**Derivation and Validation of an HIV Risk Prediction Score Among Gay, Bisexual and Other Men Who Have Sex With Men to Inform PrEP Initiation in an STD Clinic Setting**

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| **Appendix Table 1. Chronological Differences in baseline Characteristics of Gay, Bisexual and Other Men who have Sex with Men, comparing 2001-2010 and 2011-2015 time periods** | | | | |
| Characteristic | | 2001-2010 | 2011-2015 | P Value |
| N individuals | | 11,504 | 7,612 |  |
| N visits | | 35,167 | 21,555 |  |
| Person-time (years) | | 131,355 | 39,598 |  |
| Days from baseline clinic visit to HIV diagnosis, next clinic visit, or censoring, median (IQR) | | 1,364 (574–1,825) | 671 (169–1,128) | <0.001 |
| HIV diagnoses, No. (%) | | 435 (1.2) | 205 (0.9) | 0.002 |
| Age, median (IQR) | | 33 (26–41) | 32 (26–43) | <0.001 |
| Race/ethnicity, No. (%) | | |  |  |
|  | White | 23,765 (67.6) | 13,325 (61.8) | <0.001 |
|  | Black | 4,165 (11.8) | 1,997 (9.3) |
|  | Asian | 1,721 (4.9) | 1,530 (7.1) |
|  | Hispanic | 1,486 (4.2) | 1,340 (6.2) |
|  | Native American/Alaskan Native | 424 (1.2) | 249 (1.2) |
|  | Multiracial/Other/Unknown | 3,606 (10.3) | 3,114 (14.5) |
| STI diagnoses, No. (%) a | | |  |  |
|  | Urethral Gonorrhea | 1,332 (3.8) | 698 (3.2) | <0.001 |
|  | Rectal gonorrhea | 754 (2.1) | 1,120 (5.2) | <0.001 |
|  | Pharyngeal gonorrhea | 750 (2.1) | 1,220 (6.7) | <0.001 |
|  | Urethral chlamydia | 1,209 (3.4) | 586 (2.7) | <0.001 |
|  | Rectal chlamydia | 767 (2.2) | 1,200 (5.6) | <0.001 |
|  | Pharyngeal chlamydia | 1 (0.0) | 231 (1.7) | <0.001 |
|  | Syphilis | 702 (2.0) | 615 (2.9) | <0.001 |
|  | Herpes | 6,191 (17.6) | 2,323 (10.8) | <0.001 |
| Self-reported history of STI b | |  |  |  |
|  | Gonorrhea | 5,237 (14.9) | 4,333 (20.1) | <0.001 |
|  | Chlamydia | 3,846 (10.9) | 3,916 (18.2) | <0.001 |
|  | Syphilis | 1,349 (3.8) | 1,483 (6.9) | <0.001 |
| Sexual Behavior b | | | |  |
|  | Number of Sex Partners, median (IQR) | 5 (2–10) | 5 (3–10) | 0.185 |
|  | Any condomless anal intercourse, No. (%) | 16,989 (48.3) | 12,123 (56.3) | <0.001 |
|  | Any condomless receptive anal intercourse, No. (%) | 13,192 (37.5) | 9,234 (42.8) | <0.001 |
|  | Any condomless insertive anal intercourse, No. (%) | 15,579 (41.5) | 9,956 (46.2) | <0.001 |
|  | Any HIV-infected sex partners, No. (%) | 3,397 (9.7) | 3,903 (18.1) | <0.001 |
|  | Any anonymous partners, No. (%) | 6,954 (19.7) | 4,723 (21.9) | <0.001 |
| Substance useb | | | |  |
|  | Methamphetamine | 1,668 (4.7) | 1,284 (6.0) | <0.001 |
|  | Inhaled nitrate (i.e., "poppers") | 2,053 (5.8) | 4,202 (19.5) | <0.001 |
