV (any type) aOR: 1.08 (0.21, 5.44) | HPV (any type) Injectable (any typeb) aOR: 0.79 (0.34, 1.83) | NA |
| Harris, 2009 [36] | 257, HIV negative women with no history of cervical neoplasia in the United States seeking routine care at family planning clinics, ages 18-50; *N=152 cases, N=107 controlsc* | Median follow-up: 60D; 0M, and colposcopy biopsy visit | PCR amplification, line blot assay (Roche) and histology assessment  | Age at colposcopy-biopsy, lifetime number of male partners, and parity  | Cases: women with positive oncogenic HPV type; Controls: HPV-negative women with negative histology and cytology at both visits: HC reference group: never user of specific method  | Oncogenic HPV COC recent user: aOR: 0.6 (0.3, 1.5); COC $\geq $1Yr: aOR: 0.8 (0.3, 2.0); <1Yr: aOR: 0.5 (0.2, 1.2); COC former user aOR: 0.9 (0.3, 2.3) | Oncogenic HPV DMPA recent userd aOR: 1.6 (0.7, 3.7); $\geq $1Yr DMPA: aOR: 4.7 (1.4, 15.8)\*; <1Yr DMPA user: aOR: 0.7 (0.3, 2.1); Former DMPA userd aOR: 1.3 (0.6, 3.1) | NA |
| Gosvig, 2013 [38] | 604, women with CIN2 or worse at four hospitals in Denmark, age range NR; *N=18 cases of reappearance (2.2%)* | 8-12M follow-up duration; 4-6M; 8-12M | Hybrid Capture 2; HPV genotype testing via line probe assay (INNO LiPAv2 Innogenetics) | Age, HPV viral load at baseline, condom use since last visit, # partners since last visit, time since last visit | Non-user of oral contraception in last 4-6M | OCP on re-appearance of any HPV: aOR 1.00 (0.21, 4.82) | NA | NA |
| Lekovich, 2015 [39] | 302, HIV negative women with IUD placement between 2005 and 2012 and pre/post insertion HPV testing at participating U.S. institution, Mean age 33; *N=8 /152 cases Levonorgestrel IUD, 2/150 cases Copper IUD* | Mean time between pre-IUD and post IUD HR-HPV test: 555 days (Copper IUD), 534 days (Levonorgestrel IUD); IUD placement and repeat HR-HPV test: 356 (Copper IUD), 349 (Levonorgestrel IUD) | Hybrid Capture 2 test | Study groups matched on: age, high-risk HPV infection, rate of abnormal cytology and proportion of smokers | Non-pregnant Copper IUD user | NA | NA | HR-HPV: Levonorgestrel vs. Copper IUD OR: 4.37, p=0.056 |
| Louvanto, 2011 [40] | 255, postpartum women in Finland, Mean age 26 (SD 3.1); *N=203 incident cases, 133 for HPV- species* α*7 and* α*9 included in analyses*  | 6Y; 0M, 2M, 12M, 24M, 36M, 6Y | Multiplex-HPV genotyping kit (Progen Biotechnik GmbH)  | Age, HR-HPV seropositive at baseline, seroconverted to HR-HPV, # sexual partners until age 20, lifetime # sex partners, age initiation of OC use, marital status, employment status, age of onset of sexual activity, baseline PAP smear results, baseline oral HR-HPV DNA status, frequency of sex, # of births, oral sex, ever had STD, history of genital warts, history of oral warts, age initiation of smoking, pregnancy during follow-up, change in marital status during follow-upFinal model (empirical strategy): age, seroconverted to HR-HPV, # sexual partners until age 20, lifetime # sexual partners, age initiated OC use, smoking, pregnancy during follow-up, change in marital status during follow-up | Never used OC pills | OCP (ever use) on Species α7 and α9 HR- HPV: aIRR: (ns) NR (respectively) | NA | NA |
| Marks, 2011 [41] | 1135, HIV-negative women ages 20-37 in Thailand, reporting no commercial sex work in past 6M and willing to adhere to self-selected contraceptive method for at least 1Y; *N=269 (8%) incident cases for any HPV, 157 (4.7%) incident HR-HPV cases* | 18M; 0M, 6M, 12M, 18M | QIAamp DNA Blood Kit (Qiagen), HPV Linear Array, PCR assay (Roche Diagnostics) | Age, study site, # live births, male condom use P6M, age sexual debut, # lifetime partners, # partners P6M, smoking P6M, cervical cytology at enrollment and follow-up, BV at enrollment, prior STI infection, cervical ectopyFinal model (empirical strategy): age, study site, # of lifetime and recent sexual partners, new sexual partner, concurrent BV, duration of HC use | Non- hormonal user during same interval of assessment | COC on HPV (any type) aOR: 1.27 (0.93, 1.74); HR-HPV aOR: 1.22 (0.81, 1.83) | DMPA on HPV (any type) aOR: 0.90 (0.63, 1.31), HR-HPV aOR: 0.87 (0.55, 1.35) | NA |
| Moscicki 2001 [26] | 105, women aged 13 to 21 attending 2 family planning clinics in San Francisco, USA; *N=54 incident cases*  | Median follow-up: 50M [IQR: 23-79M]; ~4-6M (9 median visits, IQR: 4-15) | PCR assay; B-globin control; dot blot and Roche reverse blot method (Roche Molecular Systems) | Rate of new partners per month since last visit, history of HSV, history of vulvar warts, lifetime sexual partners, marijuana useFinal model: rate of new partners per month since last visit, history of HSV, history of vulvar warts. | Non-current OCP user | OCP on HPV (any type) aHR 0.49 (0.28, 0.86)\* | NA | NA |
