



Effective strategies to promote HIV self-testing for men who have sex with men: evidence from a mathematical model

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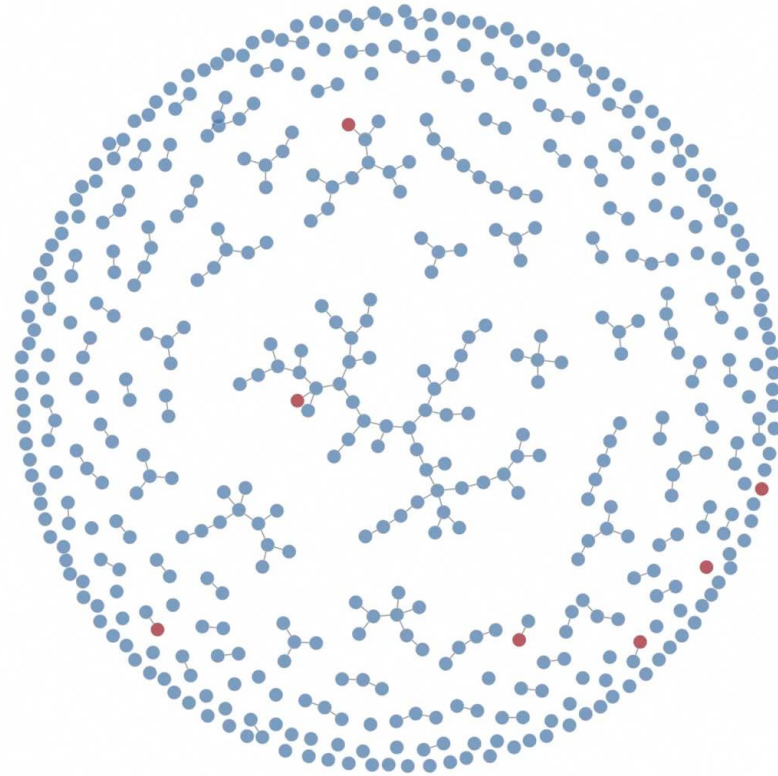
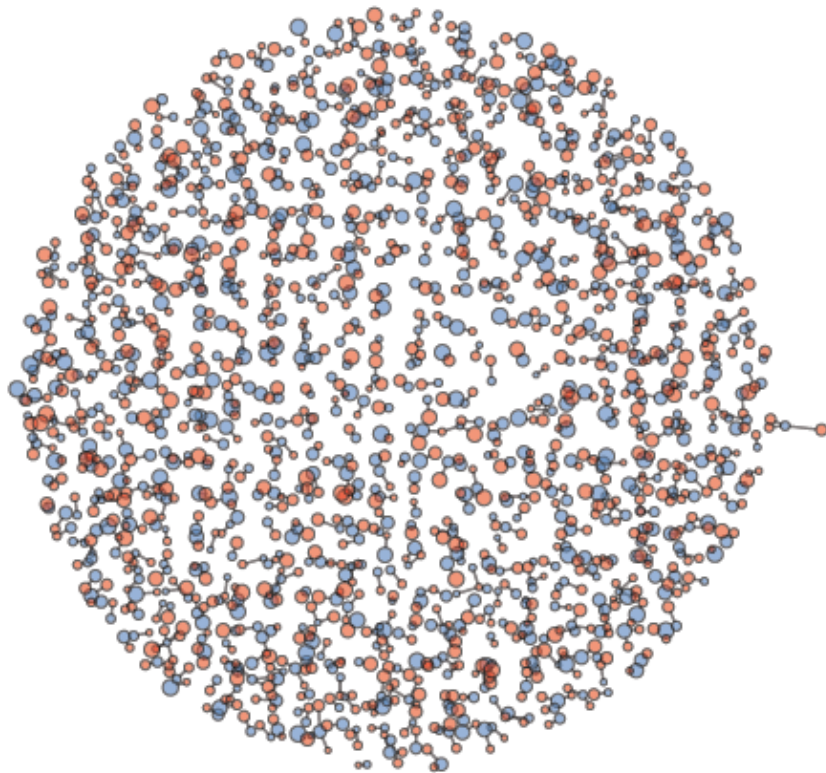
Objective:

- ▶ To inform public health approaches to promote safe and effective rapid home-use HIV testing to reduce HIV incidence in diverse populations of men who have sex with men (MSM)

Develop **stochastic network-based HIV transmission model** to identify how these strategies differ by targeting different tester types in Seattle and Atlanta.



