



HPTN

HIV Prevention
Trials Network

Cost-Effectiveness of Financial Incentives for Viral Suppression

An Economic Model of HPTN 065

Blythe Adamson, MPH, PhD Candidate

University of Washington

Seattle, WA, USA

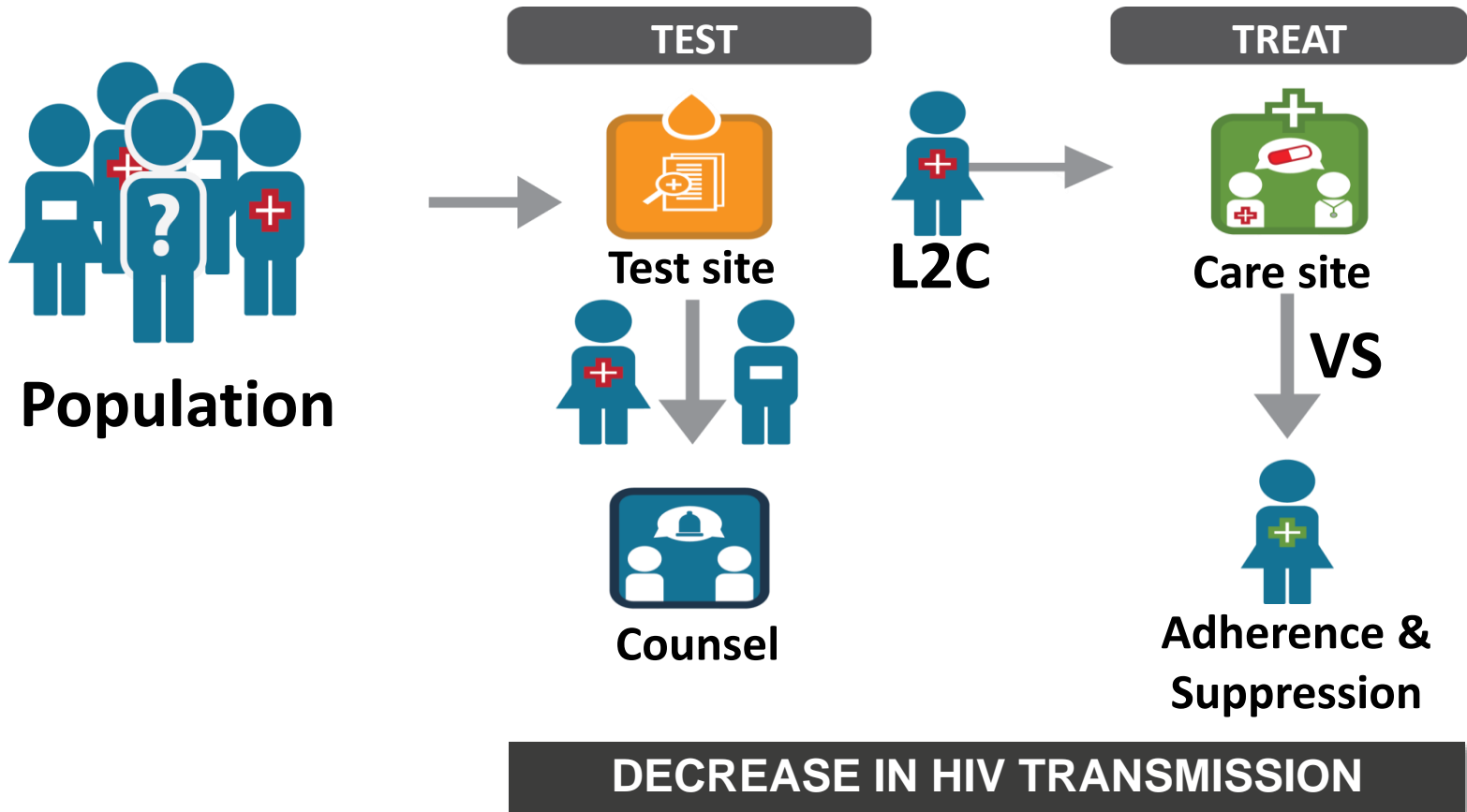
April 11, 2017

Background

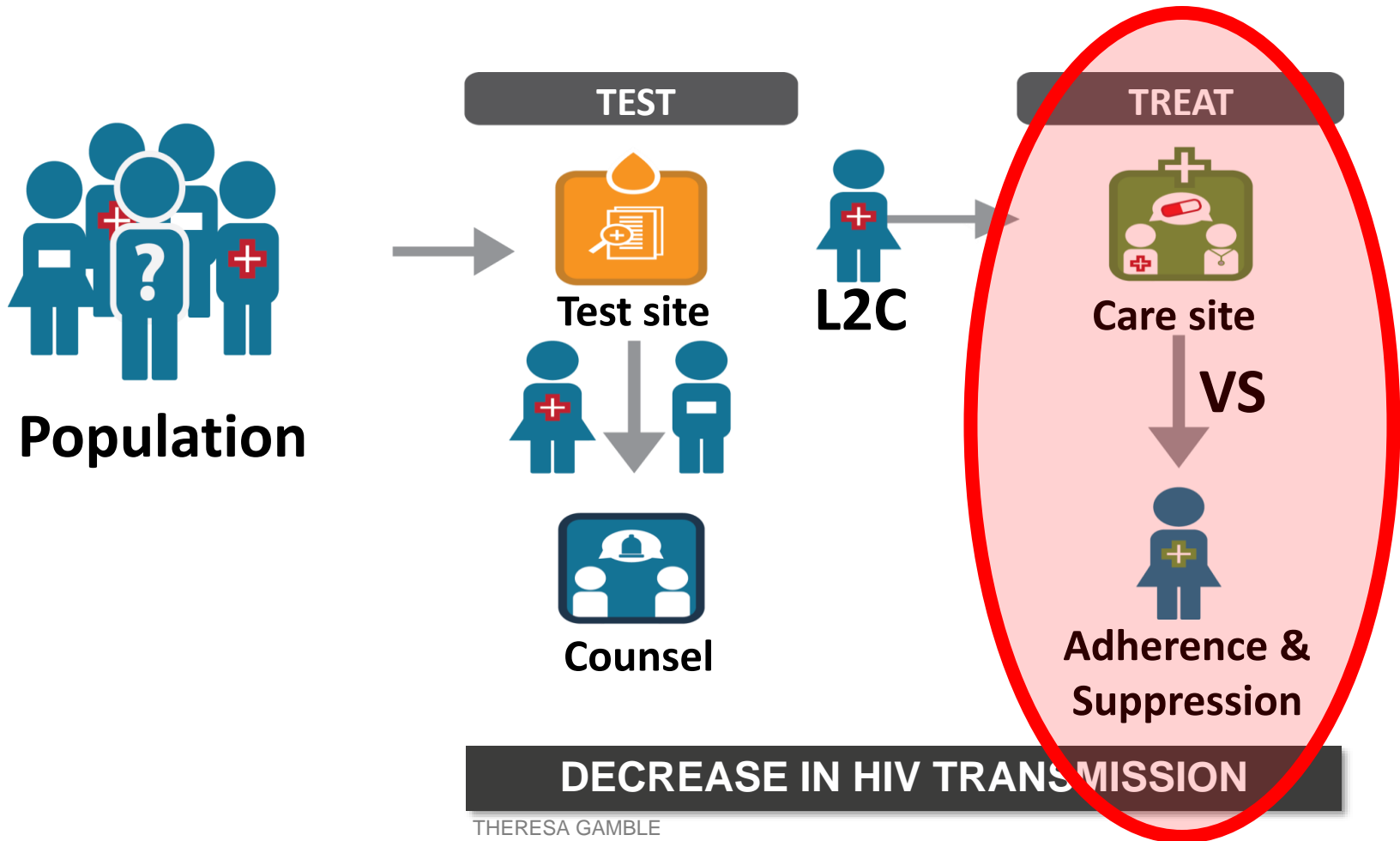
HPTN 065 aimed to assess the feasibility of the “**test and treat**” model to decrease HIV transmission at the community level.

To realize the benefits of anti-retroviral therapy (ART), **financial incentives** promoted linkage to care and viral suppression.

