

Home-based HIV Testing Costing example

Ruanne V Barnabas MBChB, DPhil



Outline

- Background
- Objective
- Methods
- Results
- Cost-effectiveness
- Discussion

Outline

- Background
- Methods
- Results
- Cost-effectiveness
- Discussion

Background

- HIV testing and counseling (HTC) and linkage to care are the first critical steps for HIV treatment and prevention
- Sub-Saharan Africa, <50% of HIV+ persons know their status
- Without linkage strategies following testing, 25% of HIV+ persons link to care
- To reach the UNAIDS 90-90-90 targets, we need scalable strategies for high uptake of **testing** and **linkage** to care

Outline

- Background
- **Objectives**
- Methods
- Results
- Cost-effectiveness
- Discussion

Objectives

- To estimate the impact of a package of interventions (community-based home HIV testing and counseling (HTC), point-of-care CD4 testing, referral to care, follow-up visits) on:
 - Linkage to HIV clinic
 - ART initiation following national guidelines
 - Viral load suppression 12 months after testing
- To estimate the cost-effectiveness of community-based HIV testing and counseling

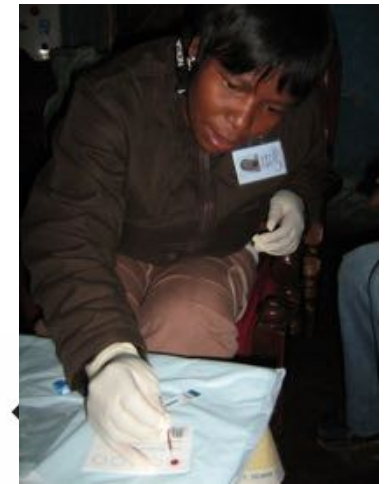
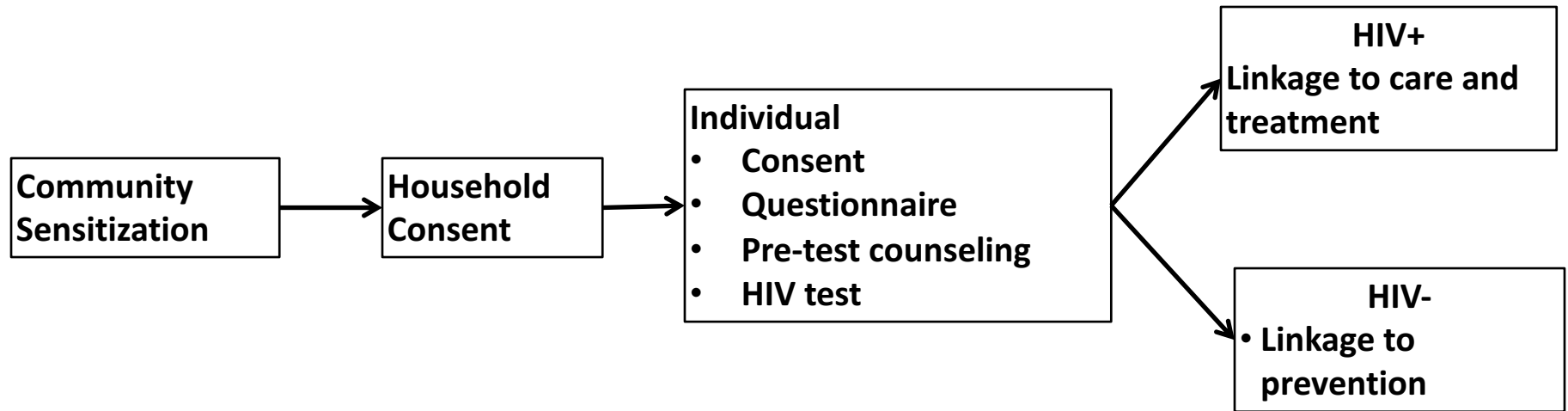
Outline

- Background
- Objectives
- **Methods**
- Results
- Cost-effectiveness
- Discussion

Study setting

- Ankole region, southwest Uganda, and KwaZulu-Natal, South Africa

Intervention package



Cost method: Micro-costing

- Activity based costing: costs split into mutually exclusive and collectively exhaustive categories:
 - Personnel
 - Vehicles
 - Equipment
 - Supplies
 - Building and overhead
 - Start up
 - Training
 - Data capture
- Cost types:
 - Fixed vs. variable
 - Start-up vs. recurrent
- Time and motion



Costing assumptions

- Primary perspective: Payer (Ministry of Health)
- Estimating economic, not financial costs and incremental not total costs
- Costing intervention not research
- 3% discounting
- 5 years of useful life for training, vehicles, and equipment

