

Examples of Economic Evaluation

Task Shifting at the Infectious Diseases Institute (IDI), Kampala, Uganda

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Summary

- **Cost-minimization analysis** of physician-led, nurse-led, and pharmacy-worker-led HIV follow-up
- **Cost-effectiveness analysis** of pharmacy refill versus standard of care

Research article

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Potential impact of task-shifting on costs of antiretroviral therapy and physician supply in Uganda

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Background

- Severe on-going health worker shortages in low-income countries
 - **Affect countries and individual clinics**
- The Infectious Diseases Institute started task-shifting in 2006 to reduce the workload of their physicians
- The aim of the study was to evaluate the potential economic impact of IDI-style task-shifting for HIV/AIDS clinical care in Uganda with regard to:
 - **Monetary savings**
 - **Physician full time equivalents (FTEs)**

Methods

- We developed an aggregate national cost-minimization model from both the societal and governmental perspectives comparing IDI follow-up algorithms:
 - Physician follow-up (PF)
 - Nurse follow-up (NF)
 - Pharmacy worker follow-up (PWF)
- Key assumption: No difference in health outcomes by follow-up algorithm.
- Human resource utilization data were obtained from a primary study at the Infectious Diseases Institute (IDI) HIV/AIDS clinic.
 - This study was a detailed one-day time-and-motion survey.
- Unit costs (wages) were obtained from IDI and the literature.
- Lost patient time was valued at GDP per capita for Uganda.
- National projections and sensitivity analyses performed.

Time use for personnel and patients

Table 1: Personnel time use and patient waiting times for different types of health workers at the Infectious Diseases Institute clinic in Kampala, Uganda

	Mean	SD	Median	Range	IQR
Physician					
Personnel	0.14	0.09	0.12	0.05 - 0.58	0.08 - 0.17
Patient waiting	1.20	0.87	1.08	0.03 - 3.30	0.53 - 1.65
Triage					
Personnel	0.24	0.19	0.20	0.03 - 1.05	0.08 - 0.33
Patient waiting	0.33	0.30	0.24	0.03 - 1.67	0.18 - 0.38
Nurse					
Personnel	0.16	0.10	0.13	0.03 - 0.42	0.08 - 0.23
Patient waiting	0.08	0.08	0.05	0 - 0.28	0.02 - 0.12
Regular PW					
Personnel	0.10	0.10	0.08	0.02 - 0.65	0.05 - 0.12
Patient waiting	0.36	0.32	0.27	0.02 - 1.73	0.15 - 0.47
Refill PW					
Personnel	0.05	0.03	0.03	0.02 - 0.13	0.02 - 0.05
Patient waiting	-	-	-	-	-

SD--Standard Deviation, IQR--Inter Quartile Range, PW--Pharmacy Worker, HWU--Health Worker Utilization

Health worker costs per visit

Table 2: Per visit time use, unit costs and total costs of follow-up for different types of health workers at the Infectious Diseases Institute clinic, Kampala, Uganda

Health worker type	Personnel time (hours)	Hourly wage (\$)	Per visit cost of Personnel (\$)	Waiting time (hours)	Total time lost (hours)	OC of lost patient time (\$)*	Total per visit cost (\$)
Physician	0.14	8.46	1.18	1.20	1.34	1.33	2.51
Triage nurse	0.24	4.65	1.12	0.33	0.57	0.56	1.68
Nurse	0.16	4.65	0.74	0.08	0.24	0.24	0.98
Regular PW	0.10	3.38	0.34	0.36	0.46	0.46	0.80
Refill PW	0.05	3.38	0.17	0	0.05	0.05	0.22

* This is multiplied by the unit hourly wage for Ugandan's of \$ 0.99, PW--Pharmacy Worker, OC--Opportunity Cost

Total per visit cost with task-shifting (societal perspective)

Table 3: Per visit and annual costs of antiretroviral therapy follow-up for different types of health workers at the Infectious Diseases Institute clinic, Kampala, Uganda from a societal perspective

