Cost-Effectiveness of Regular HIV Screening for Young Men who Have Sex with Men

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BACKGROUND

- Young men who have sex with men (YMSM) account for 92% of HIV infections among US youth.
- In Adolescent Medicine Trials Network (ATN) studies 110 and 113 of HIV pre-exposure prophylaxis (PrEP) feasibility, incident infections occurred despite cohort-level PrEP adherence of 34-56%.
- CDC currently recommends yearly HIV screening for this group.

OBJECTIVE

- To determine the clinical impact, cost, and cost-effectiveness of alternative HIV screening strategies for self-identified high-risk young men who have sex with men (YMSM)

METHODS

- We used the Cost-Effectiveness of Preventing AIDS Complications (CEPAC) microsimulation model of HIV testing, treatment, and prevention to simulate self-identified high-risk HIV-uninfected 14-year-old MSM in the US who faced age-specific risks of HIV infection (0.91-6.41/100PY, peak incidence ages 15-17).
- We assumed simulated patients had the same risk factors for HIV infection as the ATN 110 and 113 study participants, which included self-reported high risk for HIV acquisition via any of the following in the last 6 months: condomless receptive anal intercourse with a male partner with an HIV infection or unknown HIV status, anal intercourse with at least 3 male partners, exchange sex or sexually transmitted infection.
- The model simulated the current practice of HIV screening among YMSM (16-53% screened at least once by ages 15-22) in addition to the 4 HIV screening strategies, as well as disease progression and HIV-related healthcare utilization.

Strategies: 3-yearly, yearly, 6-monthly, and 3-monthly screening, each in addition to current US screening practices among YMSM

Model input data: Natural history of HIV infection; antiretroviral therapy (ART) efficacy; costs of ART, routine HIV care, and care for opportunistic infections; and HIV care continuum data; all based on and calibrated to published estimates among YMSM when available.

Table 1. Select model input parameters

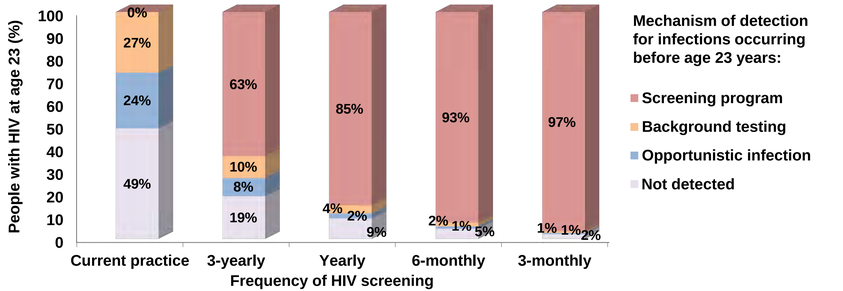
Parameter	Value	Source
HIV incidence	0.9-6.4 / 100PY	Hosek 2017; Molina 2015
HIV transmission rate	0.3-130.9 / 100PY	Attia 2009; Wawer 2005; Hosek 2017
Mean medication adherence (%)	94	Sax 2012
Mean CD4 at infection, cells/μL	667	Neilan 2018
HIV screen sensitivity / specificity (%)	99.6 / 99.7	Schackman 2015
Probability of screen offer and acceptance (%)	80	Paltiel 2005; Lally 2018
Probability of result return (%)	97	Martin 2010
Probability of linkage to care (%)	76	Hall 2013; Lally 2018
HIV screen cost negative / positive (USD 2018)	38 / 114	Eggman 2014; Schackman 2016
ART costs, annually (USD 2018)	27,600-45,400	Red Book 2017

Model outcomes:

- Monthly survival and healthcare costs
- HIV care continuum: numbers of new HIV infections, and cases diagnosed, linked, and retained in care
- Life expectancy and average lifetime costs, with and without discounting (at 3%/year)
- Monthly primary transmissions over a 15-year time horizon, based on population viral load, as well as cost savings and life-years saved due to averted transmissions
- Incremental cost-effectiveness ratios (ICERs): $/year-of-life saved ($/YLS) for each strategy relative to the next best strategy and to current practice; "cost-effective" defined as ICER<$100,000/YLS

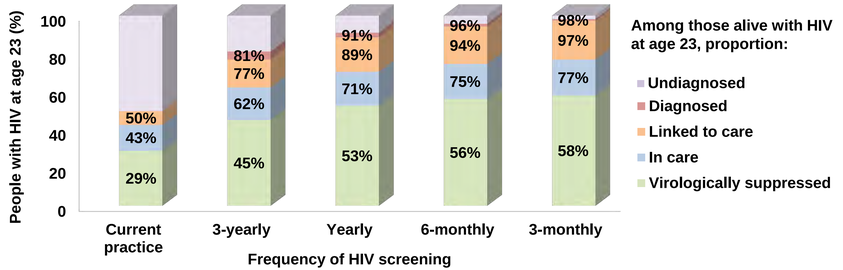
RESULTS

Figure 1. Mechanism of HIV detection for people with HIV by age 23



- Any repeat screening program in addition to current practice detected a substantial proportion of those HIV-infected by age 23 (63-97%). 3-monthly screening detected the greatest proportion of cases.

