**Supplement to**

**Manuscript title:**

The effect of HIV infection on anal and penile human papillomavirus incidence and clearance. A cohort study among men who have sex with men.

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**Supplementary Text 1: Imputation**

The following variables included in the analyses contained missing values, and these values were imputed: number of lifetime male sex partners at baseline (56 missing values); circumcision status at baseline (14 missing values); CD4 cell count at baseline (56 missing values); nadir CD4 cell count as known at baseline (38 missing values); undetectable HIV viral load at baseline (50 missing values); recent use of poppers (139 missing values in total); recent use of cannabis (122 missing values in total); current smoking (104 missing values in total); number of recent anal sex partners (135 missing values in total); recent anal sex position (121 missing values in total); recently having been rimmed (116 missing values in total); recent receptive fisting (94 missing values in total); anal chlamydia or gonorrhea diagnosis (78 missing values in total); penile chlamydia or gonorrhea diagnosis (52 missing values in total).

Imputation was done separately for HIV-positive and HIV-negative MSM. When a variable was not normally distributed we transformed it to the logarithm before including the variable in the imputation model. The following variables were transformed: number of lifetime male sex partners (at baseline), CD4 count (at baseline), nadir CD4 cell count (at baseline) and recent number of anal sex partners (time updated). We created 20 imputed dataset for HIV-positive and HIV-negative with 25 iterations per imputed dataset, which resulted in a total of 40 imputed datasets.

For both HIV-positive and HIV-negative MSM, the following variables were used to impute the missing data: HPV test results for 14 HPV-types (12 high-risk and HPV 6 and 11), number of lifetime male sex partners at baseline, circumcision status at baseline, recent use of poppers, recent use of cannabis, current smoking, number of recent anal sex partners, recent anal sex position, recently having been rimmed (passive rimming) and having rimmed someone (active rimming), recent receptive fisting, anal chlamydia or gonorrhea diagnosis, penile chlamydia or gonorrhea diagnosis, follow-up time in years, recent alcohol use, country of birth, income status at baseline and anal and genital warts. For HIV-positive only: CD4 cell count at baseline, nadir CD4 cell count as known at baseline and undetectable HIV viral load at baseline.

**Supplementary Table 1: Incidence rates of anal and penile high-risk HPV infections among HIV-negative and HIV-infected MSM; sensitivity analyses using assumption IIa (H2M study, Amsterdam 2010-2013**).