Egocentric data to simulated network



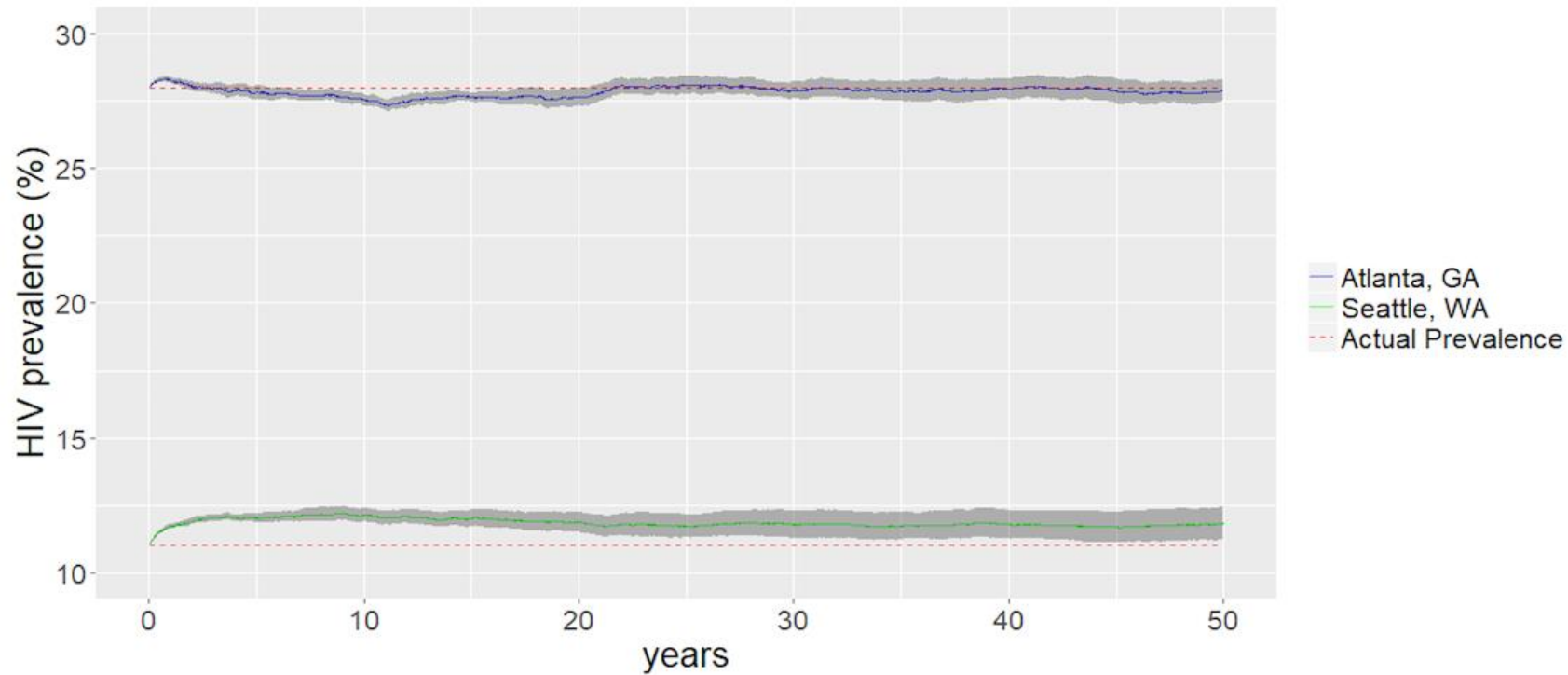
Clinic tester types

Tester type	Reasons	Seattle	Atlanta
Regular testing	Routine testing	64.9%	44%
Risk/symptom-based	Risk for HIV, Had symptoms of acute HIV, Had STD symptoms	13.8%	37%
Opportunistic only	Provider recommended, Someone else recommended, Heard HIV testing advertisement, Other	18.8%	15.5%
Never tested		2.5%	3.5%

Other key parameters

	Seattle	Atlanta
Window period: clinic test	15 days	21 days
Window period: HIV self-test	90 days	90 days
Testing frequency	<1/year – 2/year	~1.3/year
HIV care cascade	(better)	(worse)
Disclosure	~80 – 90%	~60- 80%
Condom use by partnership type	~6% - 40%	~20 – 30%
Condom use disclosure	~70% reduction	~70% reduction

Model calibration



Luo, W., et.al 2018. Development of an agent-based model to investigate the impact of HIV⁶ self-testing programs on men who have sex with men in Atlanta and Seattle. *JMIR public health and surveillance*, 4(2), p.e58.