Data collection

- November 2013- December 2014
- KZN, South Africa
- Kabwohe, Uganda

Monisha Sharma, 2014



Additional costing methods

- Intervention:
 - Examining study budgets and financial records
 - Time motion observation
 - Staff interviews about time and resource use
- Standard of care:
 - Estimates from literature review on costs of facility based VCT, ART, MC.
- Sensitivity analysis

Separating out intervention costs

- Research vs. program costs
 - Staff training
 - 4 week training including human subjects, SOPs, good clinical practice—reduced to 2 week training
 - Time with participant
 - Used time in motion analysis to remove time spend on study introduction and informed consent
 - Removed participant reimbursement
 - Network connectivity issues
 - Less stringent QC and laboratory standards
 - Salaries and supplies (eg HIV test kits)—government prices

Start-up costs

Line #	Item	Unit cost (USD)	N	Fixed or variable	Start-up or recurrent	Cost (USD)
	<u>Start up costs</u>		-	-	-	
	1 Mapping					
	2 Staff hiring - staff					
	3 Staff training - staff					
	4 Community preparedness - staff					
	5 Community sensitization - staff					
	Community sensitization - events	ZAR 3,500.00	9	V	S	\$4,625.55
	6 Community mobilization - volunteers					
	7 Programming for data capture					
	-					

Transport

Line #	Item	Unit cost (ZAR)	Unit cost (USD)	N	Fixed or variable	Start-up or recurrent	Total cost (ZAR)	Total cost (USD)
	<u>Transport</u>	-		-	-	-	Annual cost	
14	Rental (annual) cost of vehicles							
	Annual recurrent costs of transportation							
15	- fuel							

- Detailed information used to arrive at summary costs

Average distance travelled per week	km
June 12 -18	545
June 5 - 11	604
May 29 - June 4	578
May 22 - 28	1033
Average distance travelled per week	690

Time in motion results: South Africa

HIV-	Average
pre-test counseling	0:05
HIV test, additional counseling	0:10
post-test counseling	0:04
TOTAL	0:17

*Average of 14 minutes to locate and travel to home for HBCT

3 MONTH MC HOME FOLLOW UP	Average
Travel to home	0:08
MC intervention	0:06
Paperwork	0:02
TOTAL	0:16

Newly discovered HIV+	Average
pre-test counseling	0:11
fill out paperwork	0:08
home location	0:03
HIV test	0:07
post-test counseling 1	0:03
confirmatory test	0:15
post test counseling 2	0:03
TOTAL	0:50