TEST & TREAT FRAMEWORK



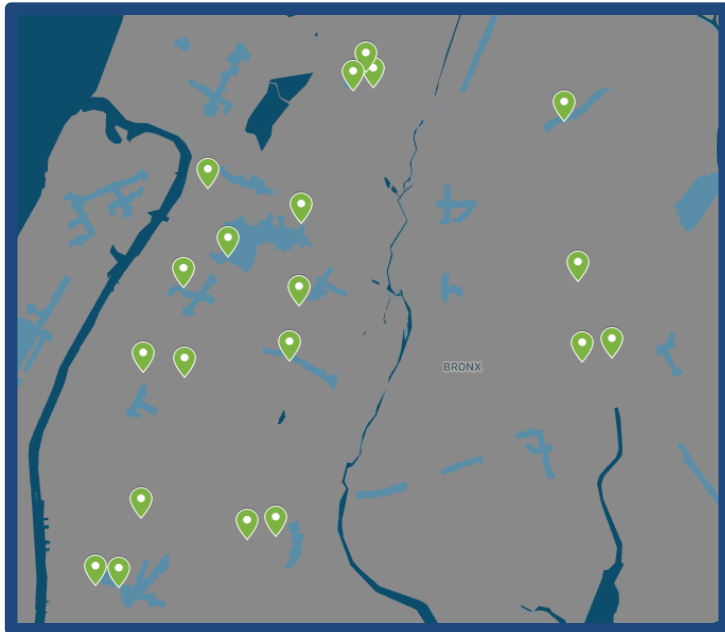
TEST & TREAT FRAMEWORK



This analysis focuses on the value of **financial incentives (FI)** for **viral suppression (VS)**

39 Clinics

The Bronx, New York



Washington, D.C.

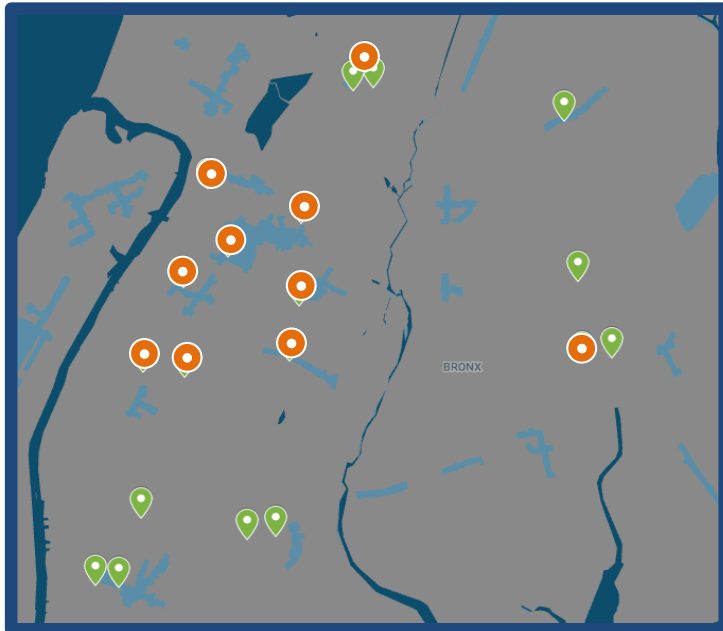


THERESA GAMBLE

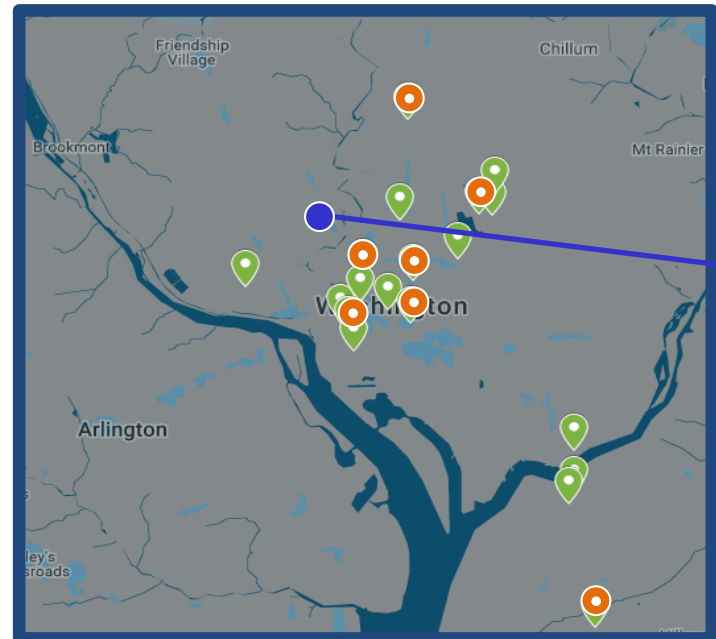
39 Clinics Randomized

To deliver **standard HIV care** OR **care plus incentive** for VS

The Bronx, New York



Washington, D.C.



You
are
here

Intervention



- **\$70** VISA gift cards
- Offered quarterly to patients on ART with viral suppression (VS <400 copies/ml)
- Duration: 2011-2013
- Supported startup costs, Financial Incentives Coordinator, and supplies at each site

Objective

To evaluate the **cost-effectiveness** of providing financial incentives for viral suppression compared to standard HIV care for patients using ART to inform public health decisions in the United States.

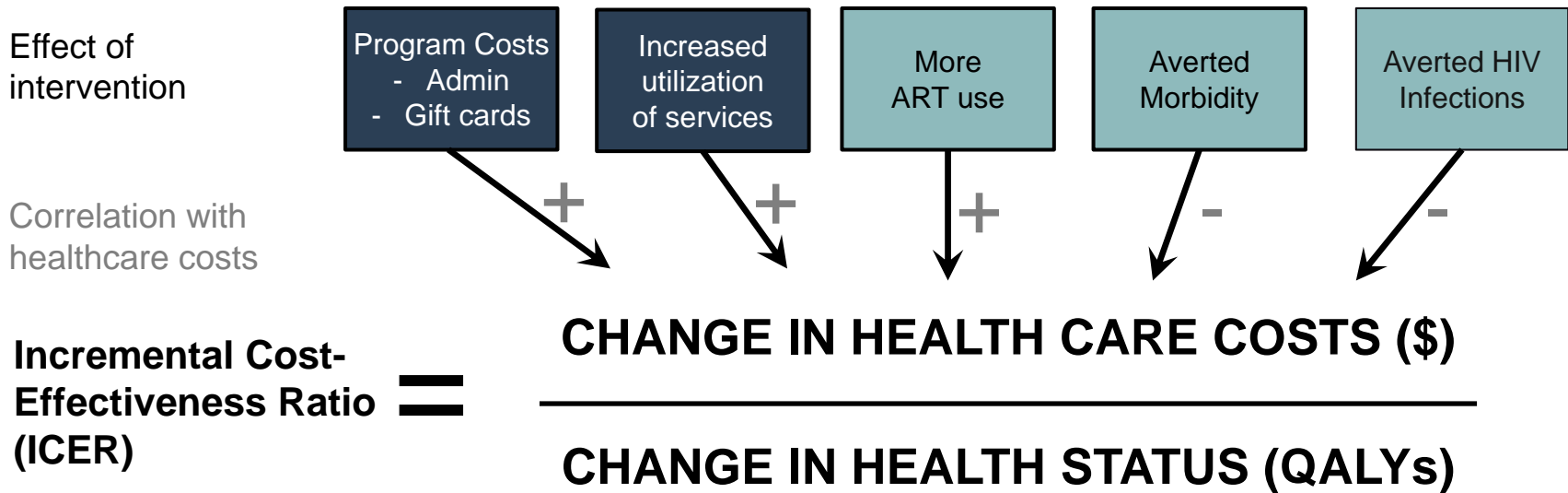
assess
value

Conceptual Model of Cost-Effectiveness

$$\text{Incremental Cost-Effectiveness Ratio (ICER)} = \frac{\text{CHANGE IN HEALTH CARE COSTS (\$)}}{\text{CHANGE IN HEALTH STATUS (QALYs)}}$$

