


Use of the Geenius Index to indicate recent HIV infection in Project DETECT

Presenter: Lauren R. Violette, MPH
University of Washington
No disclosures



2022 Advancing HIV, STI and Viral Hepatitis Testing Conference
March 31, 2022

Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the CDC.



Funding:



This study was funded by the CDC through a federal contract (# 200-2014-61285).

Additional support was provided by the UW/Fred Hutch Center for AIDS Research, a National Institutes of Health–funded program (P30 AI027757).

Background:



Identification of recent HIV infections

- Improve incidence estimates
- Target prevention efforts
- Expedite treatment during early infection
- Case-based surveillance

Background:

Bio-Rad Geenius HIV-1/2 Supplemental Assay

Measures IgG antibody responses to HIV-1 & HIV-2 antigens

CEPHIA evaluation: use band intensities to create a Geenius Index to distinguish between recent & long-term infections

- **False recency rate = 4.1% (95% CI: 2.2-7.0) among ART-naïve subjects**
- **Mean duration of recent infection = 179 days (95% CI: 155-201)**

Objective:

**To explore relationships between the
Genius Index and time since HIV
infection**

Methods: Project DETECT

Evaluation of POC HIV tests used with unprocessed whole blood & oral fluid

1. HIV-negative/unknown persons seeking HIV testing (N=1574)
2. Persons known to be HIV-positive, diagnosed >3 months ago (N=255)
3. Persons with test results indicative of AHI or an HIV diagnosis <3 months ago (N=111)

Invited to enroll in longitudinal sub-study if discordant HIV test results



Methods: Duration of Infection

Recent Infection	Established Infection	Unknown Duration
Documented NR tests within 6 months OR New diagnosis with discordant test results	ART start date >6 months prior OR Self-reported diagnosis date >6 months prior	Excluded from the analysis

Methods: Geenius Index (GI)

Geenius with VP WB

$$\text{GI} = \frac{\textit{gp41} + \textit{gp160} + \textit{p31 band intensities}}{\textit{control band intensity}}$$

Compared at GI recent infection threshold = 1.5

Methods: Analysis

T-tests to compare mean GIs between:

- Recent & established infection
- ART use among recently infected participants
- HIV-1 RNA level among those with established infection
- p31 presence

$$\text{False recency rate} = \frac{\textit{Considered recent by GI}}{\textit{Established infection >6 months}}$$

Results: Sample Size

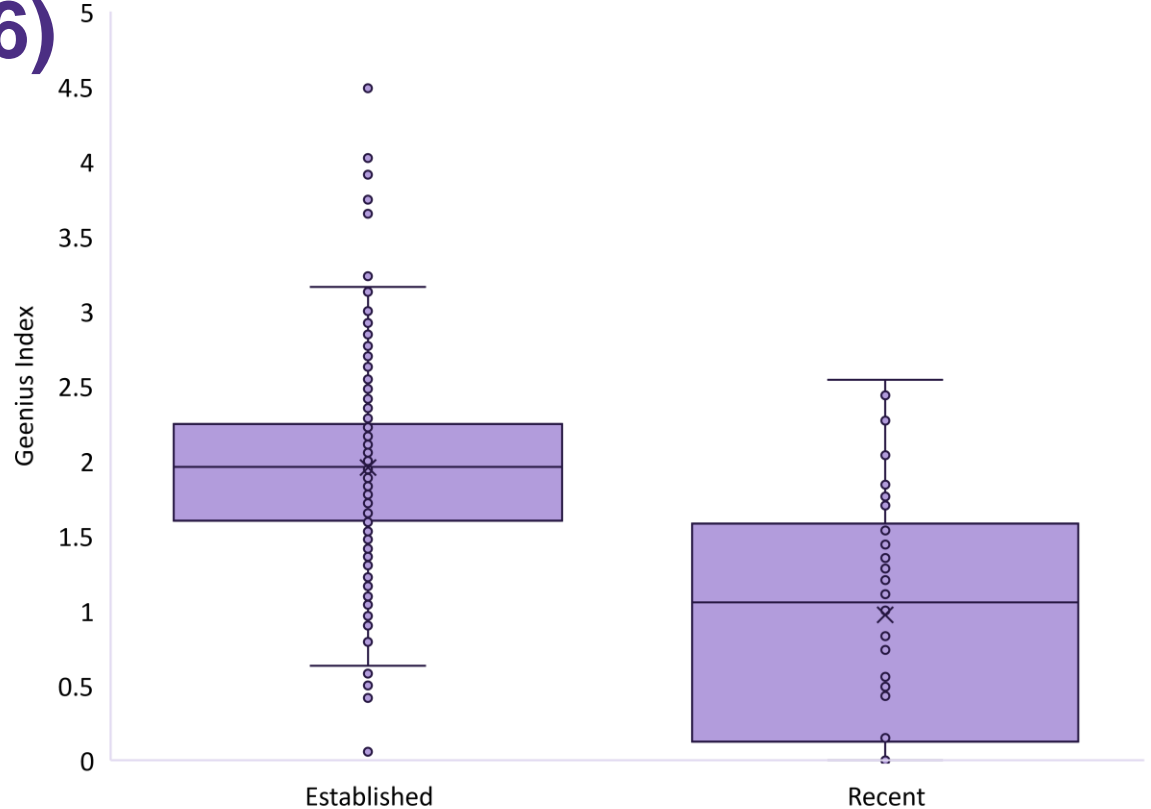
Recent Infection 38	Established Infection 208	Unknown Duration 120
<p>Documented NR tests within 6 months</p> <p>19</p> <p>OR</p> <p>19</p> <p>New diagnosis with discordant test results</p>	<p>ART start date >6 months prior</p> <p>170</p> <p>OR</p> <p>38</p> <p>Self-reported diagnosis date >6 months prior</p>	<p>Excluded from the analysis</p>