Outline

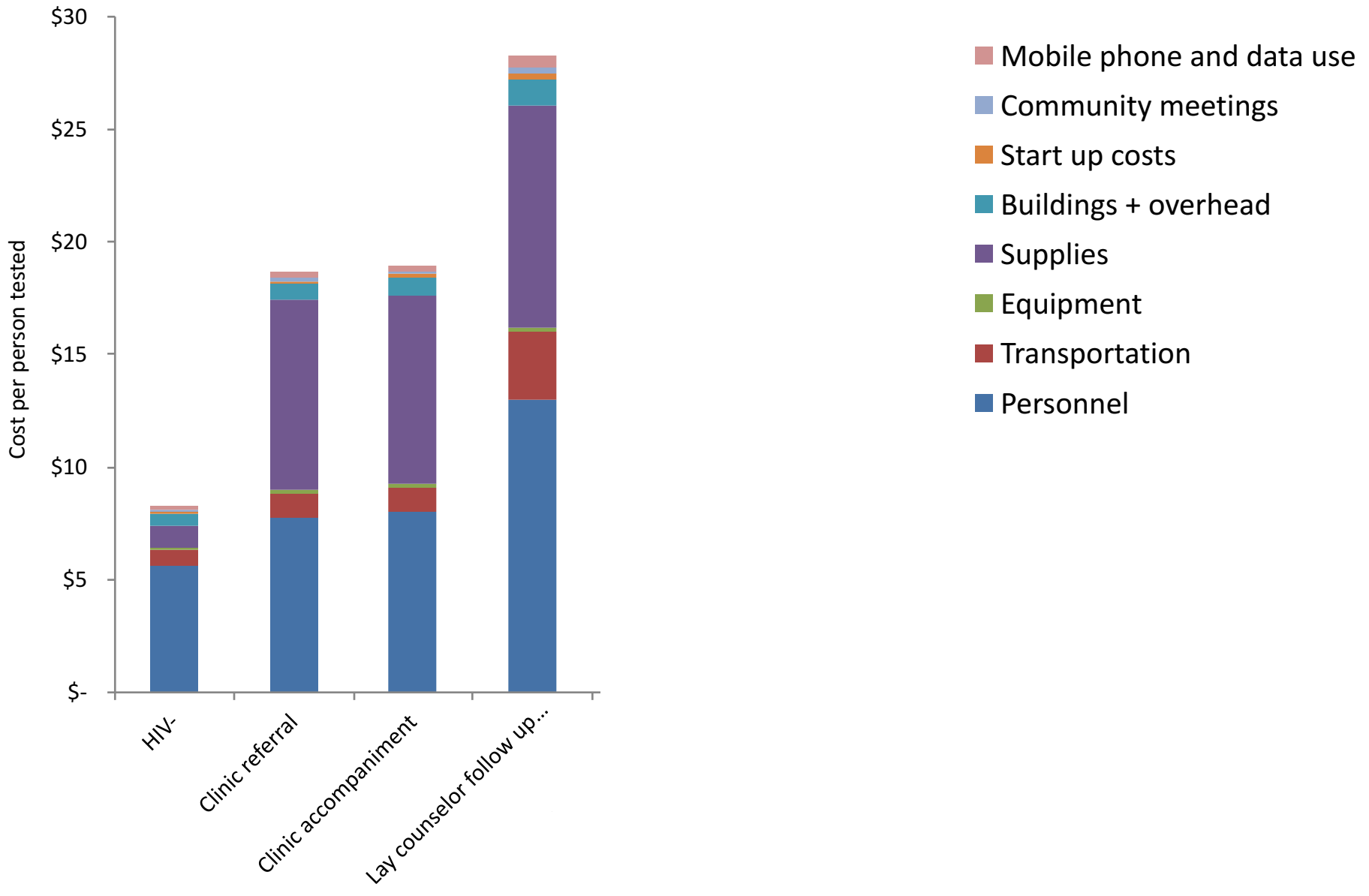
- Background
- Methods
- **Results**
- Cost-effectiveness
- Discussion

Results: HIV Testing and Counseling (HTC) costs, South Africa

Cost per person tested (USD) by HIV status and Linkage to care strategy

	HIV-	HIV +	
	HIV testing and counseling only	Clinic referral for ART linkage	Counselor follow up at 1, 3, & 6 months to encourage linkage to ART
Mobile van based HTC (<i>clinic referral for CD4 count</i>)	5.45	8.28	15.22
Mobile van based HTC (<i>Point of care CD4</i>)	5.51	14.78	21.78
Home based HTC (<i>clinic referral for CD4 count</i>)	8.22	12.13	21.64
Home based HTC (<i>Point of care CD4</i>)	8.32	18.69	28.29

Costs of Home HTC with point of care CD4 analysis (PIMA)



Estimates of HTC interventions in Sub-Saharan Africa from the literature

Study (Testing Approach)	Country	Components included	Year	Number Tested	Total Costs (US Dollars)	Cost per Person Tested (US Dollars)	Cost per Person Tested (2012 US Dollars)
Molesworth (door-to-door) [68]	Malawi	Testing supplies	2007	11,172	\$26,019	\$2.33	\$2.46
Edgil (mobile) [136]	Swaziland	Testing supplies	2011	152,000	\$918,334	\$6.04	\$6.30 ←
Furnessign (door-to-door) [74]	Uganda	Testing supplies, personnel, and transportation	2007	\$2,342	\$367,792	\$7.20	\$7.77
Chamie (mobile) [51]	Uganda	Testing supplies, personnel, and buildings	2012	—	—	\$8.27	\$8.27
Mendes (door-to-door) [29]	Uganda	Testing supplies, personnel, transportation, vehicles, buildings, utilities, training, and equipment	2007	—	—	\$8.29	\$8.56
Negin (door-to-door) [71]	Kenya	Testing supplies, personnel, and transportation	2008	1,984	\$17,569	\$8.86	\$9.43 ←
Kahn (mobile)* [131]	Kenya	Testing supplies, personnel, training, and contingency expenses	2008	—	—	\$9.91	\$10.55
Helleringer (door-to-door) [25]	Malawi	Testing supplies, personnel, transportation, buildings, utilities, and training	2007	1,183	\$15,181	\$12.83	\$14.37
Mendes (hospital) [29]	Uganda	Testing supplies, personnel, transportation, vehicles, buildings, utilities, training, and equipment	2007	—	—	\$11.68	\$12.91
Mendes (index) [29]	Uganda	Testing supplies, personnel, transportation, vehicles, buildings, utilities, training, and equipment	2007	—	—	\$13.85	\$15.50
Grabbe (mobile) [107]	Kenya	Testing supplies, personnel, vehicles, buildings, utilities, and equipment	2007	—	—	\$14.91	\$16.47
Mendes (fixed HTC site) [29]	Uganda	Testing supplies, personnel, transportation, vehicles, buildings, utilities, training, and equipment	2007	—	—	\$19.26	\$21.28
Grabbe (fixed HTC site) [107]	Kenya	Testing supplies, personnel, vehicles, buildings, utilities, and equipment	2007	—	—	\$26.75	\$29.56
Ferre-Prestholt (mobile) [135]	Uganda	Testing supplies, personnel, vehicles, buildings, and equipment	2001	4,429	\$114,761	\$25.93	\$33.54
McConnell (church) [132]	South Africa	Testing supplies, personnel, utilities, training, buildings, office equipment, and publicity materials	2003	662	\$67,248	\$101.58	\$126.48