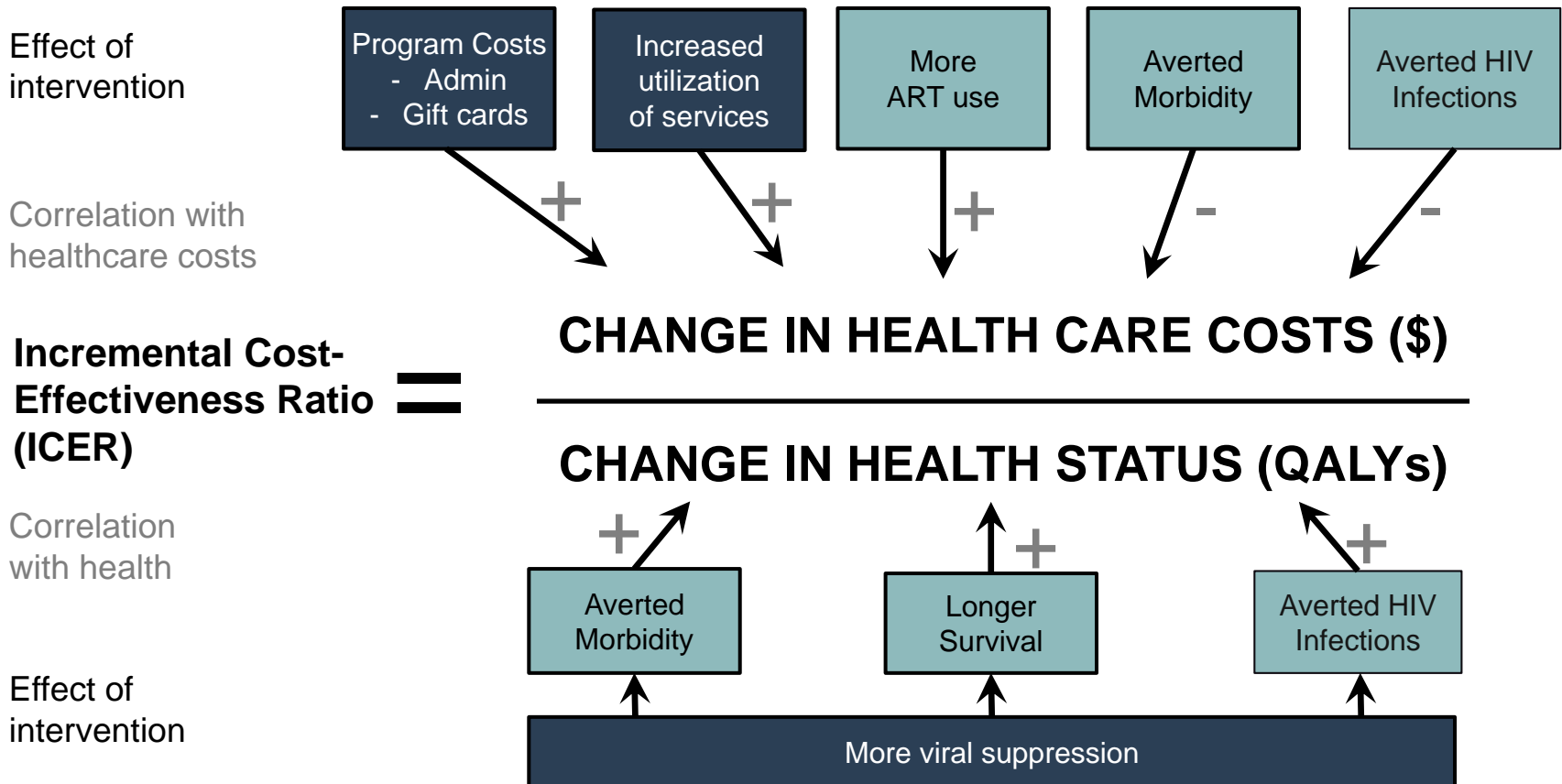
Conceptual Model of Cost-Effectiveness

HPTN 065 / modeling
 Published data / modeling



Conceptual Model of Cost-Effectiveness

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Measuring Health Benefits

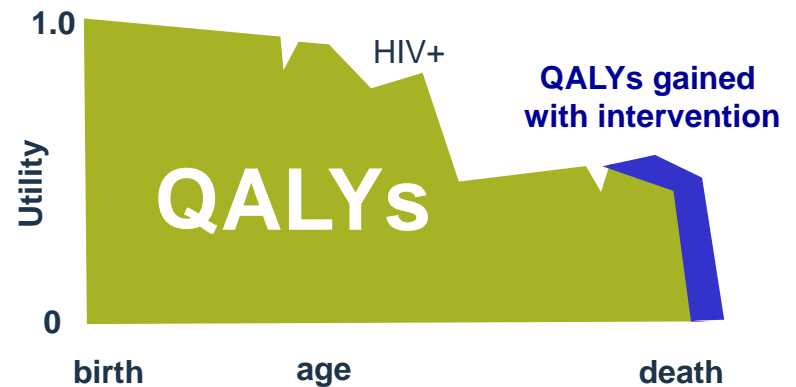
Quality-Adjusted Life Years (QALYs)

Health-related quality of life:

→ utility of health state between
1 (perfect health) and 0 (death)

$$QALYs = \text{sum}(\text{life year} * \text{utility})$$

To capture the length and
quality of life for patients and
partners



Costs included:

- FI admin & gift cards
- Patient HIV-related healthcare costs
 - ART drugs
 - Clinic visits
 - Labs

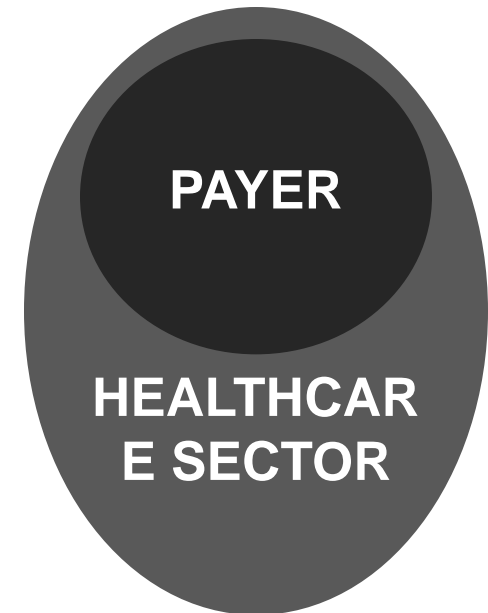
Perspective



Costs included:

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- Other HIV-unrelated healthcare
- Partner health care costs

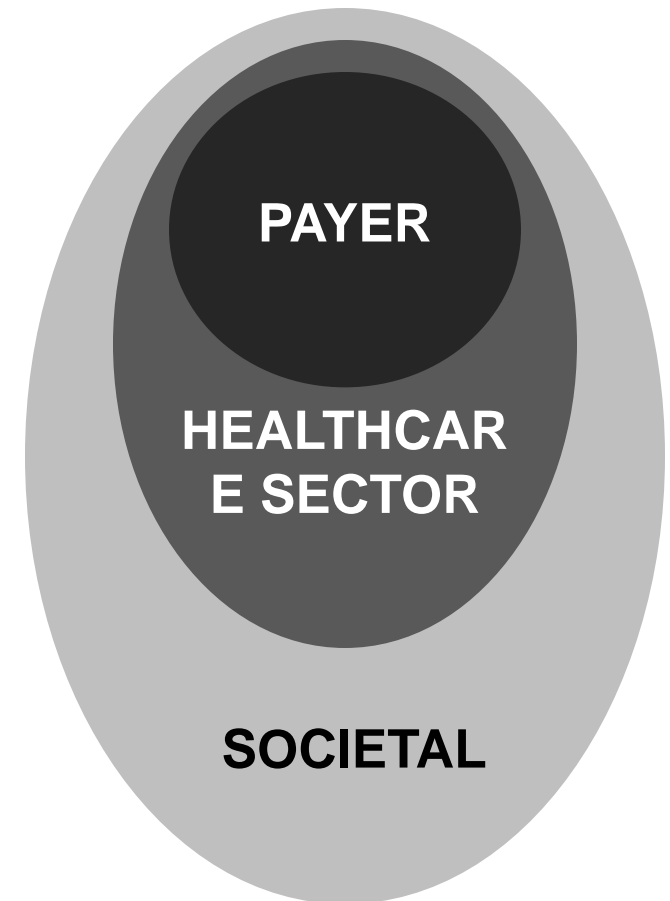
Perspective



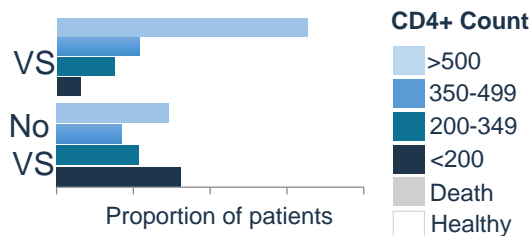
Costs included:

- FI admin & gift cards
- Patient HIV-related healthcare costs
 - ART drugs
 - Clinic visits
 - Labs
- Other HIV-unrelated healthcare
- Partner health care costs
- Productivity: earnings
- Consumption: spending

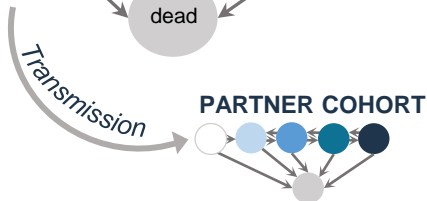
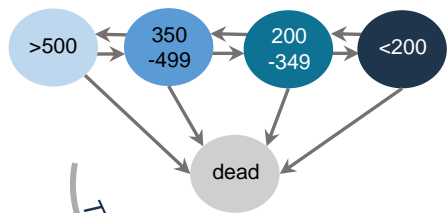
Perspective



Modeling Approach



PATIENT COHORT



- Cohort-based semi-Markov model of HIV disease progression and primary transmission to sexual partners
 - Assumes financial incentive effect diminishes to zero over 6 months after FI end
- Cost-effectiveness analysis:
 - Patient lifetime horizon
 - 3% annual discount rate

Program characteristics and key model inputs

Median (Range)

Source

Average clinic size, number of patients in care

456 (43 – 2,262)

HPTN 065

Baseline proportion of patients virally suppressed

61.9% (8.4 - 84.6%)

HPTN 065

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HPTN 065

Effectiveness: change in viral suppression

Average percentage points increase from baseline clinic proportion

3.7% (0.5 – 6.9%)

HPTN 065

Increase in clinic attendance, %

8.7% (4.2 - 13.2%)

HPTN 065

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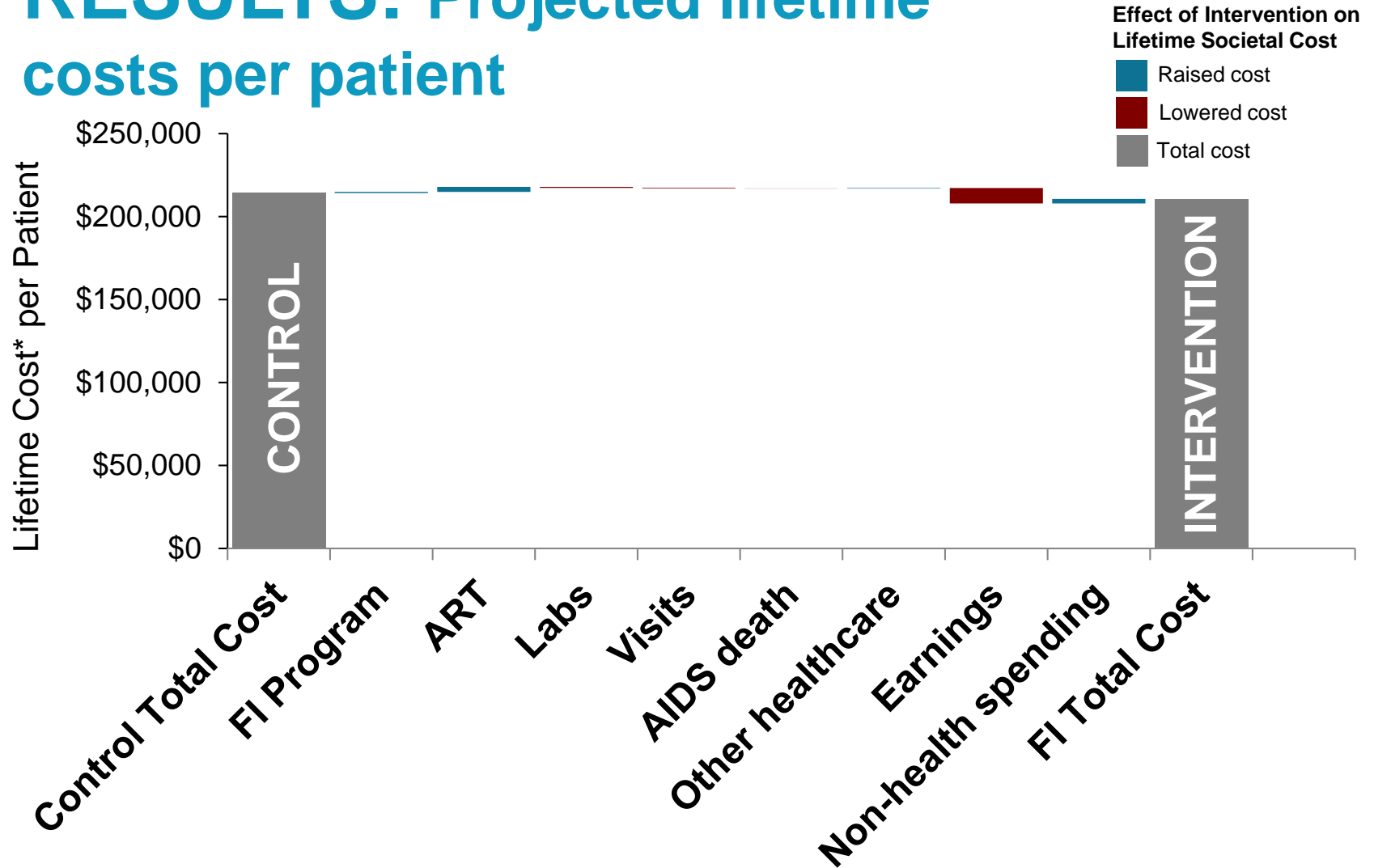
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HIV Utility, by CD4 strata	0.69 - 0.73 (0.58 - 0.83)	Whitham 2016
Quarterly healthcare costs related to HIV, by CD4 strata Disaggregated by ART, outpatient visits and labs, and other costs [e.g., treatment of opportunistic infections]	\$4,902 - \$7,675 (\$4,736 – \$8,348)	Gebo 2010

RESULTS: Health Outcomes Modeled

Compared to standard care, for the FI program cohort the model projects:

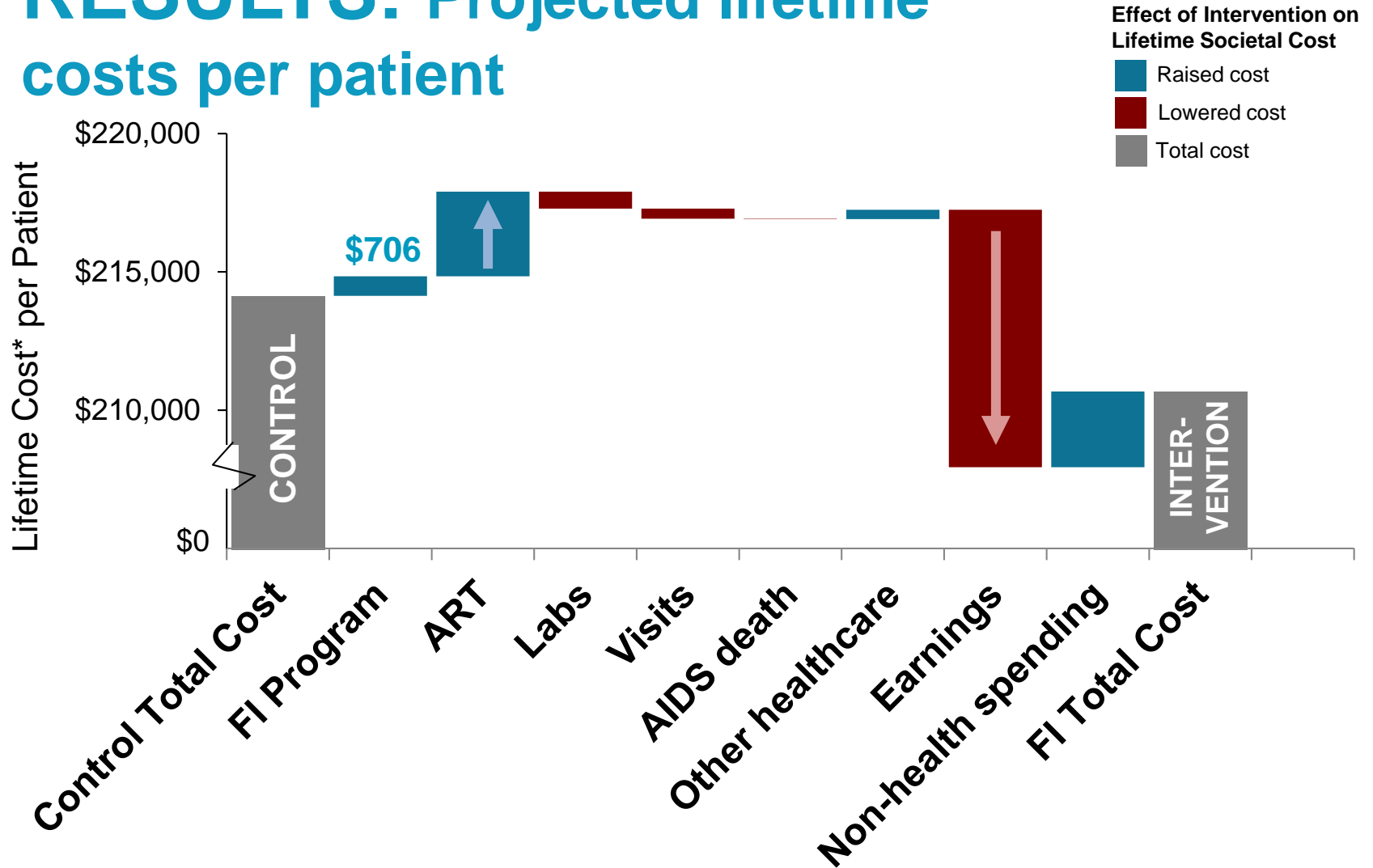
- Participants on average survive 1 month longer
- Gain of 0.05 QALYs per patient
- 1 HIV infection avoided per 200 FI participants (9% reduction in primary HIV transmission)