Results: Mean GI by infection recency (6 months) (N=246)

Established: 1.96
(95% CI: 1.87-2.05)

Recent: 0.97
(95% CI: 0.71-1.23)

p<0.001

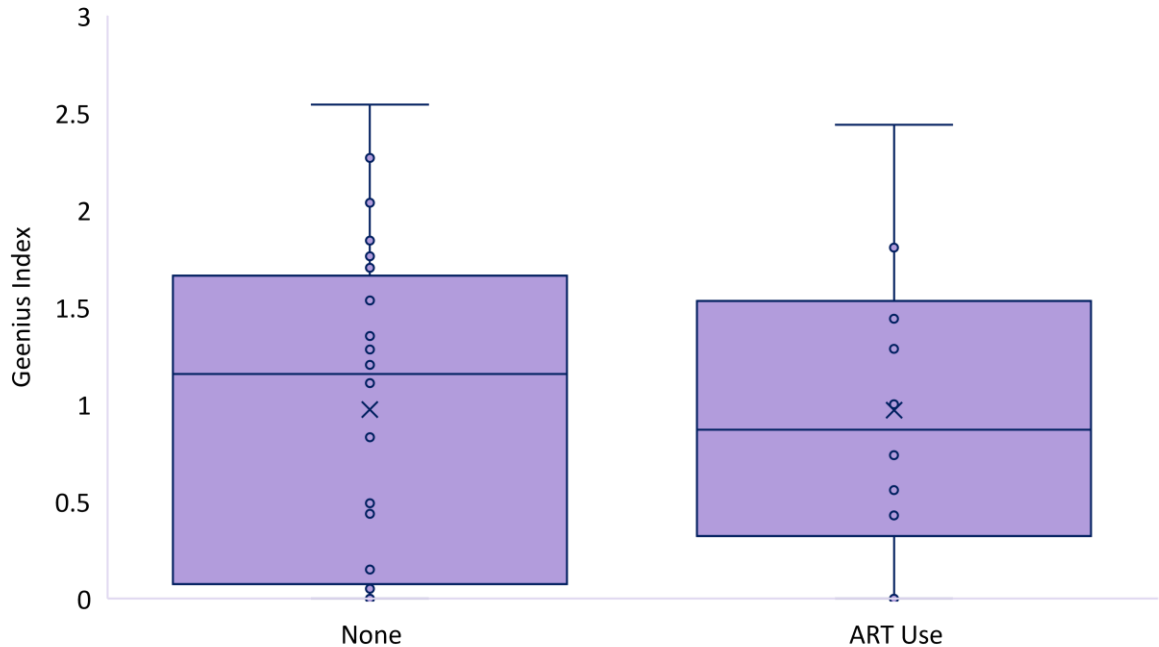


Results: Mean GI among recent infections by ART use (N=38)

No ART: 0.97
(95% CI: 0.66-1.29)

ART use: 0.97
(95% CI: 0.41-1.53)