Figure 2. HIV care continuum outcomes at age 23



- 3-monthly screening in addition to current practice also provided the greatest improvement in HIV care continuum outcomes at age 23.

Table 2. Modeled outcomes of 4 HIV screening strategies in addition to current practice

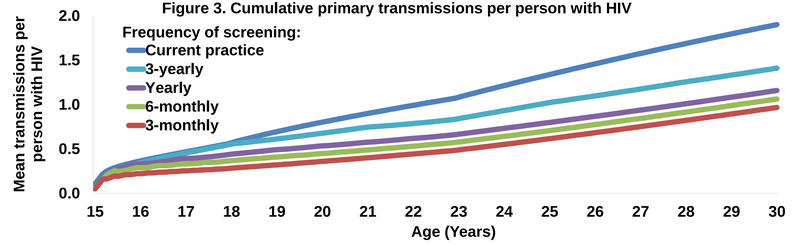
Screening strategy	Mean CD4 at diagnosis (cells/μL)	Mean age at diagnosis (years)	Population life expectancy (discounted months from age 14)	Lifetime per-person cost, population (discounted, $)	ICER ($/YLS, compared to next best strategy)
Current practice	276	35.10	297	145,300	-
3-yearly	406	32.17	306	175,000	Dominated*
Yearly	490	31.13	310	184,400	Dominated
6-monthly	521	30.82	311	186,100	Dominated
3-monthly	538	30.66	312	185,300	31,100

YLS: year-of-life saved; ICER: Incremental cost-effectiveness ratio. Costs are rounded to the nearest $100; ICERs are calculated with unrounded numbers, then rounded to the nearest $100/YLS. *Dominated strategies represent a less efficient use of resources compared to other available strategies.

- When added to current practice, 3-monthly screening provided the greatest improvement in clinical outcomes and the best value for money.

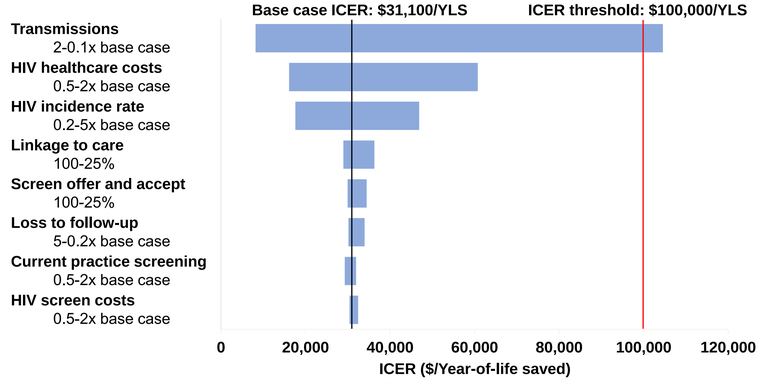
RESULTS, CONTINUED

Figure 3. Cumulative primary transmissions per person with HIV



- 3-monthly screening in addition to current practice resulted in a 50% reduction in mean cumulative primary transmissions from each person with HIV by age 30.

Figure 4. Sensitivity analyses: 3-monthly screening versus next best strategy



- Results were most sensitive to HIV transmission rates, HIV healthcare costs and HIV incidence rates.
- 3-monthly screening in addition to current practice was no longer cost-effective when HIV transmission rates were one tenth of base case values.

LIMITATIONS

- HIV incidence inputs were derived from PrEP studies with small numbers. However, these rates are consistent with other recent reports of very high HIV incidence in YMSM ages 13 and older.
- We did not account for the potential future impact of HIV PrEP and other HIV prevention strategies. However, we only included the impact of 15 years of transmissions.

CONCLUSIONS

- For self-identified high-risk young men who have sex with men in the US, HIV screening every 3 months compared to less frequent screening would improve clinical outcomes and be cost-effective.
- Self-identified high-risk young men who have sex with men should be screened more frequently than current guidelines recommend.