RESULTS: Projected lifetime costs per patient



*Limited societal perspective costs using lifetime horizon, discounted 3% annually, and adjusted to 2015 US\$

RESULTS: Projected lifetime costs per patient

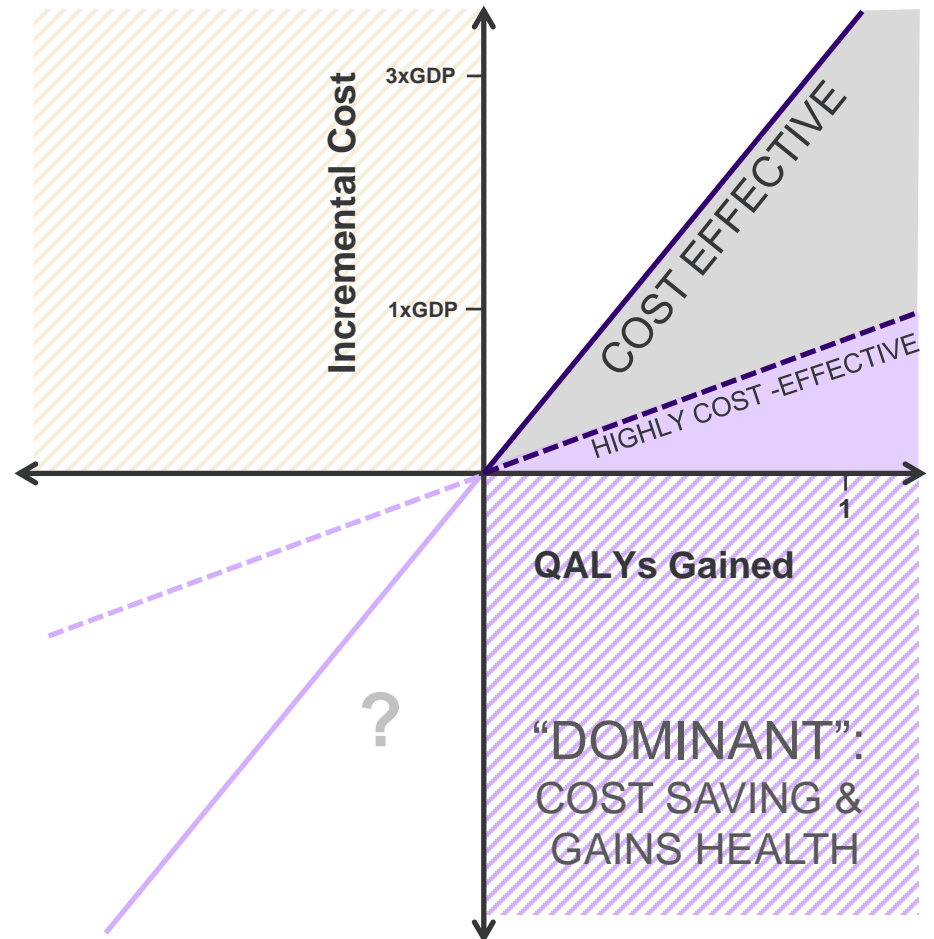


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Cost-Effectiveness

Willingness to Pay

Cost-effectiveness threshold of
\$50,000 - \$150,000 per QALY
gained (1-3 x GDP per capita)



Cost-Effectiveness

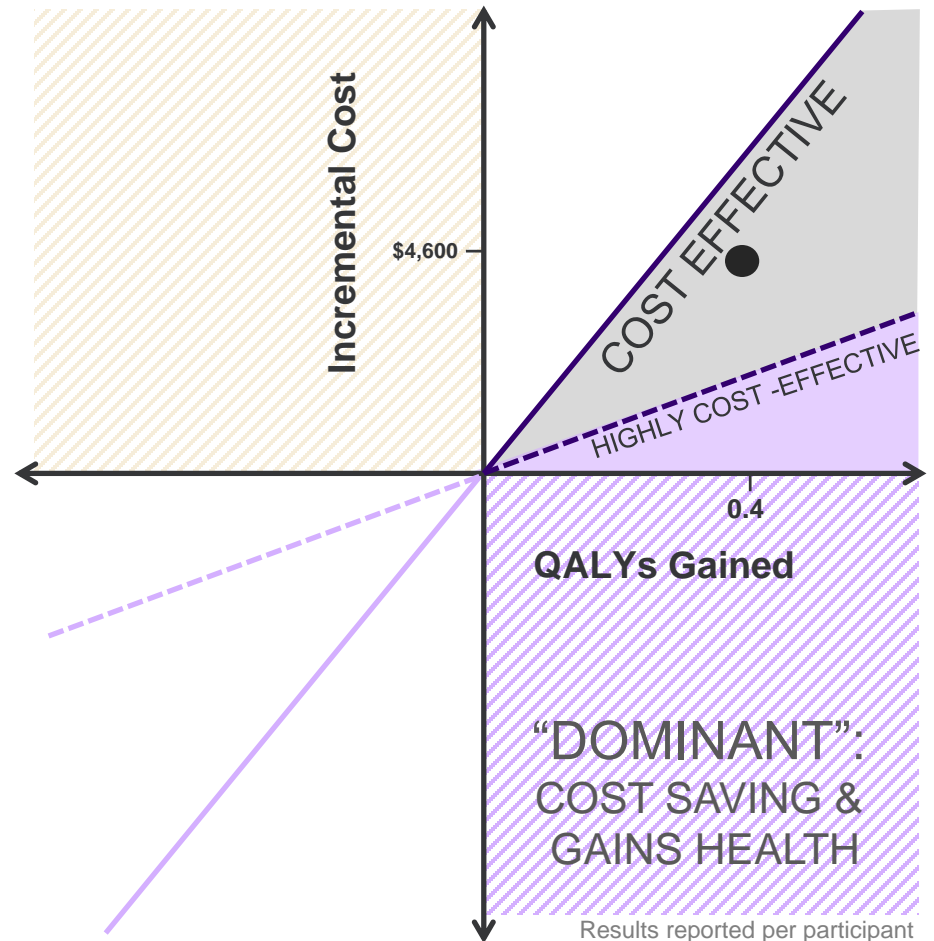
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ICER, given perspective

payer — \$113,900/QALY

HOW TO INTERPRET AN ICER: The incremental cost per QALY gained from offering financial incentives for viral suppression as compared to standard HIV care