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Anal incidence** | | | | | | | | | | | | |
|  | **HIV-negative MSM** | | | | | **HIV-infected MSM** | | | | |  |  |
| **HPV type** | **Number at risk** | **Incident events** | **PMO** | **IR** | **95% CI** | **Number at risk** | **Incident events** | **PMO** | **IR** | **95% CI** | **IRR** | **95% CI** |
| **16** | 420 | 64 | 8963.2 | 7.1 | (5.6-9.1) | 286 | 64 | 5101.1 | 12.5 | (9.8-16.0) | 1.8 | (1.2-2.5) |
| **18** | 431 | 46 | 9713.1 | 4.7 | (3.5-6.3) | 290 | 41 | 5659.5 | 7.2 | (5.3-9.8) | 1.5 | (1.0-2.3) |
| **31** | 432 | 68 | 9231.7 | 7.4 | (5.8-9.3) | 285 | 78 | 4860.3 | 16.0 | (12.9-20.0) | 2.2 | (1.6-3.0) |
| **33** | 432 | 43 | 9717.9 | 4.4 | (3.3-6.0) | 293 | 40 | 5778.4 | 6.9 | (5.1-9.4) | 1.6 | (1.0-2.4) |
| **35** | 435 | 32 | 9999.3 | 3.2 | (2.3-4.5) | 297 | 49 | 5646.0 | 8.7 | (6.6-11.5) | 2.7 | (1.7-4.2) |
| **39** | 431 | 46 | 9743.4 | 4.7 | (3.5-6.3) | 299 | 38 | 5966.5 | 6.4 | (4.6-8.8) | 1.4 | (0.9-2.1) |
| **45** | 434 | 59 | 9490.4 | 6.2 | (4.8-8.0) | 298 | 44 | 5814.1 | 7.6 | (5.6-10.2) | 1.2 | (0.8-1.8) |
| **51** | 424 | 96 | 8776.6 | 10.9 | (9.0-13.4) | 282 | 57 | 5147.2 | 11.1 | (8.5-14.4) | 1.0 | (0.7-1.4) |
| **52** | 432 | 66 | 9375.6 | 7.0 | (5.5-9.0) | 286 | 71 | 4948.0 | 14.3 | (11.4-18.1) | 2.0 | (1.5-2.9) |
| **56** | 430 | 46 | 9636.6 | 4.8 | (3.6-6.4) | 297 | 54 | 5637.5 | 9.6 | (7.3-12.5) | 2.0 | (1.4-3.0) |
| **58** | 436 | 23 | 10219.8 | 2.3 | (1.5-3.4) | 303 | 30 | 6133.1 | 4.9 | (3.4-7.0) | 2.2 | (1.3-3.7) |
| **59** | 436 | 26 | 10201.8 | 2.5 | (1.7-3.7) | 307 | 18 | 6480.7 | 2.8 | (1.7-4.4) | 1.1 | (0.6-2.0) |
| **Total** |  | 615 |  |  |  |  | 584 |  |  |  |  |  |
| **Penile incidence** | | | | | | | | | | | | |
|  | **HIV-negative MSM** | | | | | **HIV-infected MSM** | | | | |  |  |
| **HPV type** | **Number at risk** | **Incident events** | **PMO** | **IR** | **95% CI** | **Number at risk** | **Incident events** | **PMO** | **IR** | **95% CI** | **IRR** | **95% CI** |
| **16** | 434 | 41 | 9951.3 | 4.1 | (3.0-5.6) | 303 | 31 | 6100.8 | 5.1 | (3.6-7.2) | 1.2 | (0.8-2.0) |
| **18** | 433 | 30 | 10126.7 | 3.0 | (2.1-4.2) | 307 | 20 | 6447.5 | 3.1 | (2.0-4.8) | 1.1 | (0.6-1.8) |
| **31** | 436 | 22 | 10287.3 | 2.1 | (1.4-3.2) | 303 | 34 | 6128.5 | 5.5 | (4.0-7.8) | 2.6 | (1.5-4.4) |
| **33** | 436 | 20 | 10337.3 | 1.9 | (1.2-3.0) | 303 | 19 | 6326.9 | 3.0 | (1.9-4.7) | 1.6 | (0.8-2.9) |
| **35** | 434 | 17 | 10316.8 | 1.6 | (1.0-2.7) | 307 | 27 | 6321.8 | 4.3 | (2.9-6.2) | 2.6 | (1.4-4.8) |
| **39** | 436 | 29 | 10143.3 | 2.9 | (2.0-4.1) | 305 | 18 | 6389.9 | 2.8 | (1.8-4.5) | 1.0 | (0.6-1.8) |
| **45** | 436 | 24 | 10249.4 | 2.3 | (1.6-3.5) | 305 | 27 | 6303.8 | 4.3 | (2.9-6.2) | 1.8 | (1.1-3.2) |
| **51** | 434 | 43 | 9996.6 | 4.3 | (3.2-5.8) | 304 | 43 | 6085.7 | 7.1 | (5.2-9.5) | 1.6 | (1.1-2.5) |
| **52** | 435 | 26 | 10206.6 | 2.5 | (1.7-3.7) | 303 | 35 | 6026.5 | 5.8 | (4.2-8.1) | 2.3 | (1.4-3.8) |
| **56** | 434 | 22 | 10338.0 | 2.1 | (1.4-3.2) | 305 | 36 | 6150.6 | 5.9 | (4.2-8.1) | 2.8 | (1.6-4.7) |
| **58** | 437 | 10 | 10500.3 | 1.0 | (0.5-1.8) | 306 | 6 | 6627.7 | 0.9 | (0.4-2.0) | 1.0 | (0.4-2.6) |
| **59** | 436 | 6 | 10530.8 | 0.6 | (0.2-1.3) | 308 | 9 | 6603.3 | 1.4 | (0.7-2.6) | 2.4 | (0.9-6.7) |
| **Total** |  | 290 |  |  |  |  | 305 |  |  |  |  |  |