| Abbreviations: STI, sexually transmitted infections; IQR, interquartile range | | | | |
| Randomized at the visit level. There are a total of 16448 people. | | | | |
| a Bacterial STIs are those diagnosed at the baseline clinical visit; Herpes diagnosis includes herpes sero-positivity, clinical diagnosis (FA, PCR, culture) or self-report.  b prior 12 months | | | | |

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| **Appendix Table 2. Sensitivity, Specificity, and 1-year Incidence of HIV Acquisition for Risk Prediction Scores defined by the Full Model (2001-2015), Modern Model and the Seattle PrEP Score (2011-2015) in the Derivation and Validation Cohorts** | | | | | | | | | | |
|  |  | Derivation Sample | | | |  | Validation Sample | | | |
| Model | Score Cut-Off | Percent of Sample, % | Sensitivity, % | Specificity, % | Cumulative 1-year Incidence, % |  | Percent of Sample, % | Sensitivity, % | Specificity, % | Cumulative 1-year Incidence, % |
| **Full Model** | |  |  |  |  |  |  |  |  |  |
|  | ≥0 | 100.0 | 100.0 | 0.0 | 1.0 |  | 100.0 | 100.0 | 0.0 | 0.7 |
|  | ≥2 | 96.2 | 98.6 | 3.9 | 1.1 |  | 96.1 | 98.5 | 3.9 | 0.7 |
|  | ≥3 | 93.0 | 96.8 | 7.0 | 1.1 |  | 93.1 | 97.5 | 6.9 | 0.7 |
|  | ≥4 | 93.0 | 96.8 | 7.1 | 1.1 |  | 93.1 | 97.5 | 6.9 | 0.7 |
|  | ≥5 | 72.2 | 91.4 | 28.0 | 1.3 |  | 72.4 | 97.0 | 27.9 | 0.9 |
|  | ≥6 | 70.6 | 89.8 | 29.6 | 1.3 |  | 70.6 | 95.0 | 29.7 | 1.0 |
|  | ≥7 | 66.6 | 87.5 | 33.7 | 1.4 |  | 66.3 | 90.5 | 34.0 | 1.0 |
|  | ≥8 | 62.0 | 83.9 | 38.2 | 1.5 |  | 61.5 | 84.5 | 38.7 | 1.0 |
|  | ≥9 | 44.2 | 80.9 | 56.3 | 1.9 |  | 43.7 | 79.0 | 56.6 | 1.3 |
|  | ≥10 | 39.0 | 77.3 | 61.4 | 2.1 |  | 38.8 | 74.5 | 61.6 | 1.5 |
|  | ≥11 | 37.5 | 76.1 | 63.0 | 2.2 |  | 37.2 | 73.0 | 63.2 | 1.5 |
|  | ≥12 | 27.7 | 63.9 | 72.7 | 2.7 |  | 27.8 | 57.5 | 72.5 | 1.7 |
|  | ≥13 | 25.6 | 62.0 | 74.8 | 2.9 |  | 25.7 | 53.0 | 74.6 | 1.7 |
|  | ≥14 | 21.2 | 54.8 | 79.2 | 3.2 |  | 21.0 | 48.0 | 79.2 | 2.0 |
|  | ≥15 | 18.9 | 51.4 | 81.5 | 3.5 |  | 18.9 | 44.0 | 81.4 | 2.1 |
|  | ≥16 | 15.8 | 45.0 | 84.6 | 3.8 |  | 15.8 | 36.5 | 84.4 | 2.1 |
|  | ≥17 | 13.2 | 39.3 | 87.1 | 4.2 |  | 13.3 | 32.5 | 86.9 | 2.3 |
|  | ≥18 | 11.5 | 35.7 | 88.8 | 4.5 |  | 11.5 | 30.0 | 88.7 | 2.5 |
|  | ≥19 | 9.4 | 30.5 | 90.8 | 4.7 |  | 9.5 | 24.5 | 90.6 | 2.5 |
|  | ≥20 | 8.0 | 27.7 | 92.2 | 5.3 |  | 7.9 | 21.0 | 92.2 | 2.6 |
|  | ≥21 | 6.7 | 23.9 | 93.5 | 5.5 |  | 6.6 | 19.0 | 93.5 | 2.9 |
|  | ≥22 | 5.7 | 21.1 | 94.5 | 5.8 |  | 5.4 | 16.0 | 94.7 | 3.1 |
|  | ≥23 | 4.6 | 18.9 | 95.6 | 6.3 |  | 4.6 | 13.0 | 95.5 | 2.9 |
|  | ≥24 | 3.8 | 16.1 | 96.3 | 6.8 |  | 3.9 | 10.5 | 96.2 | 2.8 |
|  | ≥25 | 3.1 | 13.9 | 97.0 | 7.0 |  | 3.2 | 7.5 | 96.8 | 2.4 |