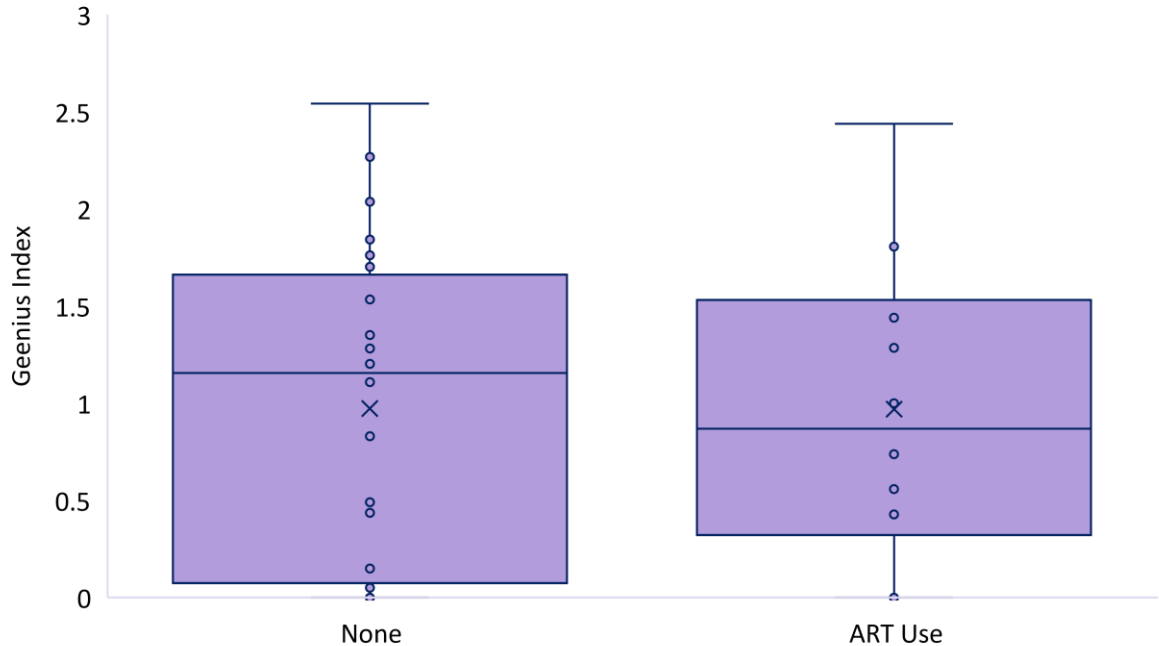
$p = 0.9931$



Results: Median GI among recent infections by ART use (N=38)

No ART: 1.16
(IQR: 0.10-1.62)

ART use: 0.87
(IQR: 0.43-1.44)



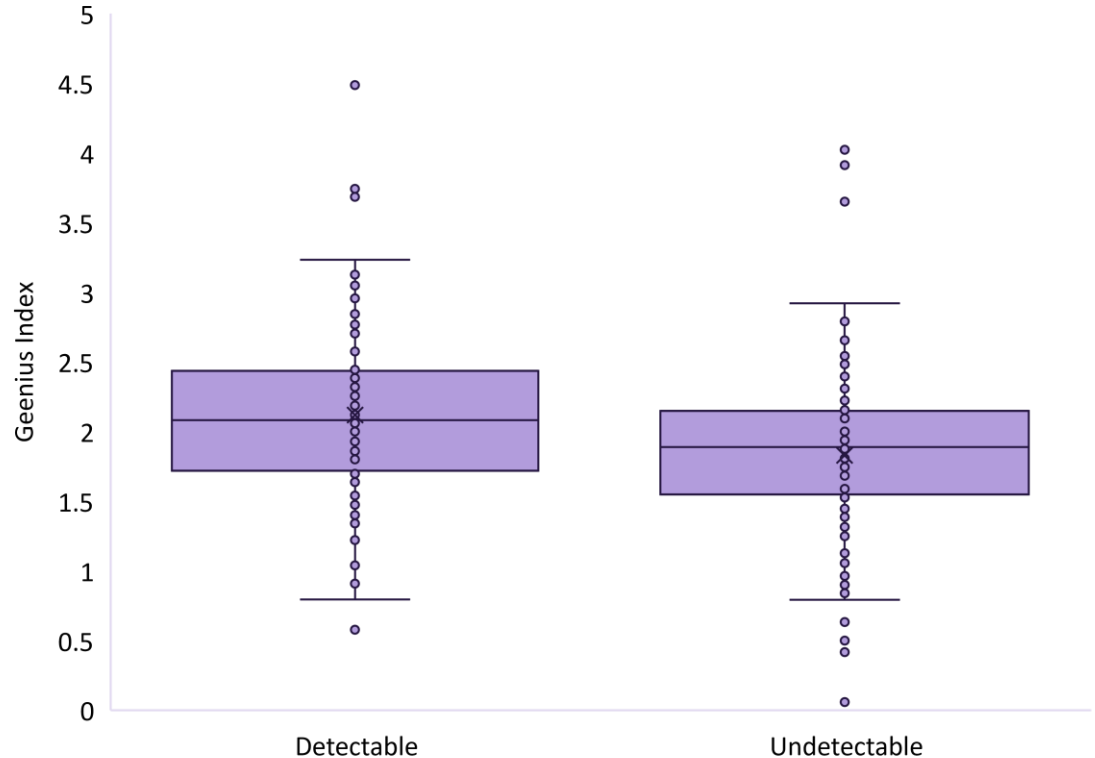
Results: Mean GI among established infections by HIV-1 RNA levels (N=208)

Undetectable: 1.83
(95% CI: 1.71-1.95)