Abbreviations: MSM=men who have sex with men; H2M=HIV & HPV in MSM; CI=confidence interval; IR=incidence rate per 1000 person-months of observation at risk; IRR=incidence rate ratio; PMO=person-months of observation at risk.

a Assumption II: incidence was defined as one positive visit preceded by one negative visit.

**Supplementary Table 2: Incidence rates of anal and penile high-risk HPV infections among HIV-negative and HIV-infected MSM; sensitivity analyses using assumption IIIa (H2M study, Amsterdam 2010-2013).**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Anal incidence** | | | | | | | | | | | | |
|  | **HIV-negative MSM** | | | | | **HIV-infected MSM** | | | | |  |  |
| **HPV type** | **Number at risk** | **Incident events** | **PMO** | **IR** | **95% CI** | **Number at risk** | **Incident events** | **PMO** | **IR** | **95% CI** | **IRR** | **95% CI** |
| **16** | 408 | 29 | 6904.9 | 4.2 | (2.9-6.0) | 251 | 27 | 3614.5 | 7.5 | (5.1-10.9) | 1.8 | (1.1-3.0) |
| **18** | 417 | 16 | 7473.1 | 2.1 | (1.3-3.5) | 256 | 12 | 3938.9 | 3.0 | (1.7-5.4) | 1.4 | (0.7-3.0) |
| **31** | 419 | 17 | 7359.1 | 2.3 | (1.4-3.7) | 245 | 24 | 3595.0 | 6.7 | (4.5-10.0) | 2.9 | (1.6-5.4) |
| **33** | 419 | 13 | 7453.7 | 1.7 | (1.0-3.0) | 264 | 13 | 4075.8 | 3.2 | (1.9-5.5) | 1.8 | (0.9-3.9) |
| **35** | 424 | 10 | 7604.8 | 1.3 | (0.7-2.4) | 265 | 17 | 4042.9 | 4.2 | (2.6-6.8) | 3.2 | (1.5-7.0) |
| **39** | 420 | 13 | 7474.3 | 1.7 | (1.0-3.0) | 266 | 9 | 4168.8 | 2.2 | (1.1-4.1) | 1.2 | (0.5-2.9) |
| **45** | 421 | 12 | 7489.7 | 1.6 | (0.9-2.8) | 269 | 15 | 4133.4 | 3.6 | (2.2-6.0) | 2.3 | (1.1-4.8) |
| **51** | 414 | 27 | 7119.5 | 3.8 | (2.6-5.5) | 248 | 23 | 3618.0 | 6.4 | (4.2-9.6) | 1.7 | (1.0-2.9) |
| **52** | 421 | 23 | 7340.5 | 3.1 | (2.1-4.7) | 249 | 27 | 3580.9 | 7.5 | (5.2-11.0) | 2.4 | (1.4-4.2) |
| **56** | 419 | 13 | 7429.6 | 1.7 | (1.0-3.0) | 263 | 14 | 4056.3 | 3.5 | (2.0-5.8) | 2.0 | (0.9-4.2) |