|  | ≥26 | 2.6 | 12.3 | 97.5 | 8.0 |  | 2.6 | 7.0 | 97.5 | 2.8 |
|  | ≥27 | 2.2 | 10.5 | 97.9 | 8.6 |  | 2.2 | 5.5 | 97.8 | 2.8 |
|  | ≥28 | 1.8 | 8.4 | 98.3 | 8.6 |  | 1.8 | 4.0 | 98.2 | 2.6 |
|  | ≥29 | 1.5 | 7.3 | 98.6 | 9.6 |  | 1.4 | 4.0 | 98.6 | 3.4 |
|  | ≥30 | 1.2 | 5.9 | 98.8 | 10.0 |  | 1.2 | 3.0 | 98.8 | 3.4 |
|  | ≥31 | 1.0 | 5.7 | 99.1 | 12.2 |  | 0.9 | 2.0 | 99.1 | 3.1 |
|  | ≥32 | 0.8 | 5.5 | 99.2 | 15.1 |  | 0.8 | 1.5 | 99.2 | 2.9 |
|  | ≥33 | 0.6 | 3.9 | 99.4 | 15.0 |  | 0.6 | 1.5 | 99.4 | 3.6 |
|  | ≥34 | 0.5 | 2.7 | 99.6 | 14.7 |  | 0.5 | 1.5 | 99.5 | 4.6 |
|  | ≥35 | 0.4 | 2.3 | 99.6 | 15.7 |  | 0.4 | 1.5 | 99.6 | 5.8 |
|  | ≥36 | 0.3 | 2.0 | 99.7 | 17.6 |  | 0.3 | 1.5 | 99.7 | 8.0 |
|  | ≥37 | 0.2 | 1.4 | 99.8 | 16.6 |  | 0.2 | 1.5 | 99.8 | 9.7 |
|  | ≥38 | 0.2 | 1.1 | 99.9 | 15.8 |  | 0.1 | 1.5 | 99.9 | 19.5 |
| **Modern Model** | | |  |  |  |  |  |  |  |  |
|  | ≥0 | 100.0 | 100.0 | 0.0 | 0.9 |  | 100.0 | 100.0 | 0.0 | 0.7 |
|  | ≥2 | 83.4 | 93.5 | 16.7 | 1.0 |  | 84.0 | 94.0 | 16.1 | 0.8 |
|  | ≥3 | 83.1 | 93.5 | 17.0 | 1.0 |  | 83.6 | 92.5 | 16.4 | 0.8 |
|  | ≥4 | 82.8 | 93.5 | 17.3 | 1.0 |  | 83.5 | 91.0 | 16.6 | 0.8 |
|  | ≥5 | 82.8 | 93.5 | 17.3 | 1.0 |  | 83.5 | 91.0 | 16.6 | 0.8 |
|  | ≥6 | 79.4 | 91.3 | 20.7 | 1.1 |  | 80.1 | 88.1 | 20.0 | 0.8 |
|  | ≥7 | 32.7 | 65.9 | 67.6 | 2.1 |  | 33.3 | 50.7 | 66.8 | 1.2 |
|  | ≥8 | 32.7 | 65.2 | 67.6 | 2.0 |  | 33.2 | 49.3 | 66.9 | 1.2 |
|  | ≥9 | 30.3 | 61.6 | 70.0 | 2.1 |  | 30.4 | 43.3 | 69.7 | 1.2 |
|  | ≥10 | 28.2 | 56.5 | 72.1 | 2.1 |  | 28.7 | 40.3 | 71.4 | 1.1 |
|  | ≥11 | 28.2 | 56.5 | 72.1 | 2.1 |  | 28.7 | 40.3 | 71.4 | 1.1 |
|  | ≥12 | 20.5 | 47.1 | 79.8 | 2.4 |  | 20.8 | 35.8 | 79.4 | 1.4 |
|  | ≥13 | 15.0 | 36.2 | 85.2 | 2.5 |  | 15.2 | 26.9 | 85.0 | 1.5 |
|  | ≥14 | 13.7 | 34.8 | 86.5 | 2.7 |  | 14.0 | 25.4 | 86.1 | 1.6 |
|  | ≥15 | 11.1 | 29.7 | 89.0 | 3.0 |  | 11.5 | 20.9 | 88.6 | 1.5 |
|  | ≥16 | 9.4 | 27.5 | 90.7 | 3.6 |  | 9.9 | 17.9 | 90.2 | 1.7 |
|  | ≥17 | 9.3 | 26.8 | 90.9 | 3.6 |  | 9.8 | 17.9 | 90.3 | 1.7 |
|  | ≥18 | 6.4 | 24.6 | 93.8 | 4.8 |  | 6.4 | 11.9 | 93.6 | 1.7 |
|  | ≥19 | 6.3 | 24.6 | 93.9 | 4.8 |  | 6.4 | 11.9 | 93.7 | 1.7 |
|  | ≥20 | 4.8 | 22.5 | 95.3 | 5.7 |  | 4.9 | 7.5 | 95.1 | 1.4 |
|  | ≥21 | 3.6 | 18.1 | 96.5 | 6.6 |  | 3.8 | 7.5 | 96.2 | 1.7 |
|  | ≥22 | 3.0 | 15.2 | 97.1 | 7.3 |  | 3.0 | 4.5 | 97.0 | 1.4 |
|  | ≥23 | 2.7 | 14.5 | 97.5 | 7.8 |  | 2.7 | 4.5 | 97.4 | 1.6 |
|  | ≥24 | 2.2 | 13.0 | 97.9 | 9.0 |  | 2.2 | 4.5 | 97.8 | 2.1 |
|  | ≥25 | 2.2 | 12.3 | 97.9 | 8.8 |  | 2.2 | 4.5 | 97.9 | 2.1 |
|  | ≥26 | 1.6 | 8.0 | 98.5 | 7.9 |  | 1.6 | 4.5 | 98.4 | 2.8 |