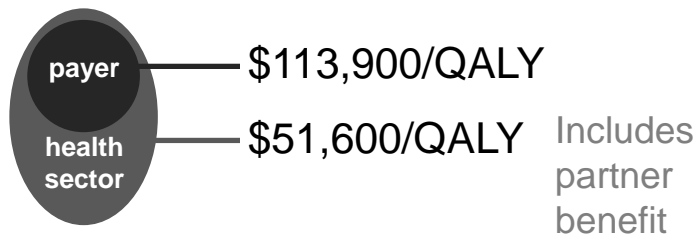


Cost-Effectiveness

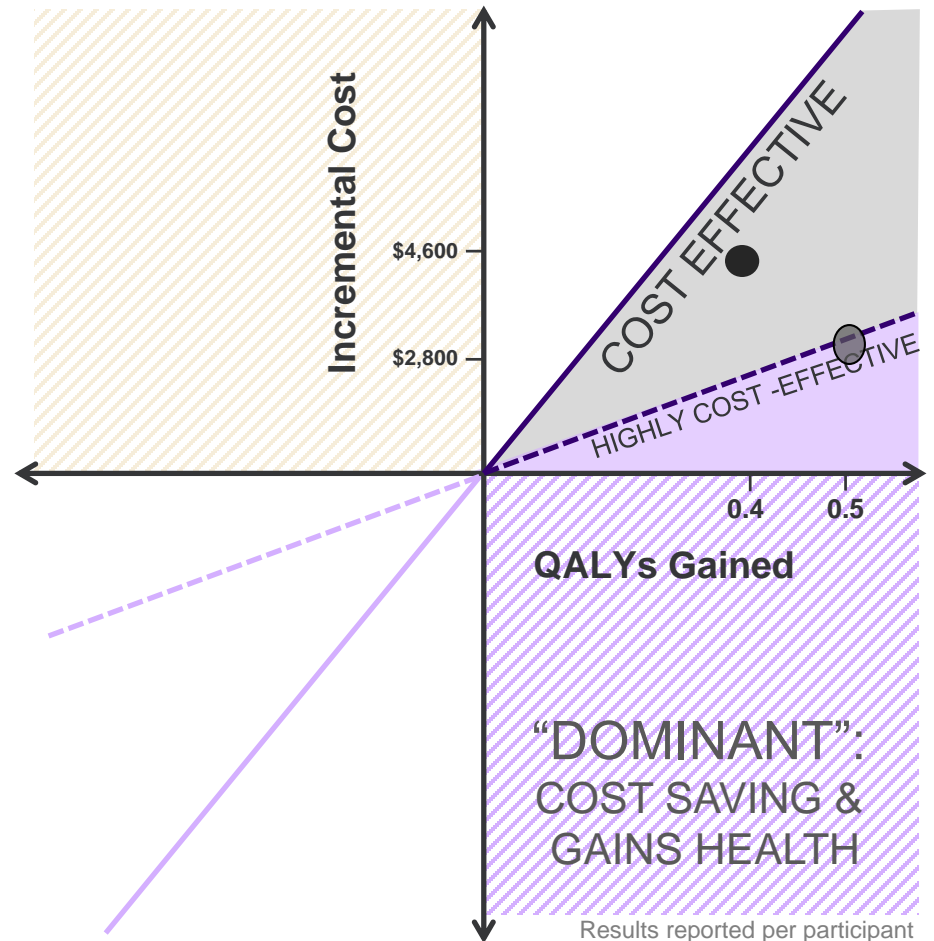
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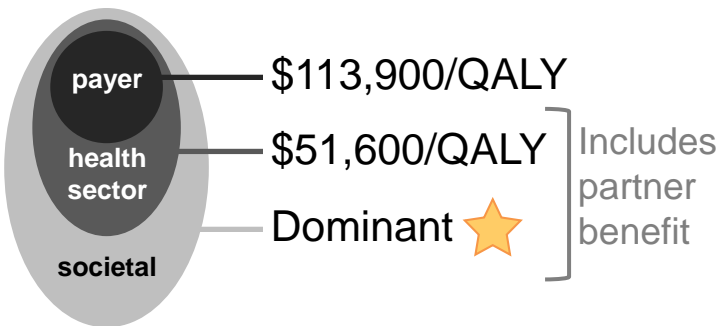


Cost-Effectiveness

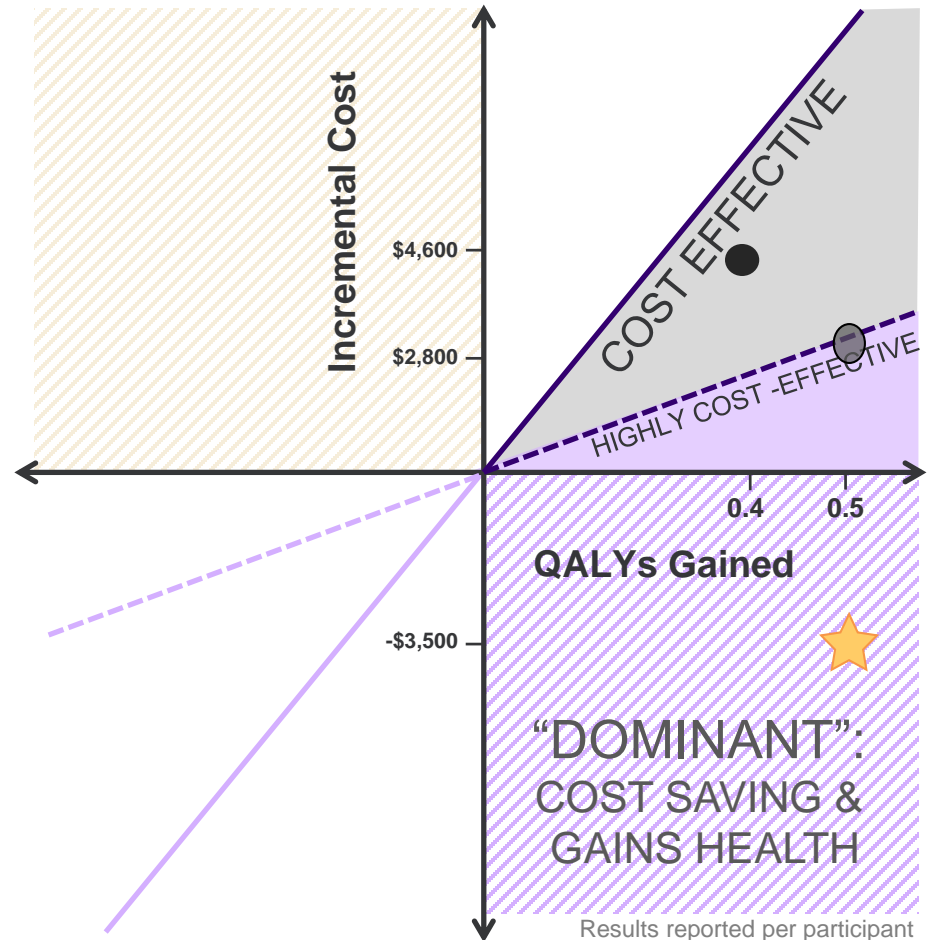
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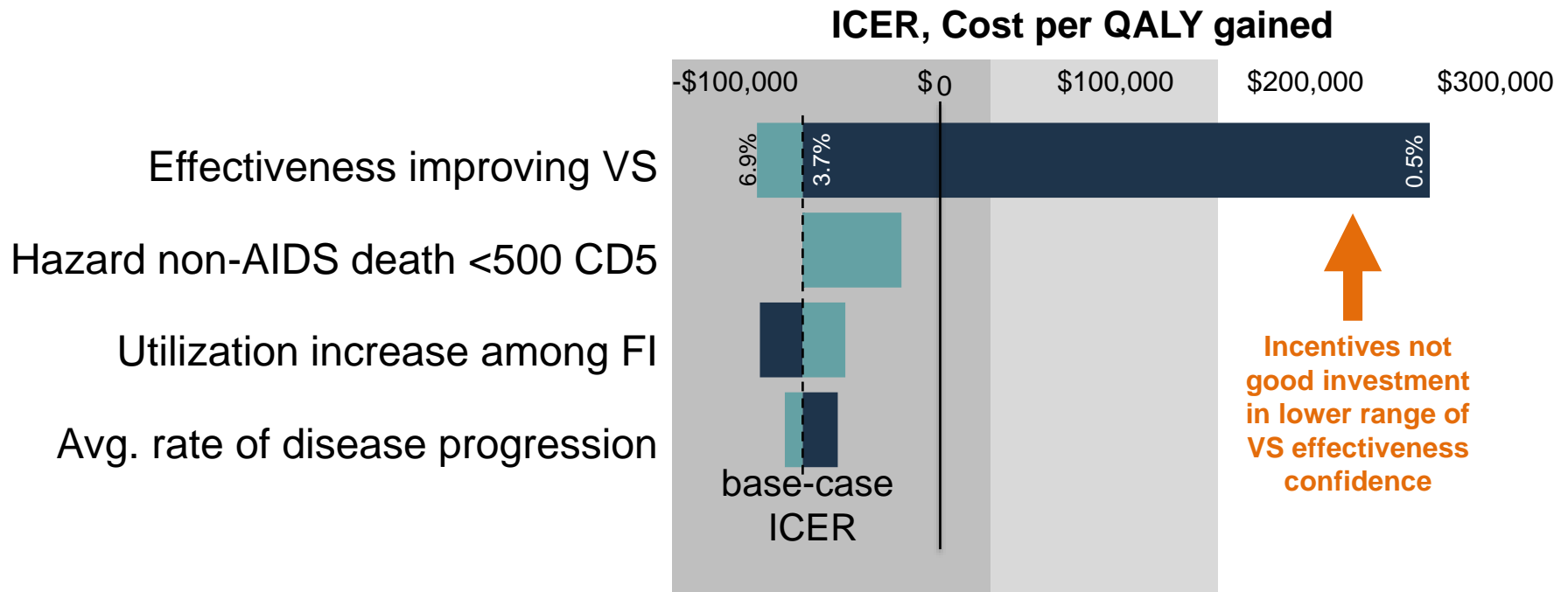
Comparative Health Interventions in US	ICER (Cost/QALY)	Source
Financial Incentives for Viral Suppression	Lower cost & Health gains	Analyzed Here
HPV Vaccine	\$4,000 - \$14,000*	Chesson 2008
Statins for Coronary Heart Disease	\$22,000	Franco 2005
PrEP in US high risk	\$120,000 - \$600,000*	Gomez 2013, Paltiel 2009, Juusola 2012, Desai 2008, and Koppenhaver 2011