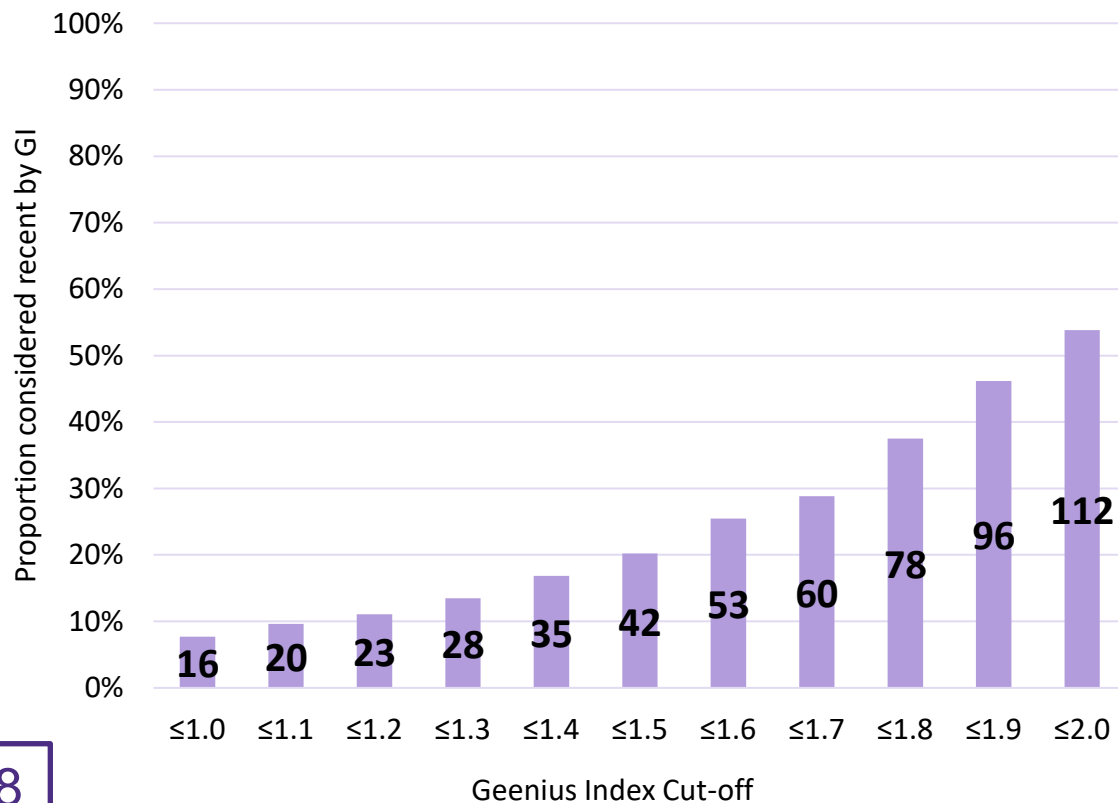
Detectable: 2.12
(95% CI: 1.99-2.25)

p = 0.0012

*missing HIV-1 RNA level for participant with
GI = 1.265



Results: Recency among those with established infection (N=208)