|  | ≥27 | 1.1 | 6.5 | 99.0 | 8.3 |  | 1.1 | 3.0 | 98.9 | 2.9 |
|  | ≥28 | 1.0 | 6.5 | 99.0 | 9.0 |  | 1.0 | 1.5 | 99.1 | 1.6 |
|  | ≥29 | 0.6 | 4.3 | 99.4 | 10.0 |  | 0.5 | 1.5 | 99.5 | 3.3 |
|  | ≥30 | 0.5 | 4.3 | 99.5 | 13.8 |  | 0.4 | 1.5 | 99.6 | 5.2 |
|  | ≥31 | 0.5 | 3.6 | 99.6 | 11.9 |  | 0.3 | 1.5 | 99.7 | 5.8 |
|  | ≥32 | 0.4 | 3.6 | 99.7 | 19.9 |  | 0.3 | 1.5 | 99.7 | 5.8 |
|  | ≥33 | 0.3 | 3.6 | 99.7 | 24.0 |  | 0.3 | 1.5 | 99.8 | 6.6 |
|  | ≥34 | 0.3 | 3.6 | 99.7 | 24.0 |  | 0.3 | 1.5 | 99.8 | 6.6 |
| **Seattle PrEP Score** | | | |  |  |  |  |  |  |  |
|  | ≥0 | 100.0 | 100.0 | 0.0 | 0.9 |  | 100.0 | 100.0 | 0.0 | 0.7 |
|  | ≥1 | 83.4 | 93.5 | 16.7 | 1.0 |  | 84.0 | 94.0 | 16.1 | 0.8 |
|  | ≥2 | 30.7 | 62.3 | 69.6 | 2.1 |  | 31.2 | 46.3 | 68.9 | 1.2 |
|  | ≥3 | 8.4 | 27.5 | 91.7 | 4.0 |  | 8.8 | 14.9 | 91.3 | 1.6 |
|  | ≥4 | 1.3 | 6.5 | 98.8 | 7.5 |  | 1.2 | 3.0 | 98.8 | 2.3 |
| Omitted numbers indicate that there is no possible combination of points to obtain such a score | | | | | | | | | |  |

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| **Appendix Table 3. Performance of the Seattle PrEP Score (2011-2015) by Race/Ethnicity** | | | | | | | |
|  | **White** | **All Non-White** | **Black** | **Asian** | **Hispanic** | **Native American/ Alaskan Native** | **Multiracial/ Other/ Unknown** |
| N visits | 13,325 | 8,230 | 1,997 | 1,530 | 1,340 | 249 | 3,114 |
| HIV diagnoses, No. (%) | 124 (0.9) | 81 (1.0) | 21 (1.1) | 6 (0.4) | 13 (1.0) | 3 (1.2) | 38 (1.2) |
| Incidence per 100  person-years (95% CI) | 1.01 (0.84, 1.22) | 1.25 (1.00, 1.56) | 1.24 (0.80, 1.92) | 0.47 (0.21, 1.04) | 1.33 (0.74, 2.40) | 1.99 (0.64, 6.16) | 1.62 (1.17, 2.24) |
| Indicated for PrEP | 4,271 (32.1) | 2,385 (29.0) | 490 (24.5) | 420 (27.5) | 467 (34.9) | 73 (29.3) | 935 (30.0) |
| AUC (96% CI) | 0.64 (0.60, 0.69) | 0.68 (0.62, 0.74) | 0.62 (0.49, 0.76) | 0.91 (0.66, 0.95) | 0.59 (0.43, 0.74) | 0.68 (0.42, 0.95) | 0.72 (0.64, 0.79) |
| Sensitivity, % | 56.5 | 58.0 | 47.6 | 83.3 | 46.2 | 66.7 | 63.2 |
| Specificity, % | 68.2 | 71.3 | 75.7 | 72.7 | 65.3 | 71.1 | 70.4 |

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| **Appendix Table 4. The Seattle PrEP Score 1-year Incidence and Number Needed to Treat Using Combined Validation and Derivation Data from 2011-2015 (Figure 2 in Main Text)** | | | |
| Score | 1-year Incidence (95% CI) | NNT |  |
| 0 | 0.0029 (0.0017, 0.0049) | 350.5 |  |
| 1 | 0.0069 (0.0055,0.0087) | 145.4 |  |
| 2 | 0.0163 (0.0127, 0.0208) | 61.5 |  |
| 3 | 0.0342 (0.0246, 0.0477) | 29.2 |  |
| 4 | 0.0751 (0.0456, 0.1356) | 13.3 |  |
| Abbreviations: CI, confidence intervals; NNT, number needed to treat | | | |