Mobile HTC: \$6.30 ←

Home HTC: \$9.40 ←

Costing

Calculation of the program costs and the costs of the consequences.

- Costs
 - Training
 - Testing
 - Treatment
 - Surveillance
- Costs of the consequences
 - HIV morbidity and mortality
 - Onward transmission



Outline

- Background
- Methods
- Results
- **Cost-effectiveness**
- Discussion

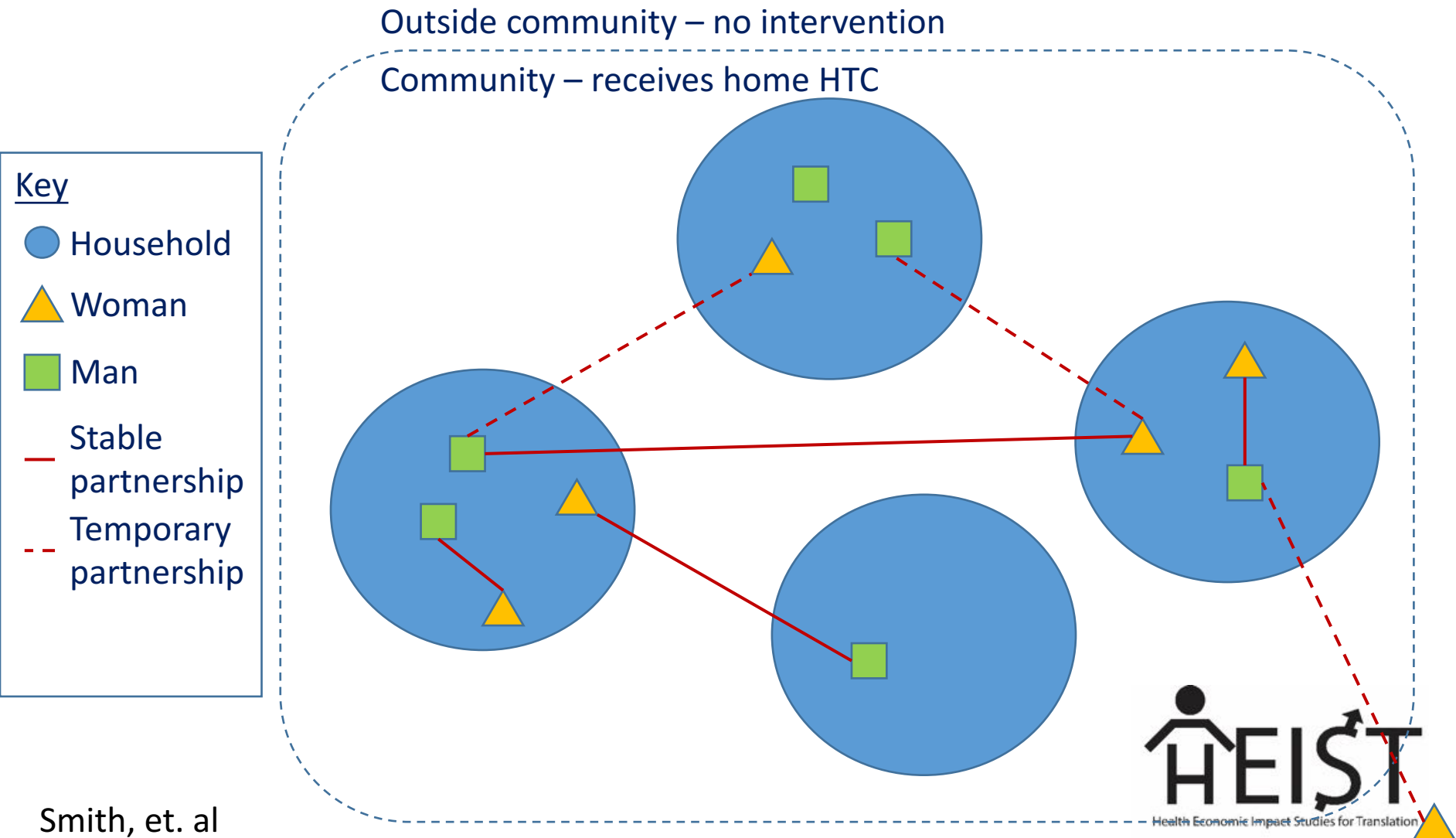
Cost-effectiveness Approach

- Incremental cost per standardized unit of health gain
 - E.g., per death averted or life-year gained
- For specified interventions; always compared with other courses of action (standard of care, other interventions)