| **58** | 425 | 11 | 7642.9 | 1.4 | (0.8-2.6) | 277 | 8 | 4335.6 | 1.8 | (0.9-3.7) | 1.3 | (0.5-3.2) |
| **59** | 425 | 1 | 7752.5 | 0.1 | (0.0-0.9) | 279 | 6 | 4438.2 | 1.4 | (0.6-3.0) | 10.5 | (1.3-87.1) |
| **Total** |  | 185 |  |  |  |  | 195 |  |  |  |  |  |
| **Penile incidence** | | | | | | | | | | | | |
|  | **HIV-negative MSM** | | | | | **HIV-infected MSM** | | | | |  |  |
| **HPV type** | **Number at risk** | **Incident events** | **PMO** | **IR** | **95% CI** | **Number at risk** | **Incident events** | **PMO** | **IR** | **95% CI** | **IRR** | **95% CI** |
| **16** | 420 | 11 | 7570.4 | 1.5 | (0.8-2.6) | 274 | 6 | 4269.7 | 1.4 | (0.6-3.1) | 1.0 | (0.4-2.6) |
| **18** | 422 | 5 | 7739.4 | 0.6 | (0.3-1.6) | 279 | 4 | 4425.8 | 0.9 | (0.3-2.4) | 1.4 | (0.4-5.2) |
| **31** | 424 | 3 | 7746.3 | 0.4 | (0.1-1.2) | 277 | 7 | 4361.6 | 1.6 | (0.8-3.4) | 4.1 | (1.1-16.0) |
| **33** | 425 | 5 | 7756.8 | 0.6 | (0.3-1.5) | 277 | 2 | 4438.1 | 0.5 | (0.1-1.8) | 0.7 | (0.1-3.6) |
| **35** | 424 | 1 | 7798.6 | 0.1 | (0.0-0.9) | 277 | 2 | 4408.9 | 0.5 | (0.1-1.8) | 3.5 | (0.3-39.0) |
| **39** | 425 | 3 | 7768.3 | 0.4 | (0.1-1.2) | 276 | 3 | 4390.7 | 0.7 | (0.2-2.1) | 1.8 | (0.4-8.8) |
| **45** | 425 | 3 | 7769.9 | 0.4 | (0.1-1.2) | 277 | 4 | 4419.8 | 0.9 | (0.3-2.4) | 2.3 | (0.5-10.5) |
| **51** | 424 | 3 | 7674.6 | 0.4 | (0.1-1.2) | 272 | 6 | 4330.6 | 1.4 | (0.6-3.1) | 3.5 | (0.9-14.2) |
| **52** | 425 | 4 | 7740.2 | 0.5 | (0.2-1.4) | 275 | 5 | 4287.5 | 1.2 | (0.5-2.8) | 2.3 | (0.6-8.4) |
| **56** | 425 | 4 | 7800.1 | 0.5 | (0.2-1.4) | 278 | 3 | 4421.8 | 0.7 | (0.2-2.1) | 1.3 | (0.3-5.9) |
| **58** | 426 | 0 | 7852.7 | 0.0 | NA | 279 | 0 | 4516.5 | 0.0 | NA | NA | NA |
| **59** | 425 | 1 | 7822.8 | 0.1 | (0.0-0.9) | 278 | 1 | 4487.4 | 0.2 | (0.0-1.6) | 1.7 | (0.1-27.9) |
| **Total** |  | 43 |  |  |  |  | 43 |  |  |  |  |  |