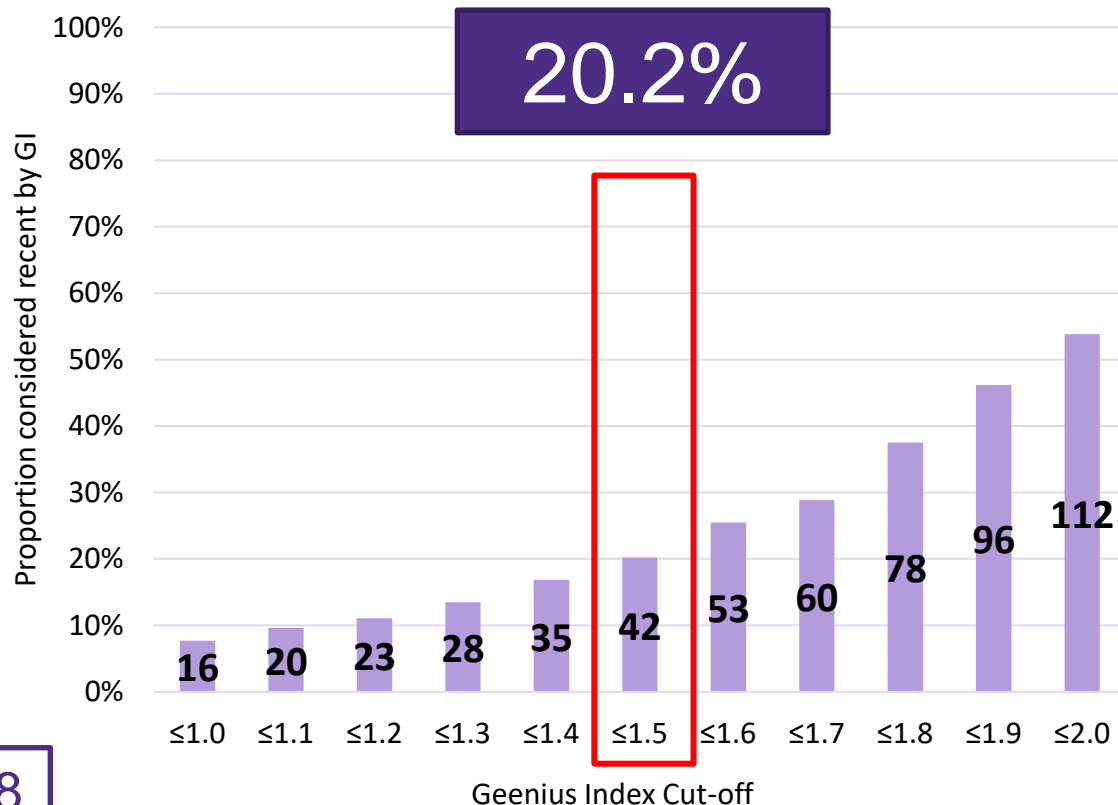


Considered recent
by GI cut-off

Considered NOT
recent by infection
dating

N=208

Results: Recency among those with established infection (N=208)