| Nielsen, 2009 [42] | 6246, women aged 20-29 in Copenhagen, Denmark, randomly sampled from general population; *N=* 798 *(12.8%) HR-HPV incident cases* | 2Y; 0M and 2Ye | Hybrid Capture 2 and LiPA V2 PCR assay (Innogenetics); B-globin control | Age, # sexual partners, marital status, self-reported history of chlamydia, self-reported history of genital warts, parity, current condom use, amount of smoking Final model (empirical strategy): age, # of sexual partners during follow-up, marital status, interaction between marital status and number of sexual partners during follow-up | Current non- hormonal user  | OCP on HR-HPV: $\leq $2Yr aOR: 1.01 (0.68, 1.50), 3-4Yr aOR: 1.39 (0.98, 1.99); 5-6Yr aOR: 1.44 (1.00, 2.07); 7+Yr aOR: 1.66 (1.17, 2.35)\*, Per Yr): 1.04 (0.98, 1.10) | NA | NA |
| Phelan, 2009 [43] | 220, HIV+ and HIV women ages 18+ who reported injection drug use in past 10 years in Baltimore, USA; Mean age 37 (SD 6.6); *Detection of new type-specific HPV cases 22% of 775 visits* | 5Y; 0M and every 6M | PCR assay; B-globin controls, oligonucleotide dot blot hybridization  | Age, HIV status and CD4 category, smoking in P6M, injection drug use P6M, marijuana use P6M, any STD P6M, # male sex partners P6M, # male sex partners P10Y, # live lifetime birthsFinal model (empirical and theoretical approach): age, HIV status and CD4 level, crack use in P6M, # of male sex partners in P10Y | Never user of OC (lifetime) | OCP (ever): Not significant at univariate level (among HIV+ or HIV- women) so multivariate not reported | NA | NA |
| Sellors, 2003 [28] | 253, Canadian women ages 15 to 49in selected physicianpractices; *28 incident HPV cases (11.1%)* | 1Y; 0M and 12M | PCR assay with HPV-genotyping; HCII assay for HR-HPV detection | Age, median number of sex partners in the last year, median number of lifetime sex partners, marital status, smoking status | Non-OCP user | OCP on HR-HPV aOR: 0.70 (0.20, 2.0) | NA | NA |
| Shew, 2015 [44] | 150, adolescents ages 14-17 in Indianapolis, U.S. visiting one of 3 primary care clinics | Mean follow-up: 5.8Y (3.9-9.2); Every 3M | Linear array HPV genotyping test (Roche Diagnostics) and PCR assay with B-globin control | STIs (clinic test): CT, NG and TV; contraceptive use, condom use, coital frequency, number of partners | Non-user of OCP in last 3M, Non-user of DMPA in last 3M, respectively | OCP on HPV (all types) aHR: 2.0 (1.28, 3.15)\*; HR-HPV aHR: 1.31 (0.73, 2.35); LR-HPV aHR: 2.73 (1.52, 4.90)\* | DMPA on HPV (all types) aHR: 0.96 (0.67, 1.38); HR-HPV aHR: 0.80 (0.54, 1.19); LR- HPV aHR: 1.57 (0.90, 2.75) | NA |
| Winer, 2003 [27] | 553, university women in Seattle, USA ages 18-20; *incident cases (all HPV type) among OCP users: 92 per 503 PY vs. 56/553 PY among non-OCP users* | 5Y; 4M intervals | PCR assay and dot-blot hybridization with B-globin control | Time interval, current smoking, history of non-genital warts, history of tampon use, being delivered by cesarean section, length of time having known a partner, partner’s ethnicity, partner’s age, partner’s educational level, partner’s lifetime number of partners, partner’s circumcision status,condom use with a new partner. Whether partner had ever had a STI, subject/partner alcohol use during sex.Final model: no. sex partners, condom use with new partners, sex partner’s no. of other partners, new partner in past 12 M, time knowing partner before sex, current smoker | Non-OCP user | OCP on HPV (all types) aHR: 1.40 (1.01, 1.80)\* | NA | NA |
| Winer, 2016 [45] | 420, women aged 25-65 in the USA sampled from internet dating group; *cumulative incidence of HR-HPV: 25.4%* | Mean follow-up: 12.5M +/- 5M; Mean interval b/w assessment: 5.1M +/- 1.4M | PCR assay with B-globin controls, Roche Linear Array genotyping test | Age at first sex, (time dependent variables): age, marital status, smoking history, abnormal PAP history, current HC use, menopausal status, sex with $\geq $1 male partner in past 6M, lifetime # sex partnersFinal model (empirical strategy): lifetime # of male sex partners, and male sex partners in the P6M (women with $\geq $1 partner in P6M)  | Current non-hormonal user  | NA | NA | Any HC use on HR-HPV, all women aHR: 1.82 (1.17, 2.83)\*; Women with no sex partners in P6M aHR: 4.16 (1.27, 13.63)\*; Women with $\geq 1$ partner in P6M aHR: 1.65 (1.05, 2.59)\* |

Notes: PY: person-years at risk; aOR: adjusted odds ratio; aHR: adjusted hazard ratio. HR-HPV: high-risk HPV, LR-HPV: low-risk HPV.\*p<0.05.

a OCP type was unspecified unless COC (combined oral contraception) or POP (progestin-only pill) is noted.

b Injectable type not reported but authors note most commonly DMPA in setting with occasional norethisterone enanthate (NE-ENT) use.

c Case control study.

d Former user defined as having stopped using method at least one year before colposcopy-biopsy. Recent use defined as having used that method within 6 months of biopsy.

e Contraceptive use exposure period retrospectively recalled, exceeds study follow-up duration.