Abbreviations: MSM=men who have sex with men; H2M=HIV & HPV in MSM; CI=confidence interval; IR=incidence rate per 1000 person-months of observation at risk; IRR=incidence rate ratio; PMO=person-months of observation at risk; NA=not applicable.

a Assumption III: incidence was defined as two consecutive positive visits preceded by one negative visit.

**Supplementary Table 3: Clearance rates of anal and penile high-risk HPV infections among HIV-negative and HIV-infected MSM; sensitivity analyses using assumption IIa (H2M study, Amsterdam 2010-2013).**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Anal clearance** | | | | | | | | | | | | |
|  | **HIV-negative MSM** | | | | | **HIV-infected MSM** | | | | |  |  |
| **HPV type** | **Number at risk** | **Cleared events** | **PMO** | **CR** | **95% CI** | **Number at risk** | **Cleared events** | **PMO** | **CR** | **95% CI** | **CRR** | **95% CI** |
| **16** | 95 | 76 | 932.8 | 81.5 | (65.1-102.0) | 98 | 75 | 911.6 | 82.3 | (65.6-103.2) | 1.0 | (0.7-1.4) |
| **18** | 57 | 51 | 386.3 | 132.0 | (100.3-173.7) | 67 | 47 | 686.2 | 68.5 | (51.1-91.2) | 0.5 | (0.4-0.8) |
| **31** | 82 | 75 | 534.2 | 140.4 | (112.0-176.0) | 106 | 83 | 994.1 | 83.5 | (67.3-103.5) | 0.6 | (0.4-0.8) |
| **33** | 53 | 49 | 356.0 | 137.7 | (104.0-182.1) | 58 | 45 | 512.6 | 87.8 | (65.5-117.6) | 0.6 | (0.4-1.0) |
| **35** | 37 | 34 | 226.6 | 150.1 | (107.2-210.0) | 68 | 57 | 513.5 | 111.0 | (85.6-143.9) | 0.7 | (0.5-1.1) |
| **39** | 55 | 43 | 409.7 | 105.0 | (77.8-141.5) | 53 | 42 | 392.9 | 106.9 | (79.0-144.7) | 1.0 | (0.7-1.6) |
| **45** | 68 | 60 | 402.2 | 149.2 | (115.8-192.1) | 54 | 43 | 423.5 | 101.5 | (75.3-136.9) | 0.7 | (0.5-1.0) |
| **51** | 104 | 86 | 781.1 | 110.1 | (89.1-136.0) | 95 | 67 | 973.0 | 68.9 | (54.2-87.5) | 0.6 | (0.5-0.9) |
| **52** | 72 | 64 | 487.5 | 131.3 | (102.7-167.7) | 116 | 94 | 942.3 | 99.8 | (81.5-122.1) | 0.8 | (0.6-1.0) |
| **56** | 59 | 52 | 409.7 | 126.9 | (96.7-166.5) | 68 | 56 | 572.4 | 97.8 | (75.3-127.1) | 0.8 | (0.5-1.1) |
| **58** | 24 | 21 | 151.3 | 138.8 | (90.5-212.8) | 37 | 31 | 222.0 | 139.6 | (98.2-198.5) | 1.0 | (0.6-1.8) |
| **59** | 21 | 21 | 104.0 | 202.0 | (131.7-309.8) | 18 | 18 | 100.0 | 180.0 | (113.4-285.7) | 0.9 | (0.5-1.7) |
| **Total** |  | 632 |  |  |  |  | 658 |  |  |  |  |  |
| **Penile clearance** | | | | | | | | | | | | |
|  | **HIV-negative MSM** | | | | | **HIV-infected MSM** | | | | |  |  |
| **HPV type** | **Number at risk** | **Cleared events** | **PMO** | **CR** | **95% CI** | **Number at risk** | **Cleared events** | **PMO** | **CR** | **95% CI** | **CRR** | **95% CI** |
| **16** | 47 | 37 | 330.9 | 111.8 | (81.0-154.3) | 51 | 45 | 278.6 | 161.5 | (120.6-216.3) | 1.4 | (0.9-2.2) |
| **18** | 29 | 23 | 192.9 | 119.3 | (79.3-179.5) | 26 | 25 | 89.0 | 280.8 | (189.8-415.6) | 2.4 | (1.3-4.2) |
| **31** | 24 | 23 | 141.3 | 162.7 | (108.1-244.9) | 45 | 38 | 223.2 | 170.3 | (123.9-234.0) | 1.1 | (0.6-1.8) |
| **33** | 18 | 16 | 102.2 | 156.6 | (95.9-255.6) | 28 | 26 | 130.8 | 198.8 | (135.4-292.0) | 1.3 | (0.7-2.4) |
| **35** | 19 | 18 | 100.2 | 179.7 | (113.2-285.2) | 31 | 30 | 144.0 | 208.4 | (145.7-298.0) | 1.2 | (0.7-2.1) |
| **39** | 26 | 25 | 127.8 | 195.6 | (132.2-289.5) | 25 | 22 | 145.8 | 150.9 | (99.3-229.1) | 0.8 | (0.4-1.4) |
| **45** | 27 | 25 | 115.4 | 216.7 | (146.4-320.7) | 29 | 29 | 117.1 | 247.6 | (172.1-356.3) | 1.1 | (0.7-2.0) |
| **51** | 40 | 40 | 189.7 | 210.9 | (154.7-287.5) | 45 | 42 | 239.8 | 175.2 | (129.5-237.0) | 0.8 | (0.5-1.3) |
| **52** | 27 | 25 | 130.0 | 192.3 | (129.9-284.6) | 49 | 43 | 277.6 | 154.9 | (114.9-208.9) | 0.8 | (0.5-1.3) |
| **56** | 19 | 17 | 99.2 | 171.3 | (106.5-275.6) | 41 | 38 | 165.7 | 229.3 | (166.9-315.2) | 1.3 | (0.8-2.4) |
| **58** | 8 | 8 | 27.8 | 287.8 | (143.9-575.5) | 8 | 8 | 27.9 | 286.6 | (143.3-573.2) | 1.0 | (0.4-2.7) |
| **59** | 4 | 4 | 28.6 | 139.9 | (52.5-372.9) | 10 | 9 | 41.4 | 217.5 | (113.2-418.0) | 1.6 | (0.5-5.1) |
| **Total** |  | 261 |  |  |  |  | 355 |  |  |  |  |  |