Health worker type	Cost per visit (\$)	Number of visits per year			Annual societal cost of follow-up (\$)		
		PF	NF	PWF	PF	NF	PWF
Physician	2.51	12	2	2	30.12	5.02	5.02
Triage	1.68	12	12	4	20.16	20.16	6.72
Nurse	0.98	0	10	2	0	9.80	1.96
Regular PW	0.80	12	12	4	9.60	9.60	3.20
Refill PW	0.22	0	0	8	0	0	1.76
Total	--	--	--	--	59.88	44.58	18.66

PW--Pharmacy Worker, PF--Physician Intensive Follow-up, NF--Nurse Intensive Follow-up, PWF--PW-intensive follow-up

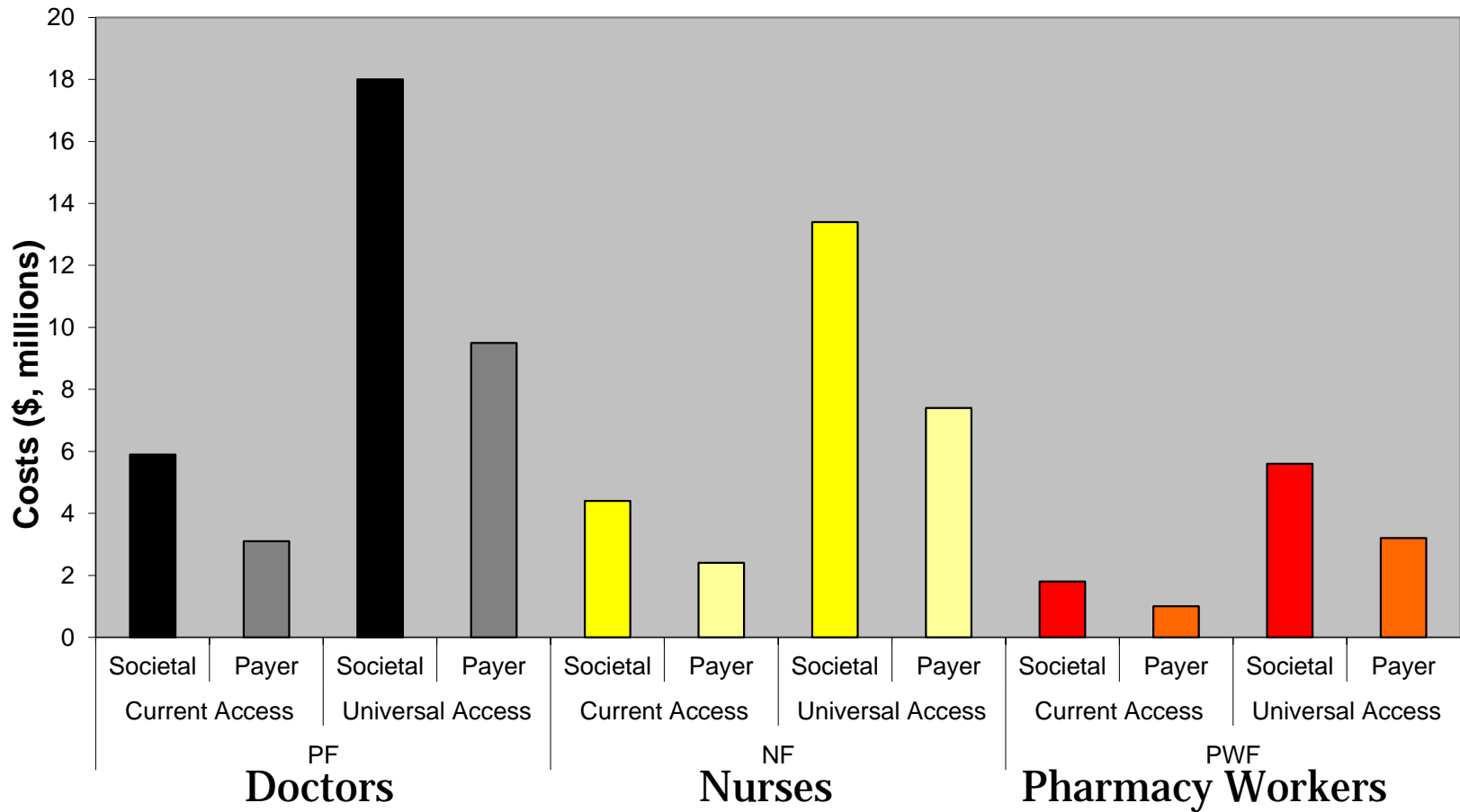
Total per visit cost with task-shifting (governmental perspective)