HIV Self-test scenarios

Tester type	Replacement	Supplement
Non testers P_{nt}	none	10% test, 25% test
Opportunistic testers P_{ot}	<ul style="list-style-type: none">• 25% replace• 50% replace	<ul style="list-style-type: none">• Supplement 1 test/year• Supplement 2 test/year
Regular P_{re}	<ul style="list-style-type: none">• 25% replace• 50% replace	<ul style="list-style-type: none">• Supplement 1 test/year• Decrease inter-test interval by 1 test/year
Risk P_{ri}	<ul style="list-style-type: none">• 25% replace• 50% replace	<ul style="list-style-type: none">• Increase probability of testing given risk by 10%• Increase probability of testing given risk by 25%

Hamilton D, Katz D, **Luo W**, etc, 2021, Effective strategies to promote HIV self-testing for men who have sex with men: evidence from a mathematical model. *Epidemics*, p.100518.

Replacement Scenarios

Location	Intervention	Number of infections averted / 100K person years at risk
Atlanta	No intervention	NA
	25% of opportunistic tests	-2 (95% SI: -274, 279)
	25% of regular tests	1 (95% SI: -252, 287)
	25% of risk based tests	0 (95% SI: -275, 311)
	25% of all tests	-12 (95% SI: -265, 299)
	50% of opportunistic tests	-23 (95% SI: -266, 285)
	50% of regular tests	-45 (95% SI: -318, 263)
	50% of risk based tests	-9 (95% SI: -339, 248)
	50% of all tests	-57 (95% SI: -325, 241)
Seattle	No intervention	NA
	25% of opportunistic tests	-4 (95% SI: -238, 260)
	25% of regular tests	-4 (95% SI: -218, 266)
	25% of risk based tests	-2 (95% SI: -217, 214)
	25% of all tests	-23 (95% SI: -261, 224)
	50% of opportunistic tests	-14 (95% SI: -221, 206)
	50% of regular tests	-29 (95% SI: -243, 209)
	50% of risk based tests	-23 (95% SI: -284, 227)
50% of all tests	-64 (95% SI: -267, 176)	

Supplemental Scenarios

Location	Intervention	Number of infections averted / 100K person years at risk
Atlanta	No intervention	NA
	+1 annual opp. test	27 (95% SI: -286, 318)
	+1 annual test reg. test	9 (95% SI: -257, 296)
	+10% after risk event	-10 (95% SI: -305, 254)
	+1 annual never testers	30 (95% SI: -230, 295)
	All above	68 (95% SI: -259, 306)
	+2 annual opp. test	32 (95% SI: -289, 320)
	+2 annual test reg. test	9 (95% SI: -355, 320)
	+20% after risk event	-6 (95% SI: -291, 244)
	+2 annual never testers	49 (95% SI: -281, 301)
	All above	57 (95% SI: -261, 334)
	Reduce inter-test interval / 1 additional annual test	12 (95% SI: -339, 295)
	SEATTLE	No intervention
+1 annual opp. test		19 (95% SI: -200, 254)
+1 annual test reg. test		0 (95% SI: -216, 232)
+10% after risk event		-2 (95% SI: -208, 211)
+1 annual never testers		6 (95% SI: -190, 249)
All above		44 (95% SI: -156, 285)
+2 annual opp. test		21 (95% SI: -213, 212)
+2 annual test reg. test		30 (95% SI: -204, 237)
+20% after risk event		-3 (95% SI: -234, 278)
+2 annual never testers		24 (95% SI: -171, 296)
All above	40 (95% SI: -145, 253)	

Conclusions

- ▶ HIV self-testing can avert HIV infections
- ▶ The benefit of supplementary strategies depended on the tester type using HIVST.
- ▶ Targeting non-testers averted the highest number of cases per test.
- ▶ Targeting opportunistic testers is effective too.

► Thanks