Abbreviations: MSM=men who have sex with men; H2M=HIV & HPV in MSM; CI=confidence interval; CR=clearance rate per 1000 person-months of observation at risk; CRR=clearance rate ratio; PMO=person-months of observation at risk.

a Assumption II: clearance was defined as one positive visit followed by one negative visit.

**Supplementary Table 4: Clearance rates of anal and penile high-risk HPV infections among HIV-negative and HIV-infected MSM; sensitivity analyses using assumption IIIa (H2M study, Amsterdam 2010-2013).**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Anal clearance** | | | | | | | | | | | | |
|  | **HIV-negative MSM** | | | | | **HIV-infected MSM** | | | | |  |  |
| **HPV type** | **Number at risk** | **Cleared events** | **PMO** | **CR** | **95% CI** | **Number at risk** | **Cleared events** | **PMO** | **CR** | **95% CI** | **CRR** | **Lower** |
| **16** | 49 | 30 | 488.4 | 61.4 | (43.0-87.9) | 58 | 35 | 486.1 | 72.0 | (51.7-100.3) | 1.2 | (0.7-1.9) |
| **18** | 19 | 14 | 155.0 | 90.3 | (53.5-152.5) | 34 | 19 | 365.4 | 52.0 | (33.2-81.5) | 0.6 | (0.3-1.2) |
| **31** | 25 | 19 | 199.1 | 95.4 | (60.9-149.6) | 53 | 36 | 527.6 | 68.2 | (49.2-94.6) | 0.7 | (0.4-1.3) |
| **33** | 19 | 15 | 144.5 | 103.8 | (62.6-172.2) | 26 | 17 | 262.2 | 64.8 | (40.3-104.3) | 0.6 | (0.3-1.3) |
| **35** | 13 | 12 | 66.0 | 181.8 | (103.3-320.2) | 27 | 20 | 225.8 | 88.6 | (57.2-137.3) | 0.5 | (0.2-1.0) |
| **39** | 18 | 11 | 164.4 | 66.9 | (37.1-120.8) | 21 | 14 | 149.7 | 93.5 | (55.4-158.0) | 1.4 | (0.6-3.1) |
| **45** | 23 | 12 | 121.6 | 98.7 | (56.1-173.8) | 42 | 14 | 202.0 | 69.3 | (41.0-117.0) | 0.7 | (0.3-1.5) |
| **51** | 54 | 29 | 326.5 | 88.8 | (61.7-127.8) | 27 | 25 | 542.2 | 46.1 | (31.2-68.2) | 0.5 | (0.3-0.9) |
| **52** | 27 | 19 | 188.3 | 100.9 | (64.4-158.2) | 56 | 38 | 451.7 | 84.1 | (61.2-115.6) | 0.8 | (0.5-1.5) |
| **56** | 21 | 16 | 153.0 | 104.6 | (64.1-170.7) | 31 | 21 | 277.3 | 75.7 | (49.4-116.1) | 0.7 | (0.4-1.4) |
| **58** | 11 | 9 | 46.4 | 193.9 | (100.9-372.6) | 13 | 7 | 90.7 | 77.2 | (36.8-161.9) | 0.4 | (0.2-1.1) |