*2005 US\$, **2012 US\$,

- League tables compare the value of different interventions
- Lower ICERs correspond to greater value
- Cost-effectiveness depends on willingness to pay for health gains

Sensitivity Analysis

Parameter Range



Summary

- Financial incentives as used in HPTN 065 are likely to be cost-effective compared to standard HIV care in the US
- Limited by uncertainty in effectiveness
- Implications for global health
- NYC Housing Works
Undetectables now provide financial incentives for viral suppression



ACKNOWLEDGEMENTS

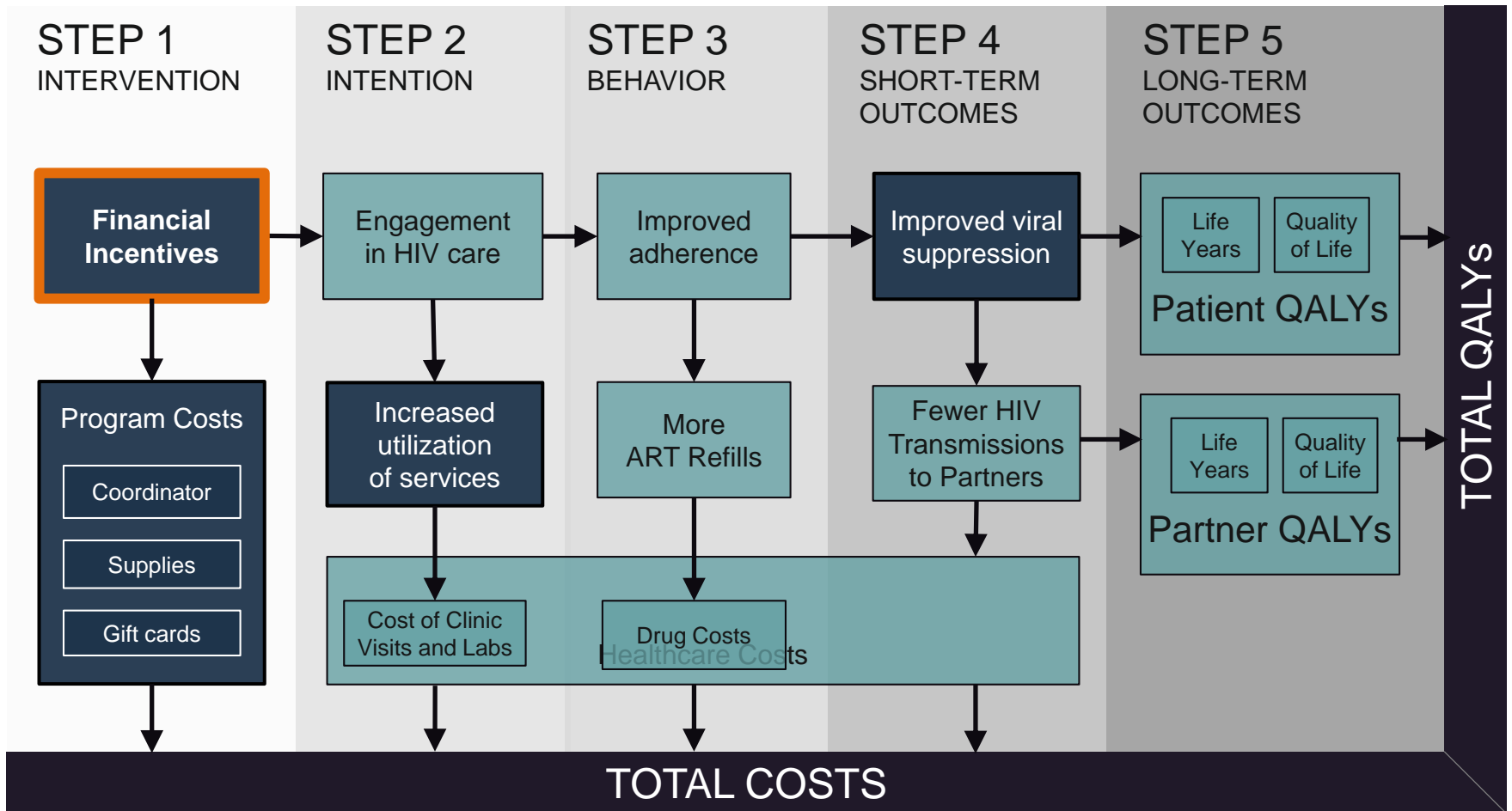
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The HPTN 065 Study team acknowledges
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Supplementary Material

CONCEPTUAL FRAMEWORK FOR COSTS & BENEFITS

- HPTN 065 / modeling
- Published literature / modeling



Results from other perspectives

Table 1. Total costs, QALYs, and cost-effectiveness given perspective (societal or healthcare), time horizon (3 years or lifetime), and population (patients)

SOCIETAL PERSPECTIVE	Cost Std	Cost Int	QALYs Std	QALYs Int	Inc Costs	Inc QALYs	ICER
Patients and Partners							
Lifetime	\$214,135	\$210,677	38.569	38.623	\$3,458	0.05365	-\$ 64,453
3 year horizon	\$20,272	\$21,577	6.360	6.362	\$1,305	0.00176	\$ 739,994
Patients Only							
Lifetime	\$667,506	\$666,908	9.312	9.350	\$598	0.03828	-\$ 15,617
3 year horizon	\$63,585	\$64,948	2.035	2.036	\$1,363	0.00139	\$ 978,766
HEALTHCARE SECTOR	Cost Std	Cost Int	QALYs Std	QALYs Int	Inc Costs	Inc QALYs	ICER
Patients and Partners							
Lifetime	\$469,512	\$649,769	38.569	38.623	\$180,256	0.05365	\$3,359,723
3 year horizon	\$83,287	\$106,450	6.360	6.362	\$23,163	0.00176	\$13,130,090
Patients Only							
Lifetime	\$425,246	\$429,874	9.312	9.350	\$4,629	0.03828	\$120,933
3 year horizon	\$75,516	\$79,171	2.035	2.036	\$3,655	0.00139	\$2,625,126