- Is the inverse of (and equivalent to) health gain per increment of spending

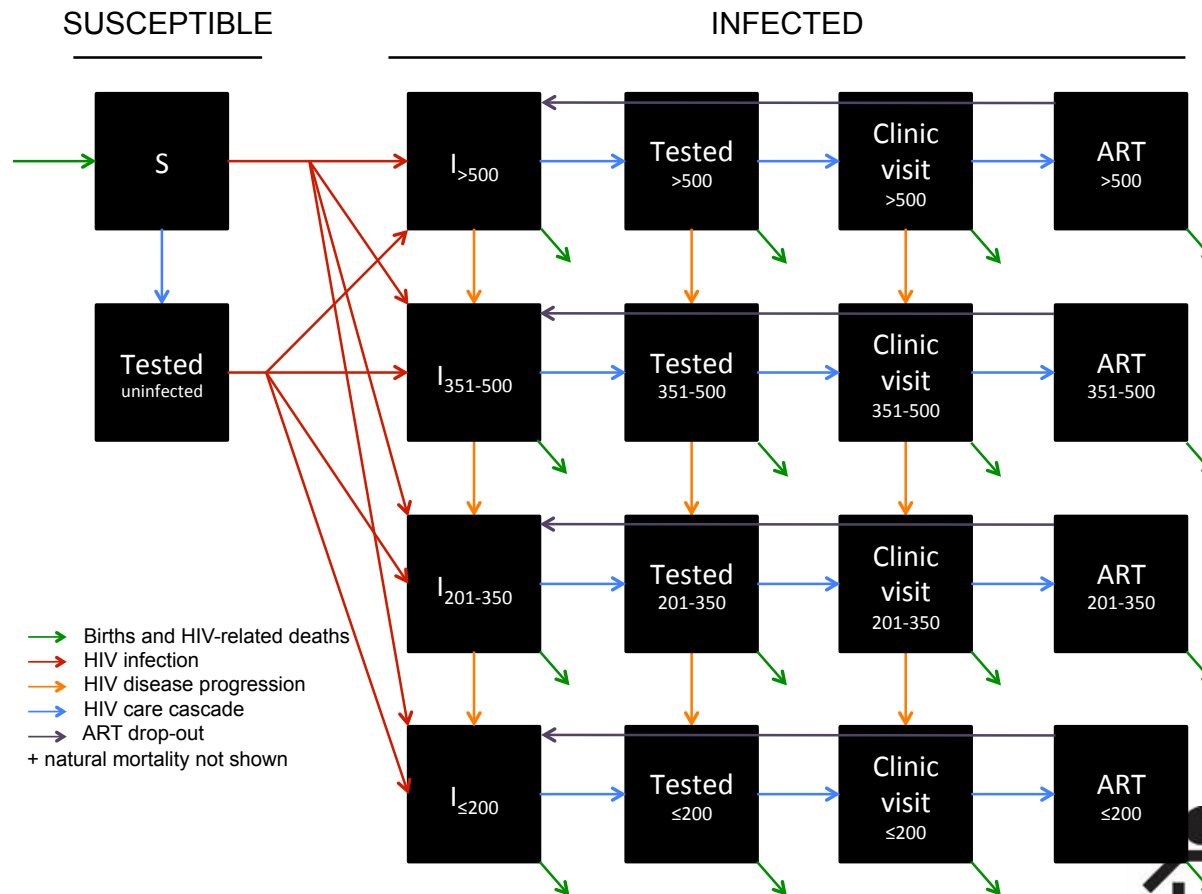
Threshold for CEAs

- There is no absolute threshold below which an intervention is considered cost-effective
- WHO guidelines suggest using a country's GDP per capita as the threshold to aid in which choosing interventions to implement.
 - Highly cost-effective: less than GDP per capita
 - Cost-effective: 1-3 x GDP per capita
 - Not cost-effective: >3x GDP per capita)
 - For South Africa, this would mean that HIV interventions that cost less than \$7,351 USD per QALY saved are considered very cost effective.