| **59** | 5 | 5 | 22.4 | 223.1 | (92.9-536.1) | 7 | 7 | 26.8 | 260.9 | (124.4-547.4) | 1.2 | (0.4-3.7) |
| **Total** |  | 191 |  |  |  |  | 253 |  |  |  |  |  |
| **Penile clearance** | | | | | | | | | | | | |
|  | **HIV-negative MSM** | | | | | **HIV-infected MSM** | | | | |  |  |
| **HPV type** | **Number at risk** | **Cleared events** | **PMO** | **CR** | **95% CI** | **Number at risk** | **Cleared events** | **PMO** | **CR** | **95% CI** | **CRR** | **Lower** |
| **16** | 15 | 8 | 137.8 | 58.1 | (29.0-116.1) | 10 | 8 | 67.1 | 119.2 | (59.6-238.4) | 2.1 | (0.8-5.5) |
| **18** | 6 | 2 | 75.0 | 26.7 | (6.7-106.6) | 2 | 2 | 6.5 | 305.9 | (76.5-1223.1) | 11.5 | (1.6-81.4) |
| **31** | 6 | 6 | 41.2 | 145.7 | (65.5-324.3) | 6 | 2 | 48.5 | 41.3 | (10.3-165.0) | 0.3 | (0.1-1.4) |
| **33** | 4 | 4 | 26.6 | 150.2 | (56.4-400.2) | 3 | 3 | 36.4 | 82.5 | (26.6-255.8) | 0.6 | (0.1-2.5) |
| **35** | 2 | 1 | 33.4 | 29.9 | (4.2-212.3) | 4 | 4 | 29.2 | 136.9 | (51.4-364.7) | 4.6 | (0.5-41.0) |
| **39** | 5 | 4 | 31.3 | 127.8 | (48.0-340.6) | 6 | 5 | 38.3 | 130.7 | (54.4-314.0) | 1.0 | (0.3-3.8) |
| **45** | 2 | 2 | 17.6 | 113.5 | (28.4-453.7) | 4 | 3 | 30.7 | 97.7 | (31.5-303.0) | 0.9 | (0.1-5.2) |
| **51** | 6 | 6 | 36.7 | 163.6 | (73.5-364.1) | 10 | 8 | 53.4 | 149.7 | (74.9-299.4) | 0.9 | (0.3-2.6) |
| **52** | 5 | 2 | 41.8 | 47.9 | (12.0-191.4) | 10 | 6 | 91.8 | 65.4 | (29.4-145.5) | 1.4 | (0.3-6.8) |
| **56** | 4 | 4 | 11.7 | 343.0 | (128.7-913.8) | 4 | 3 | 24.9 | 120.6 | (38.9-374.0) | 0.4 | (0.1-1.6) |
| **58** | 0 | NA | NA | NA | NA | 0 | NA | NA | NA | NA | NA | NA |
| **59** | 1 | 1 | 9.2 | 109.1 | (15.4-774.5) | 1 | 1 | 3.0 | 329.0 | (46.4-2335.9) | 3.0 | (0.2-48.2) |
| **Total** |  | 40 |  |  |  |  | 45 |  |  |  |  |  |

Abbreviations: MSM=men who have sex with men; H2M=HIV & HPV in MSM; CI=confidence interval; CR=clearance rate per 1000 person-months of observation at risk; CRR=clearance rate ratio; PMO=person-months of observation at risk; NA=not applicable.

a Assumption III: clearance was defined as two consecutive positive visits followed by one negative visit.