Table 4: Per visit and annual costs of antiretroviral therapy follow-up for different types of health workers at the Infectious Diseases Institute clinic, Kampala, Uganda from a ministry of health perspective

Health worker type	Cost per visit (\$)	Number of visits per year			Annual payer cost of follow-up (\$)		
		PF	NF	PWF	PF	NF	PWF
Physician	1.18	12	2	2	14.16	2.36	2.36
Triage	1.12	12	12	4	13.44	13.44	4.48
Nurse	0.74	0	10	2	0	7.40	0.94
Regular PW	0.34	12	12	4	4.08	4.08	1.36
Refill PW	0.17	0	0	8	0	0	1.36
Total	--	--	--	--	31.68	27.28	10.5

PW--Pharmacy Worker, PF--Physician Intensive Follow-up, NF--Nurse Intensive Follow-up, PWF--PW-intensive follow-up

National projections



Physician full time equivalents (FTE) analysis

- **Task shift to nurses or pharmacy workers at current access**
 - **Saves 108 physician FTEs per year (4.9% of national workforce)**
 - **Equivalent to 0.3 physician FTEs per 100,000 population**
- **Task shift to nurses or pharmacy workers at universal access**
 - **Saves 328 physician FTEs per year (14.9% of national physician workforce)**
 - **Equivalent to 1.05 physician FTEs per 100,000 population**

Conclusion

- Task shifting saves between \$0.5 million and \$11.0 million annually depending on perspective and ART access.
- Task shifting reduces current physician needs by between 4.1% and 14.8% of the national physician workforce depending on perspective and ART access.

Cost Effectiveness of a Pharmacy-Only Refill Program in a Large Urban HIV/AIDS Clinic in Uganda

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Methods

- Retrospective cohort analysis to compare the effectiveness of IDI's Pharmacy-only refill program (PRP) and standard of care (SOC) in which patients are seen by a physician monthly.
- Effectiveness was defined as Favorable Immune Response (FIR), measured as having a CD4 lymphocyte count of over 500 cells/ μ l at follow-up.
- Multivariate logistic regression to assess the difference in FIR between patients in the PRP and comparison SOC group.
- Estimates of effectiveness incorporated into an incremental cost-effectiveness analysis performed from the modified societal perspective and governmental perspective.
- Costs estimated from previous studies at IDI and univariate and probabilistic sensitivity analyses conducted.