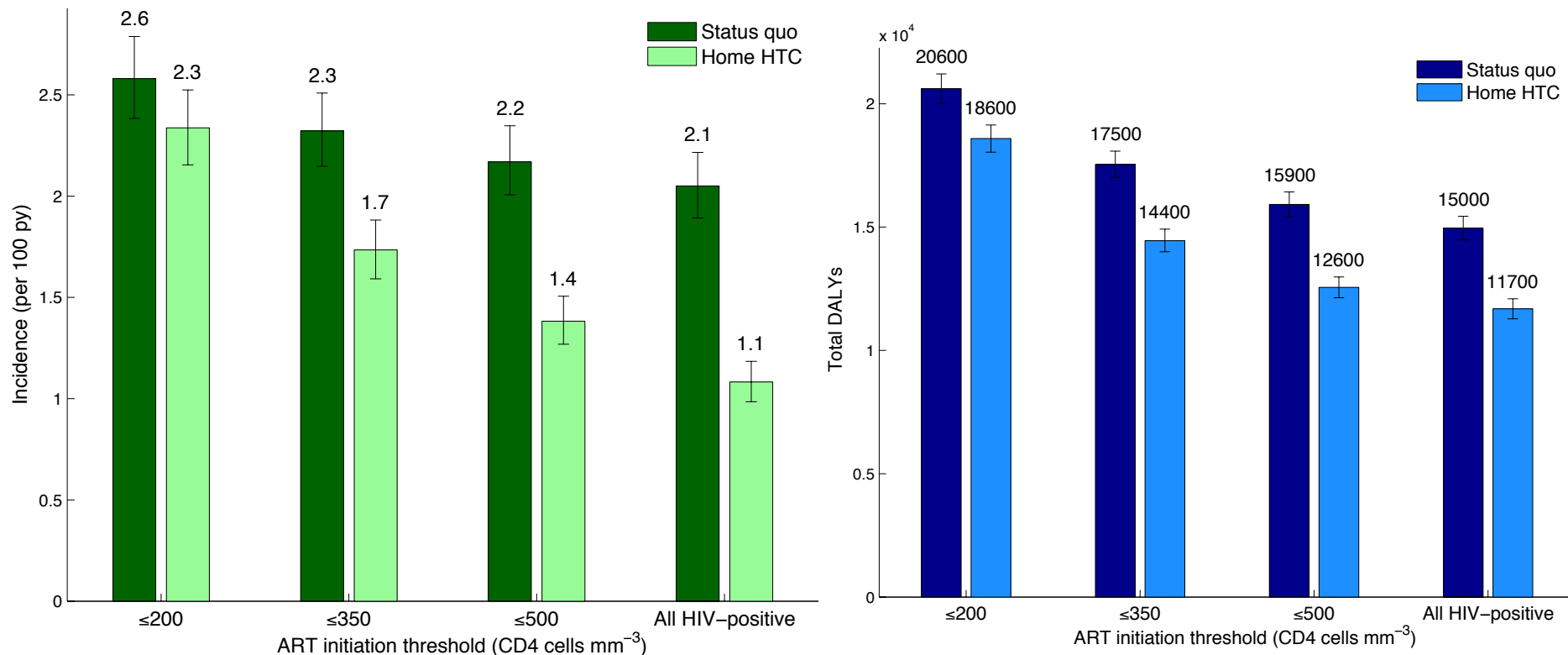
Model: community structure & partnerships