**Supplementary Table 5: Crude and adjusted clearance rate ratios for anal and penile incident versus prevalent high-risk HPV infections (H2M study, Amsterdam 2010-2013).**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Anal clearancea** | | | | | | | **Penile clearanceb** | | | | | | |
| Outcome assumption I | | | | | | | Outcome assumption I | | | | | | |
|  | **CRR** | **95% CI** | ***P*-value** | **aCRR** | **95% CI** | ***P*-value** |  | **CRR** | **95% CI** | ***P*-value** | **aCRR** | **95% CI** | ***P*-value** |
| Prevalent | 1 |  |  | 1 |  |  | Prevalent | 1 |  |  | 1 |  |  |
| Incident | 1.40 | (1.19-1.65) | <0.001 | 1.36 | (1.15-1.62) | <0.001 | Incident | 1.33 | (1.09-1.63) | 0.004 | 1.34 | (1.10-1.64) | 0.004 |
| Outcome assumption II | | | | | | | Outcome assumption II | | | | | | |
|  | **CRR** | **95% CI** | ***P*-value** | **aCRR** | **95% CI** | ***P*-value** |  | **CRR** | **95% CI** | ***P*-value** | **aCRR** | **95% CI** | ***P*-value** |
| Prevalent | 1 |  |  | 1 |  |  | Prevalent | 1 |  |  | 1 |  |  |
| Incident | 1.64 | (1.45-1.86) | <0.001 | 1.60 | (1.40-1.82) | <0.001 | Incident | 1.35 | (1.14-1.59) | 0.04 | 1.34 | (1.15-1.58) | <0.001 |
| Outcome assumption III | | | | | | | Outcome assumption III | | | | | | |
|  | **CRR** | **95% CI** | ***P*-value** | **aCRR** | **95% CI** | ***P*-value** |  | **CRR** | **95% CI** | ***P*-value** | **aCRR** | **95% CI** | ***P*-value** |
| Prevalent | 1 |  |  | 1 |  |  | Prevalent | 1 |  |  | 1c |  |  |
| Incident | 1.24 | (1.01-1.52) | 0.04 | 1.17 | (0.96-1.44) | 0.13 | Incident | 1.36 | (0.89-2.08) | 0.16 | 1.46 | (0.95-2.24) | 0.09 |

Abbreviations: H2M=HIV & HPV in MSM; CRR=clearance rate ratio; aCRR=adjusted clearance rate ratio; CI=confidence interval.

Incident versus prevalent infections were defined as infections that were not detected at baseline versus infections that were detected at baseline.

Outcome assumption I=1-0-0 (main analyses: one positive visit followed by two consecutive negative visits); assumption II=1-0 (sensitivity analyses: one positive visit followed by one negative visit); assumption III=1-1-0 (sensitivity analyses: two consecutive positive visits followed by one negative visit).

a Multivariable models for anal high-risk HPV clearance were a priori adjusted for age, HIV infection, smoking, number of recent anal sex partners, number of lifetime male sex partners, recent cannabis and/or poppers use, anal sex position, having been rimmed, receptive fisting, anal STI (chlamydia and/or gonorrhea), and HPV type.

b Multivariable models for penile high-risk HPV clearance were a priori adjusted for age, HIV infection, smoking, number of recent anal sex partners, number of lifetime male sex partners, recent cannabis and/or poppers use, anal sex position, circumcision status, urethral STI (chlamydia and/or gonorrhea), and HPV type, unless indicated otherwise.

c Because of limited number of events only a priori adjusted for age, smoking, and number of recent anal sex partners.