Results: Study Population

Category	Sub-category	SOC (%)	PRP (%)	Total (%)	p-value
Time (baseline to follow-up)		12.8 (1.6)	15.1 (1.3)	13.5 (1.9)	<0.001
Age, years (SD)		38.8 (7.5)	35.9 (7.5)	36.8 (7.6)	<0.001
Gender	Male	100 (39.8)	253 (43.8)	353 (42.6)	0.293
	Female	151 (60.2)	325 (56.2)	476 (57.4)	
ART duration (months)		41.8 (16.2)	30.9 (13.0)	34.2 (14.9)	<0.001
Initial ART regimen	d4T-3TC-NVP	160 (63.8)	362 (62.6)	522 (63.0)	<0.001
	ZDV-3TC-EFV	51 (20.3)	194 (33.6)	245 (11.2)	
	Other*	40 (15.9)	22 (3.8)	62 (7.5)	
Current ART regimen	ZDV-3TC-NVP	52 (20.7)	167 (29.9)	219 (26.4)	<0.001
	ZDV-3TC-EFV	37 (14.7)	154 (26.6)	191 (23.0)	
	ZDV-TDF-FTC-LPV/r	33 (13.5)	165 (28.6)	198 (23.9)	
	Other**	129 (51.4)	92 (15.9)	221 (26.6)	
OI at baseline	None	216 (86.1)	544 (94.1)	760 (91.7)	<0.001
	1 or more	35 (13.9)	34 (5.9)	69 (8.3)	
OI at follow-up	None	220 (93.4)	540 (87.6)	760 (91.7)	0.006
	1 or more	31 (6.6)	38 (12.4)	69 (8.3)	
Adherence ^Ψ	<95%	26 (11.1)	9 (1.6)	35 (4.3)	<0.001
	> 95%	208 (88.9)	564 (98.4)	772 (95.7)	
CD4+ count (start of ART)		121 (131)	124 (103)	123 (112)	0.758
CD4+ count (start of study)		218 (160)	292 (145)	268 (154)	<0.001

Results: Univariable and Multivariable Logistic Regression (Favorable Immune Response is Outcome)

Variable	Sub-category	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Exposure status	SOC	1 [Reference]		1 [Reference]	
	PRP	0.93 (0.72 – 1.60)	0.737	0.93 (0.55 – 1.58)	0.797
Duration of follow-up	<1 year	1 [Reference]		1 [Reference]	
	>1 years	1.53 (1.01 – 2.33)	0.045	1.98 (1.19 – 3.25)	0.007
Duration of ART	<2 years	1 [Reference]		1 [Reference]	
	2 – 3 years	1.12 (0.66 – 1.90)	0.682	0.84 (0.47 – 1.52)	0.570
	>3 years	0.56 (0.33 – 0.96)	0.035	0.34 (0.18 – 0.65)	<0.001
Age		1.02 (0.99 – 1.05)	0.072	1.02 (0.99 – 1.04)	0.286
Gender	Male	1 [Reference]		1 [Reference]	
	Female	0.44 (0.29 – 0.66)	<0.001	0.47 (0.30 – 0.73)	<0.001
Initial ART regimen	d4T-3TC-NVP	1 [Reference]		1 [Reference]	
	ZDV-3TC-EFV	1.61 (1.03 – 2.52)	0.035	2.45 (0.81 – 7.35)	0.109
	Other*	1.01 (0.49 – 2.00)	0.988	1.09 (0.47 – 2.54)	0.833
Current ART regimen	ZDV-3TC-NVP	1 [Reference]		1 [Reference]	
	ZDV-3TC-EFV	1.48 (0.86 – 2.52)	0.152	0.62 (0.18 – 2.11)	0.442
	ZDV-TDF-FTC-LPV/r	0.99 (0.61 – 1.64)	0.952	1.03 (0.61 – 1.85)	0.903
	Other**	1.51 (0.89 – 2.53)	0.120	1.68 (0.91 – 3.11)	0.098
OI at baseline	None	1 [Reference]		1 [Reference]	
	1 or more	1.62 (0.76 – 3.49)	0.214	1.68 (0.75 – 3.79)	0.210