Standardized per patient

Disease Progression and Predicted Survival

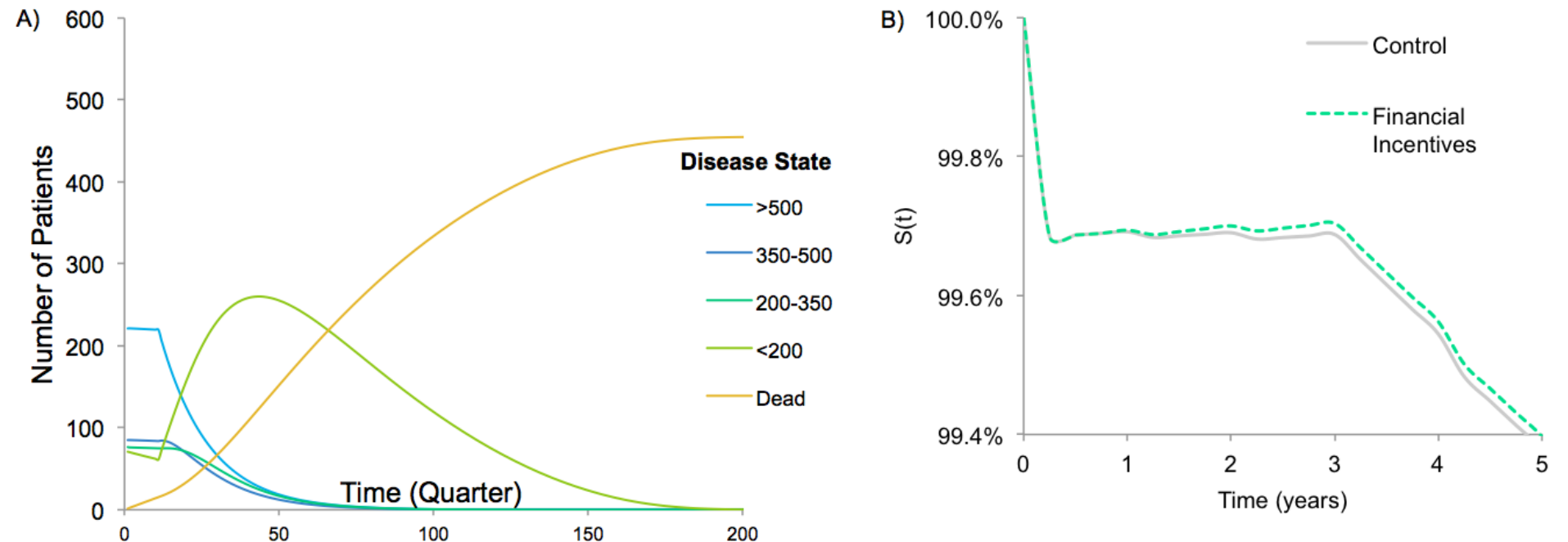
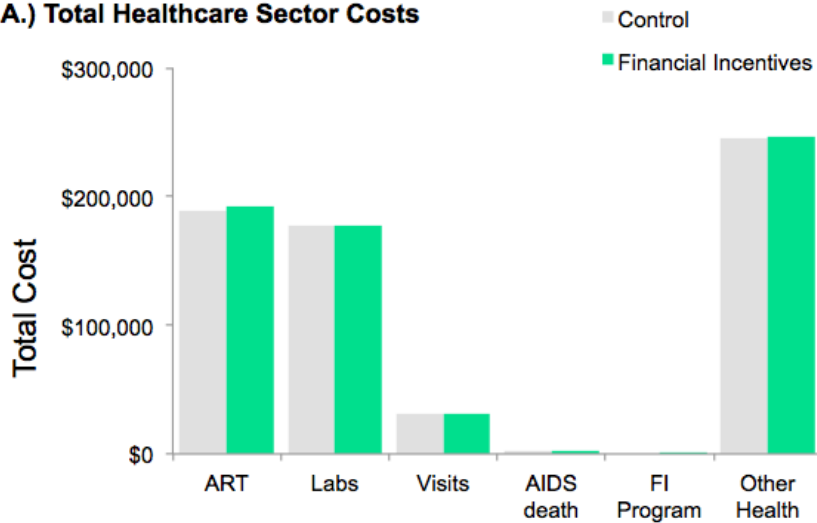


Figure 1. Disease Progression and Survival. A) Number of patients in each health state over time in control group (solid line) and financial incentives group (dashed line) over a lifetime horizon; B) quarterly probability of survival in the control group (grey) and financial incentives group (green).

Modeling Outcomes

A.) Total Healthcare Sector Costs



B.) Health Outcomes

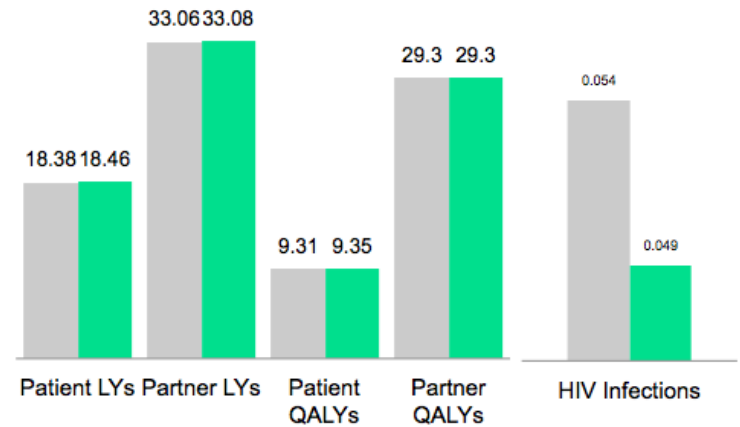
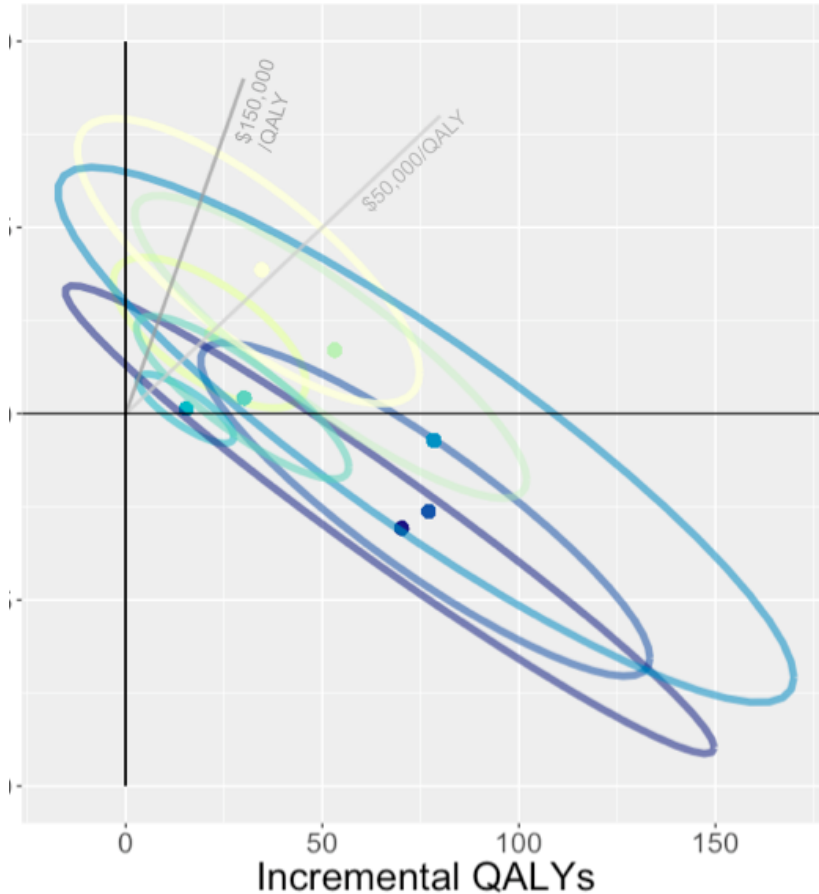


Figure 2. Disaggregated A) total healthcare sector costs and B) health outcomes for patients and partners, standardized per patient for control (grey) and financial incentives group (green)

Probabilistic Sensitivity Analysis

Cost-Effectiveness



Clinic Sub-Group	Effectiveness, % pts (SE)	Me, ICE \$/QALY
Low Baseline VS	11.5 (6.7)	-\$21,
Washington, DC	6.6 (2.3)	-\$17,
Hospital	4.8 (3.3)	-\$4,5
Small Size	4.9 (1.8)	\$4,3
Community	3.7 (1.8)	\$6,9
High Baseline VS	2.8 (1.8)	\$16,1
New York	1.6 (1.5)	\$47,7
Large Size	0.6 (1.8)	\$55,1