Individual-based model structure



Home HTC and linkage has the potential to decrease HIV incidence

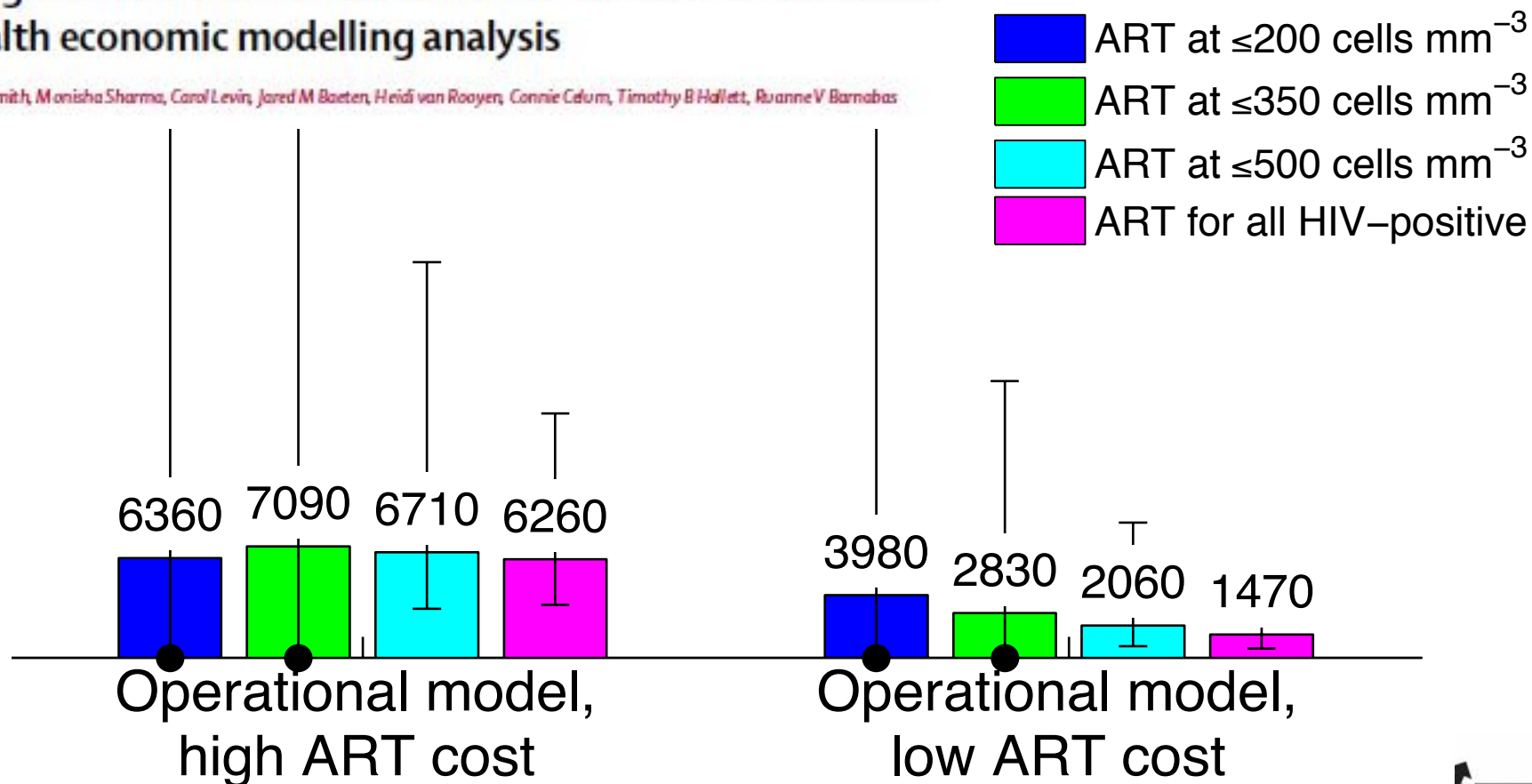


- Under new South African ART initiation criteria (CD4 ≤500 cells per μ L), home HTC and linkage has the potential to reduce HIV incidence by almost 50% and total DALYs by 22% over 10 years.