Results: Cost-Effectiveness Analysis

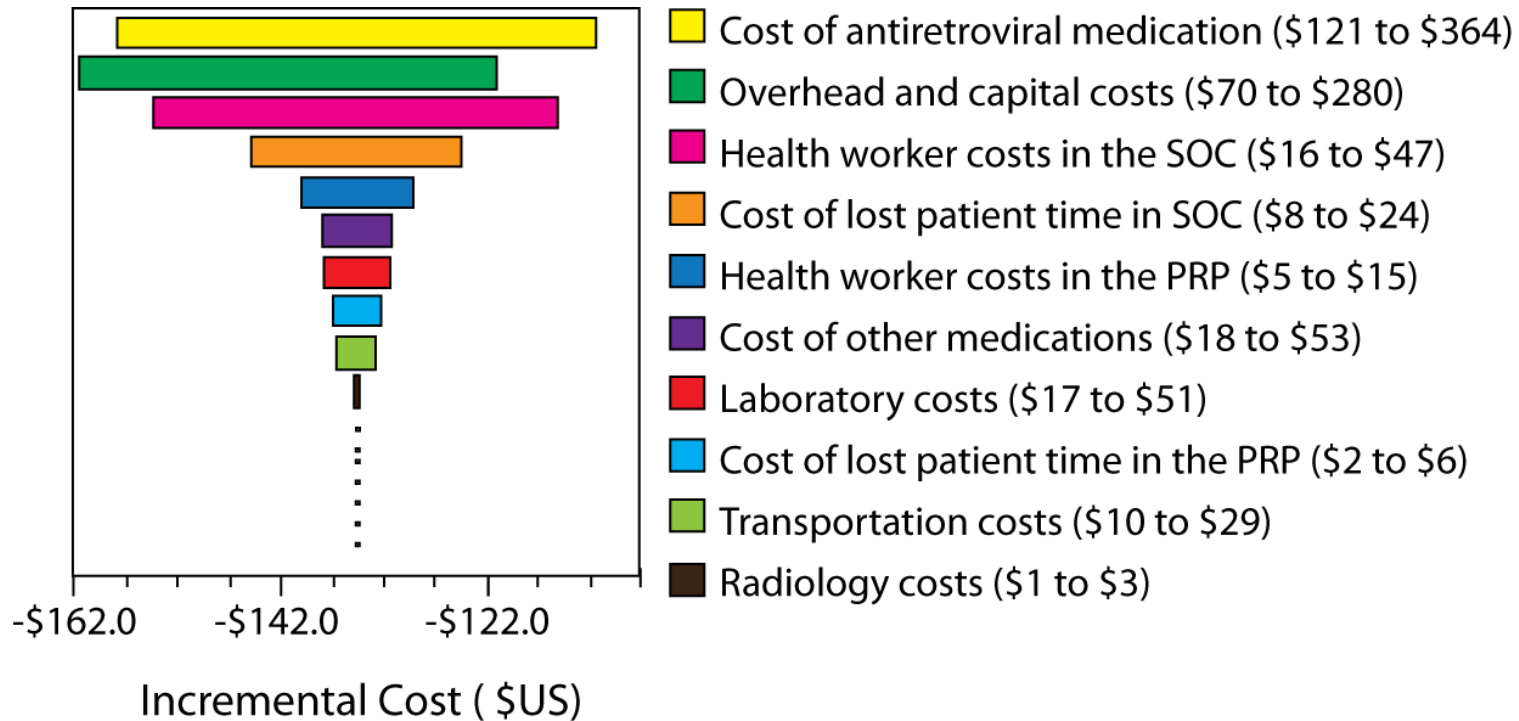
	Societal Cost*	Inc.	MoH Cost*	Inc.	Prob of FIR	Inc.	Societal ICER (US\$/FIR)	MoH ICER (US\$/FIR)
SOC	\$655	--	\$610	--	0.196	--	--	
PRP	\$520	- \$135	\$496	- \$114	0.186	- 0.010	\$13,500	\$11,400

