

## Appendix

### Predictive values across a range of epidemic contexts

To estimate the potential changes in predictive value based on different levels of underlying prevalence, we estimated the predictive values under a range of increased and decreased incidence in comparison to the observed data. We estimated predictive values if we were to have observed 1/3, 1/2, 2 times, and 3 times as many incident infections during the study period. The results are presented in Figure A1.

As expected, PPV increases and NPV decreases as the underlying prevalence increases. The change in PPV and NPV is more drastic among black MSM compared to white MSM, reflecting the assumption that the epidemic would continue to affect black MSM disproportionately.

### Sensitivity analysis to assess discriminatory performance at 6 months

Each of the three scores was developed and validated using an outcome of 6-month seroconversion. Table A1 presents the sensitivity, specificity, PPV, and NPV for each score for the outcomes of 6-month and 2-year seroconversion. Due to the lower number of events observed at 6 months the confidence intervals for these estimates are wider. The point estimates are relatively stable across the two different time frames.

### Longitudinal analysis

As a secondary analysis we updated the risk scores for each participant at each 6-month follow-up visit. This approach has some limitations. In order to limit participant burden, participants were only asked to report on sexual behavior with new, but not existing, partners at follow-up visits. Further, depending on the number of partners reported, participants did not complete the full battery of questions about each new partner. Risk scores could only be updated for those men who completed the full set of questions reporting on a new partner. For all others, the risk score from the previous visit was carried forward. The outcome in this analysis was 6-month seroconversion (i.e., HIV diagnosis at the subsequent follow-up visit). We used a generalized linear model with a logit link to estimate the odds ratio for 6-month seroconversion based on a score indicating high-risk with exchangeable correlation structure to account for repeated measures across participants. To estimate the effect of including race in the model, we report the crude association between risk score and seroconversion and the association adjusted for race. The results of these models are presented in Table A2.

Race was a stronger predictor compared to the risk score in each of the models. The risk score was not statistically significantly associated with HIV seroconversion in any of the crude models. Adjusting for race, men with a HIRI-MSM score indicating high risk had 2.4 times higher odds of seroconverting within 6 months compared to men with low risk scores. Race was a significant predictor in all crude and adjusted models. Black MSM had approximately 5 times greater odds of seroconverting compared to white MSM. These results likely reflect the underlying prevalence (1) and racial homophily (2) in sexual partnerships.

Figure A1. Predictive values for each of three risk scores across a range of possible incidence values.

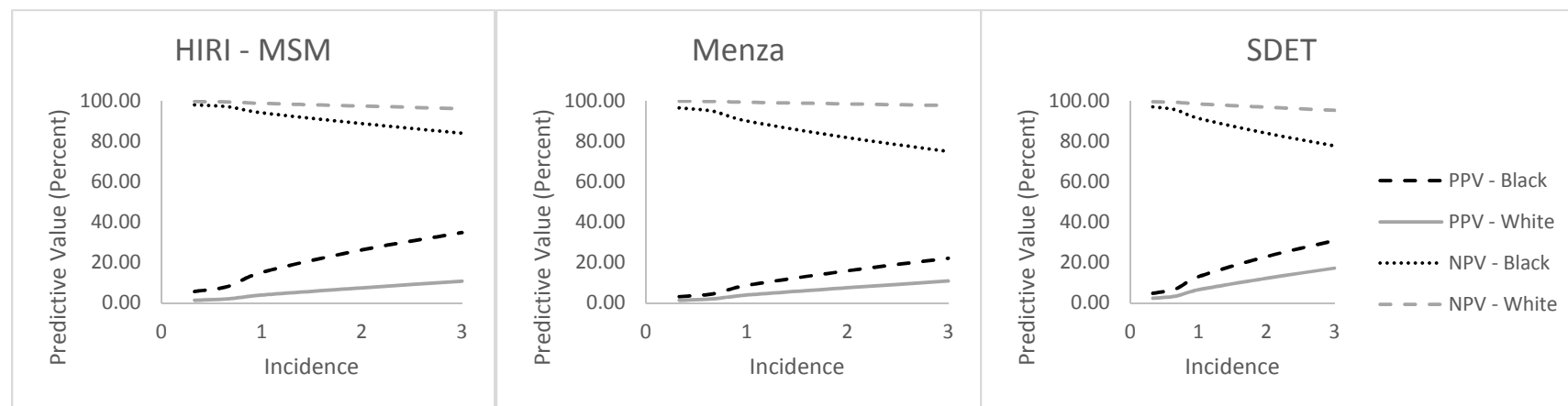


Figure Caption: Positive predictive value (PPV) and negative predictive value (NPV) for black and white MSM using three different risk scores to predict seroconversion over two years of follow-up over a range of underlying prevalence values. The incidence value of 1.0 reflects the observed incidence in the current study.

Table A1. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of three HIV risk scores to predict seroconversion at 6 months and 2 years.