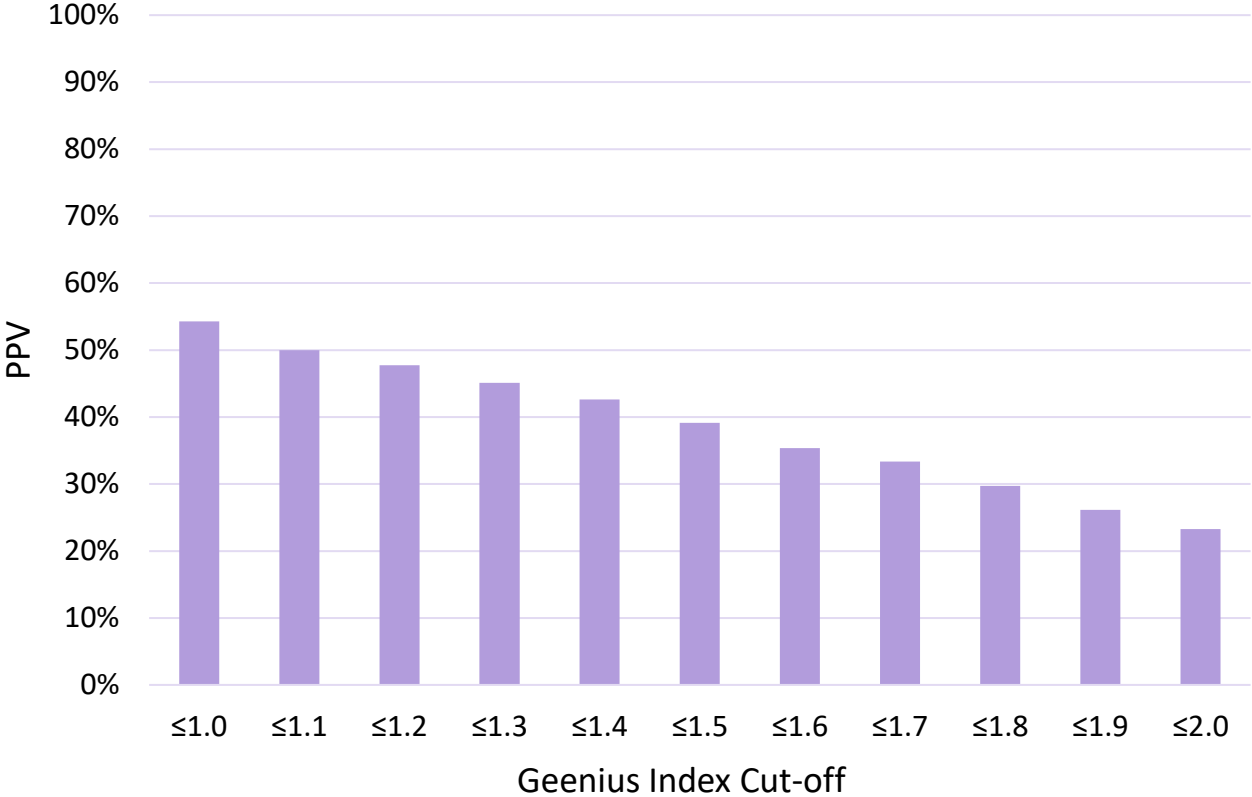


Considered recent
by GI cut-off

Considered NOT
recent by infection
dating

N=208

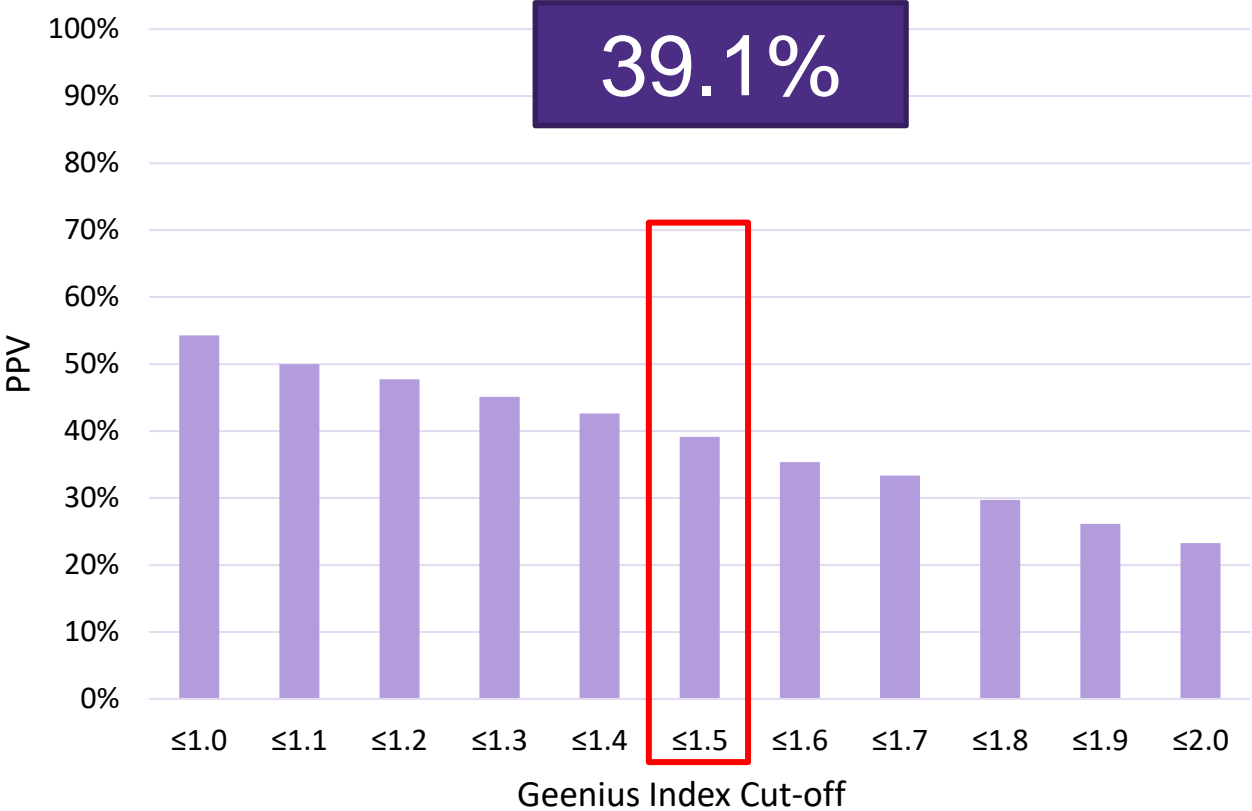
Results: PPV



Considered recent
by GI cut-off and
infection dating

Considered recent
by GI cut-off

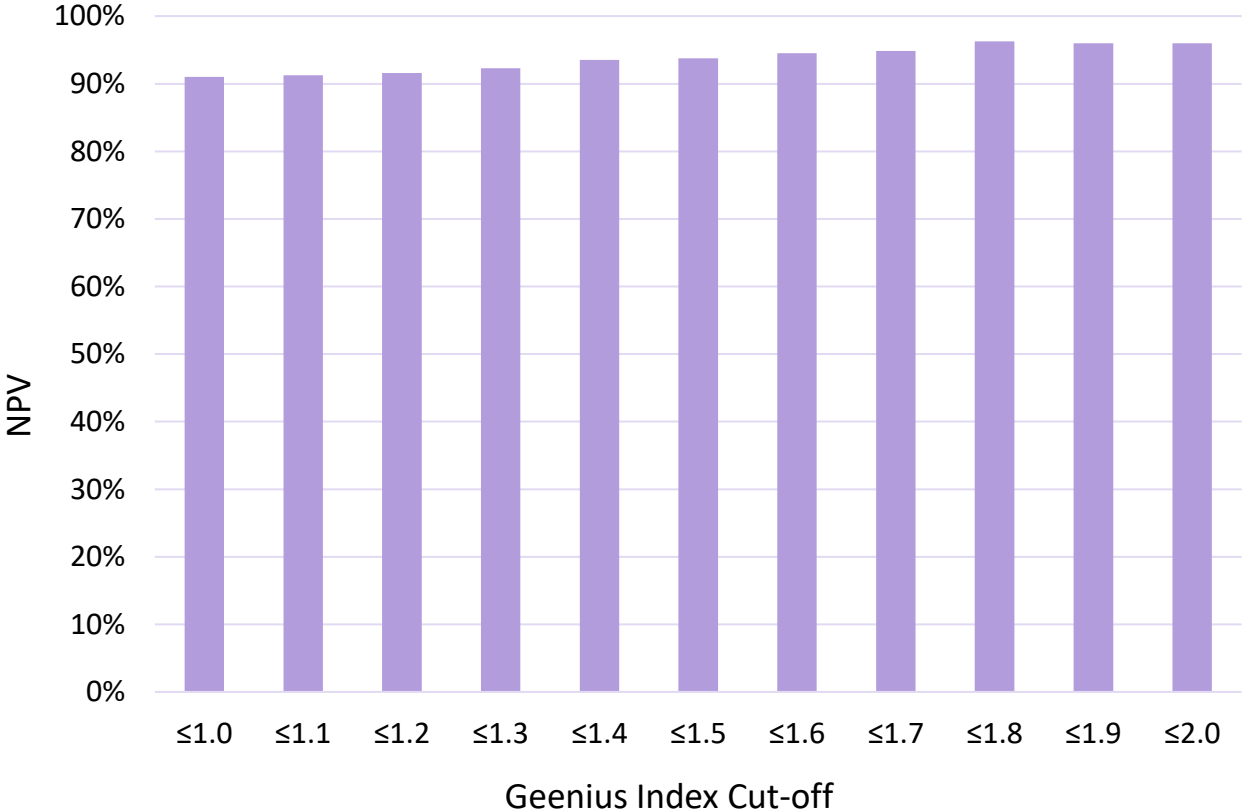
Results: PPV



Considered recent