*All costs per patient per year

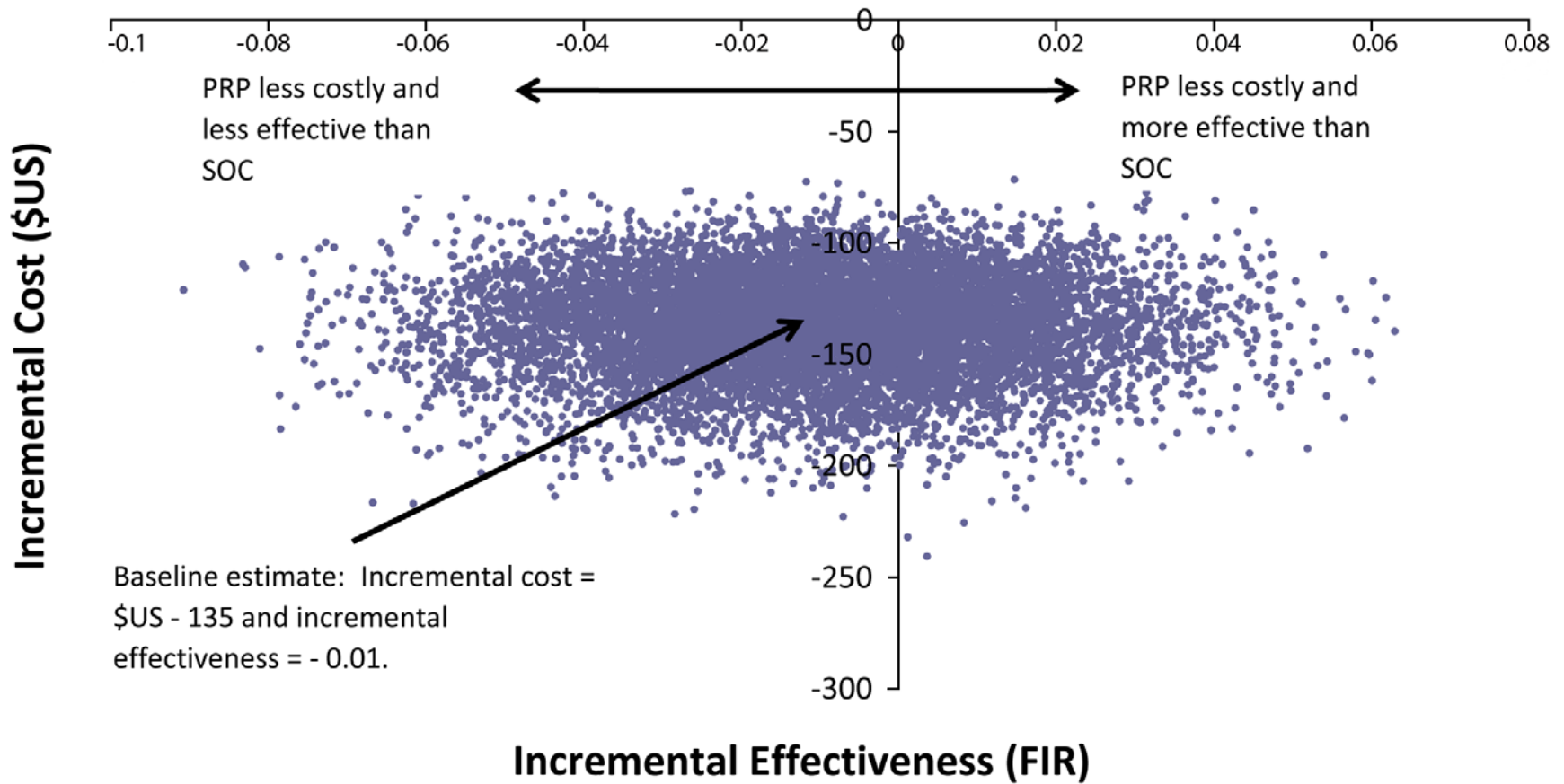
Interpretation

- The PRP results in one less FIR for an additional saving of \$13,500 from the societal perspective or \$11,400 from the MoH (Governmental) perspective

Univariate Sensitivity Analysis



Incremental Cost-Effectiveness Scatter Plot



Conclusion

- **The PRP is more cost-effective than the standard of care.**
- **Similar task-shifting programs might help large HIV/AIDS clinics in Uganda and other low-income countries to cope with increasing numbers of patients seeking care.**