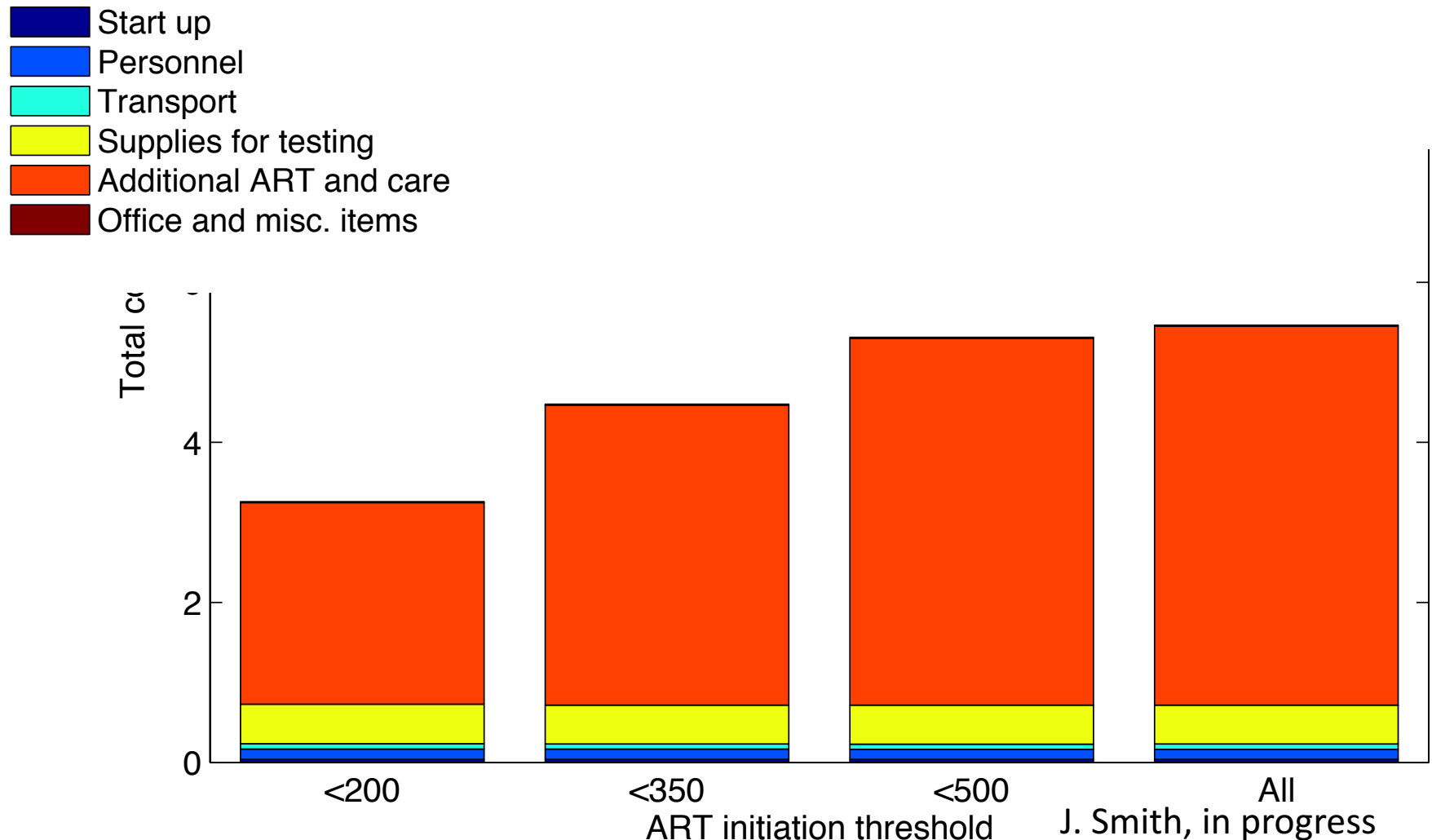
Individual based model – ICER/infection averted

Cost-effectiveness of community-based strategies to strengthen the continuum of HIV care in rural South Africa: a health economic modelling analysis

Jennifer A Smith, Monisha Sharma, Carol Levin, Jared M Baeten, Heidi van Rooyen, Connie Celum, Timothy B Hallett, Ruanne V Barnabas



HTC total program costs over 10 years



ART costs far outweigh all other costs

Outline

- Background
- Methods
- Results
- Cost-effectiveness
- Discussion

Discussion

- Community based HTC and linkage strategies achieve high uptake of testing, linkage to care and viral suppression
- Following test and treat guidelines, this approach has the potential to cost-effectively avert ~50% of incident infection
- The cost of ART is the largest proportion of program costs over ten years – a variable cost

Discussion

- Infectious disease modeling is a useful tool that can be used to estimate health outcomes
- Study data can be used to parameterize models and estimate costs
- Costing can be done as part of study implementation
- CEA is a tool to help choose affordable, effective interventions
- Sensitivity analysis helps deal with the uncertainty
- Consulting with a health economist and/or modeler will help with choosing the most appropriate model to answer your question

Discussion

- Key implementation science questions include
 - Strategies for retention in pre-ART care
 - Strategies to identify and re-link persons who migrate or are otherwise lost to follow-up
 - Efficient delivery of ART
- Integrating modeling and costing into treatment and prevention research, facilitates timely estimates of cost-effectiveness

Contact

- CFAR website: <http://depts.washington.edu/cfar/>
- Ruanne Barnabas: rbarnaba@uw.edu

Thank You!

BILL & MELINDA
GATES *foundation*



UNIVERSITY OF WASHINGTON
INTERNATIONAL CLINICAL RESEARCH CENTER