by GI cut-off and
infection dating

Considered recent
by GI cut-off

Results: NPV

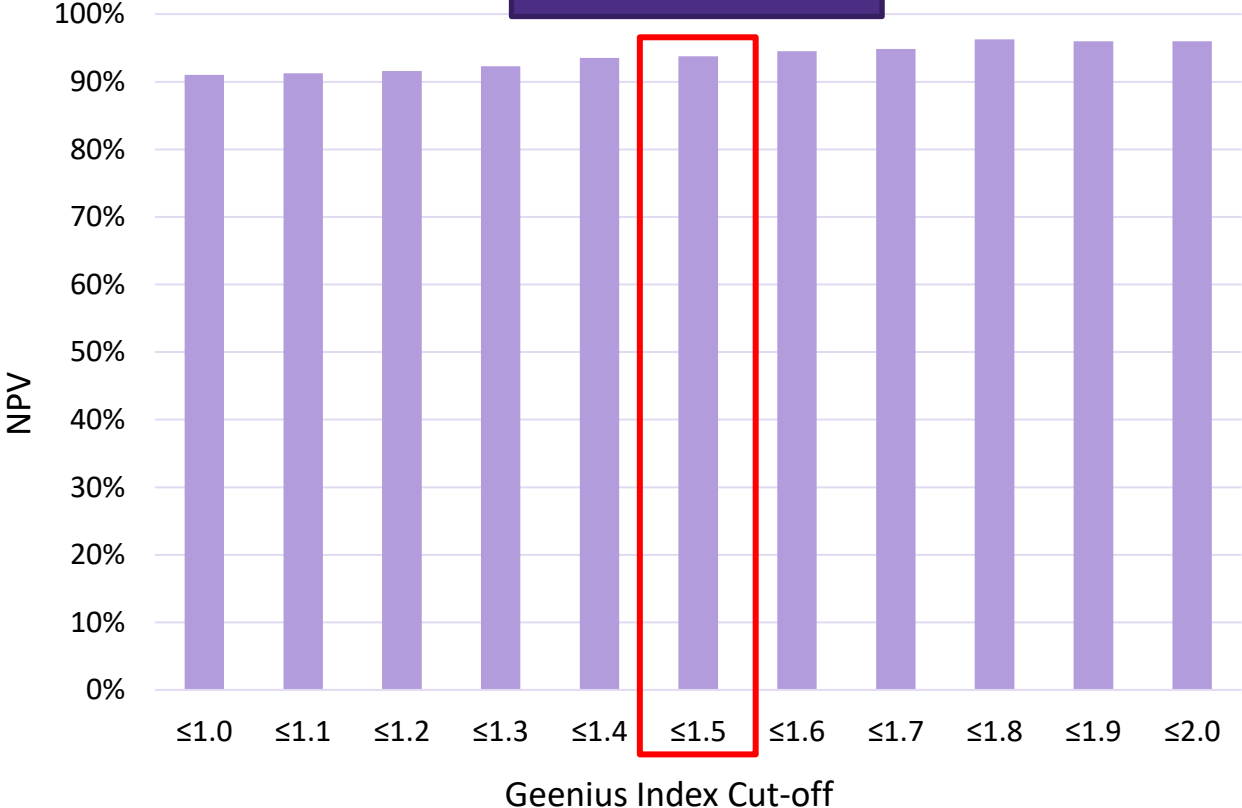


Considered NOT recent by GI cut-off and infection dating

Considered NOT recent by GI

Results: NPV

93.8%



Considered NOT recent by GI cut-off and infection dating

Considered NOT recent by GI

Results:

Band presence:

- p31 = 51% tests
- gp160 = 96% tests
- gp41 = 97% tests
- All bands = 51% tests

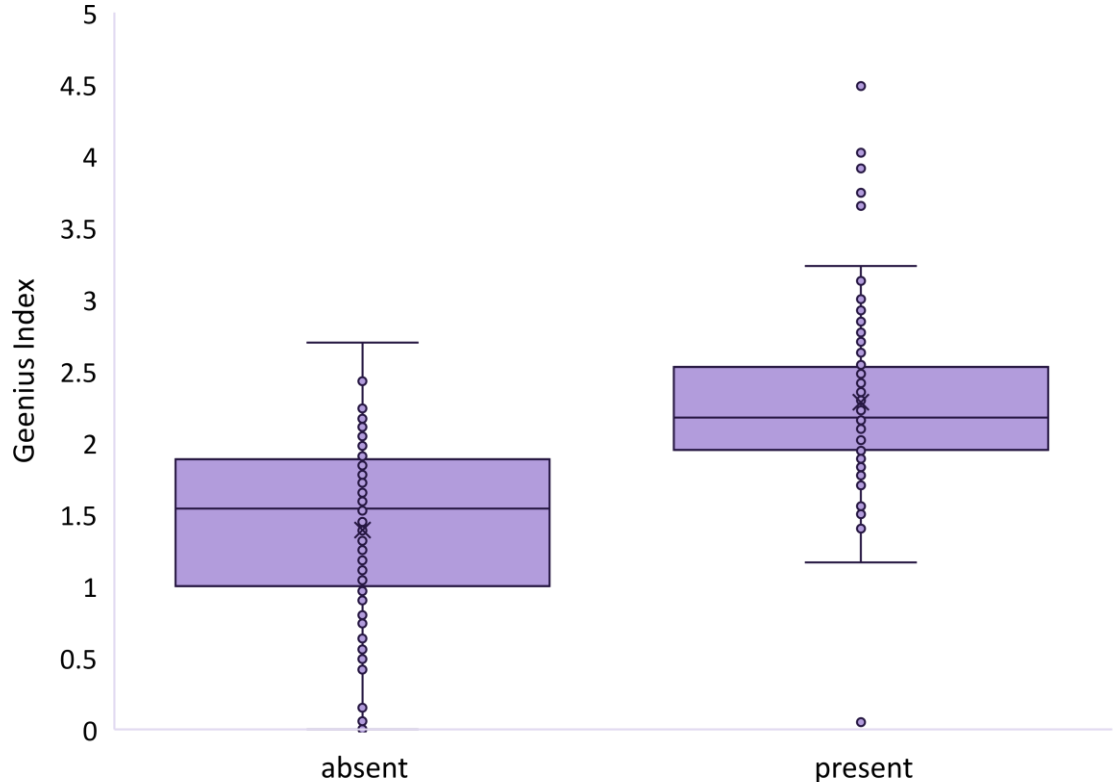
GI threshold for recent infection	Percent agreement between p31 band presence and recency defined by GI threshold N = 246
≤1.0	59.8%
≤1.1	61.8%
≤1.2	62.6%
≤1.3	65.4%
≤1.4	68.7%
≤1.5	70.3%
≤1.6	72.4%
≤1.7	74.8%
≤1.8	76.8%
≤1.9	78.9%
≤2.0	80.5%

Results: Mean GI by presence of p31 band

p31 present: 2.28
(95% CI: 2.17-2.39)

p31 absent: 1.39
(95% CI: 1.28-1.50)

$p < 0.001$



Results:

7 participants had false negative Geenius results, all with recent infection

Among 7 participants with newly diagnosed infection who initiated ART and were followed longitudinally, GI remained ≤ 1.5 at all visits after six months of follow-up.

Limitations:

Misclassification of infection recency

- Previous testing history based on medical records

Small sample size

- Excluded 120 people due to infection dating uncertainty
- 38 recent infections

Off-label use of Geenius

Implications & Future Work:

High NPV = rule out recent infections

- Cluster detection (who has high chance of being newly infected?)
- Expediting partner services

Performance of recency assays

- Long window periods
- Closer to time of infection
 - > Does this mean test more frequently?

Fine tune assays to target treatment & prevention interventions

Questions or comments?

Lauren Violette
lvio@uw.edu

Thank you!

Acknowledgements

- Project DETECT participants
- PHSKC Sexual Health Clinic
- PHSKC Laboratory
- UW AIDS Clinical Trials Unit
- Madison Clinic at Harborview
- Co-authors:
 - Lisa A Niemann
 - Andy Cornelius-Hudson
 - David A Katz
 - Pollyanna R Chavez
 - Kevin P Delaney
 - Joanne D Stekler