HIRI-MSM						
	Overall		Black		White	
	6 Month	2 Year	6 Month	2 Year	6 Month	2 Year
Se <sup>1</sup>	57.1 ( 28.9, 82.3)	62.5 ( 43.7, 78.9)	53.8 ( 25.1, 80.8)	58.3 ( 36.6, 77.9)	100.0 ( 2.5, 100.0)	75.0 ( 34.9, 96.8)
Sp	55.9 ( 51.7, 60.2)	56.7 ( 52.4, 61.0)	65.0 ( 58.7, 71.0)	66.4 ( 60.0, 72.4)	48.5 ( 42.7, 54.3)	49.0 ( 43.1, 54.8)
PPV	3.2 ( 1.4, 6.2)	8.0 ( 5.0, 12.1)	7.5 ( 3.1, 14.9)	15.1 ( 8.5, 24.0)	0.6 ( 0.0, 3.5)	3.8 ( 1.4, 8.2)
NPV	98.1 ( 95.9, 99.3)	96.2 ( 93.4, 98.0)	96.4 ( 92.3, 98.7)	94.0 ( 89.2, 97.1)	100.0 ( 97.5, 100.0)	98.6 ( 95.1, 99.8)

Menza						
	Overall		Black		White	
	6 Month	2 Year	6 Month	2 Year	6 Month	2 Year
Se	64.3 ( 35.1, 87.2)	62.5 ( 43.7, 78.9)	61.5 ( 31.6, 86.1)	54.2 ( 32.8, 74.4)	100.0 ( 2.5, 100.0)	87.5 ( 47.3, 99.7)
Sp	41.1 ( 36.9, 45.3)	41.1 ( 36.9, 45.5)	42.1 ( 35.9, 48.5)	41.5 ( 35.2, 48.1)	40.2 ( 34.6, 46.0)	40.8 ( 35.1, 46.7)
PPV	2.7 ( 1.2, 5.1)	6.0 ( 3.7, 9.2)	5.3 ( 2.3, 10.2)	8.6 ( 4.7, 14.3)	0.6 ( 0.0, 3.0)	3.9 ( 1.6, 7.8)
NPV	97.8 ( 95.0, 99.3)	94.8 ( 91.1, 97.3)	95.4 ( 89.6, 98.5)	89.9 ( 82.7, 94.9)	100.0 ( 97.0, 100.0)	99.2 ( 95.5, 100.0)

SDET						
	Overall		Black		White	
	6 Month	2 Year	6 Month	2 Year	6 Month	2 Year
Se	28.6 ( 8.4, 58.1)	25.0 ( 11.5, 43.4)	23.1 ( 5.0, 53.8)	16.7 ( 4.7, 37.4)	100.0 ( 2.5, 100.0)	50.0 ( 15.7, 84.3)
Sp	83.7 ( 80.4, 86.7)	83.9 ( 80.5, 87.0)	88.6 ( 84.0, 92.3)	88.5 ( 83.7, 92.3)	79.7 ( 74.7, 84.1)	80.3 ( 75.3, 84.7)
PPV	4.3 ( 1.2, 10.6)	8.6 ( 3.8, 16.2)	9.7 ( 2.0, 25.8)	12.9 ( 3.6, 29.8)	1.6 ( 0.0, 8.7)	6.5 ( 1.8, 15.7)
NPV	97.9 ( 96.1, 99.0)	94.9 ( 92.5, 96.7)	95.6 ( 92.1, 97.9)	91.2 ( 86.8, 94.6)	100.0 ( 98.5, 100.0)	98.3 ( 95.8, 99.5)

<sup>1</sup>Se = sensitivity, sp = specificity, PPV = positive predictive value, NPV = negative predictive value

Table A2. Odds ratios for 6-month seroconversion using risk scores updated at each 6-month follow-up visit.

HIRI-MSM			Menza		SDET	
	Crude OR (95% CI)	Adjusted OR (95% CI)	Crude OR (95% CI)	Adjusted OR (95% CI)	Crude OR (95% CI)	Adjusted OR (95% CI)
Score						
High	1.93 (0.93, 4.03)	2.42* (1.16, 5.03)	1.34 (0.64, 2.83)	1.47 (0.70, 3.09)	1.43 (0.54, 3.80)	1.96 (0.72, 5.32)
Low	Ref	Ref	Ref	Ref	Ref	Ref
Race						
Black	5.03* (2.05, 12.30)	5.72* (2.36, 13.86)	5.03* (2.05, 12.30)	5.15* (2.12, 12.53)	5.03* (2.05, 12.30)	5.40* (2.21, 13.22)
White	Ref	Ref	Ref	Ref	Ref	Ref

\*Statistically significant at  $p < .05$

1. Sullivan PS, Peterson J, Rosenberg ES, et al. Understanding racial HIV/STI disparities in black and white men who have sex with men: a multilevel approach. PLoS One. 2014;9(3):e90514.
2. Newcomb ME, Mustanski B. Racial differences in same-race partnering and the effects of sexual partnership characteristics on HIV Risk in MSM: a prospective sexual diary study. J Acquir Immune Defic Syndr. 2013;62(3):329-33.