

Economic returns of Global Fund-supported ART programs

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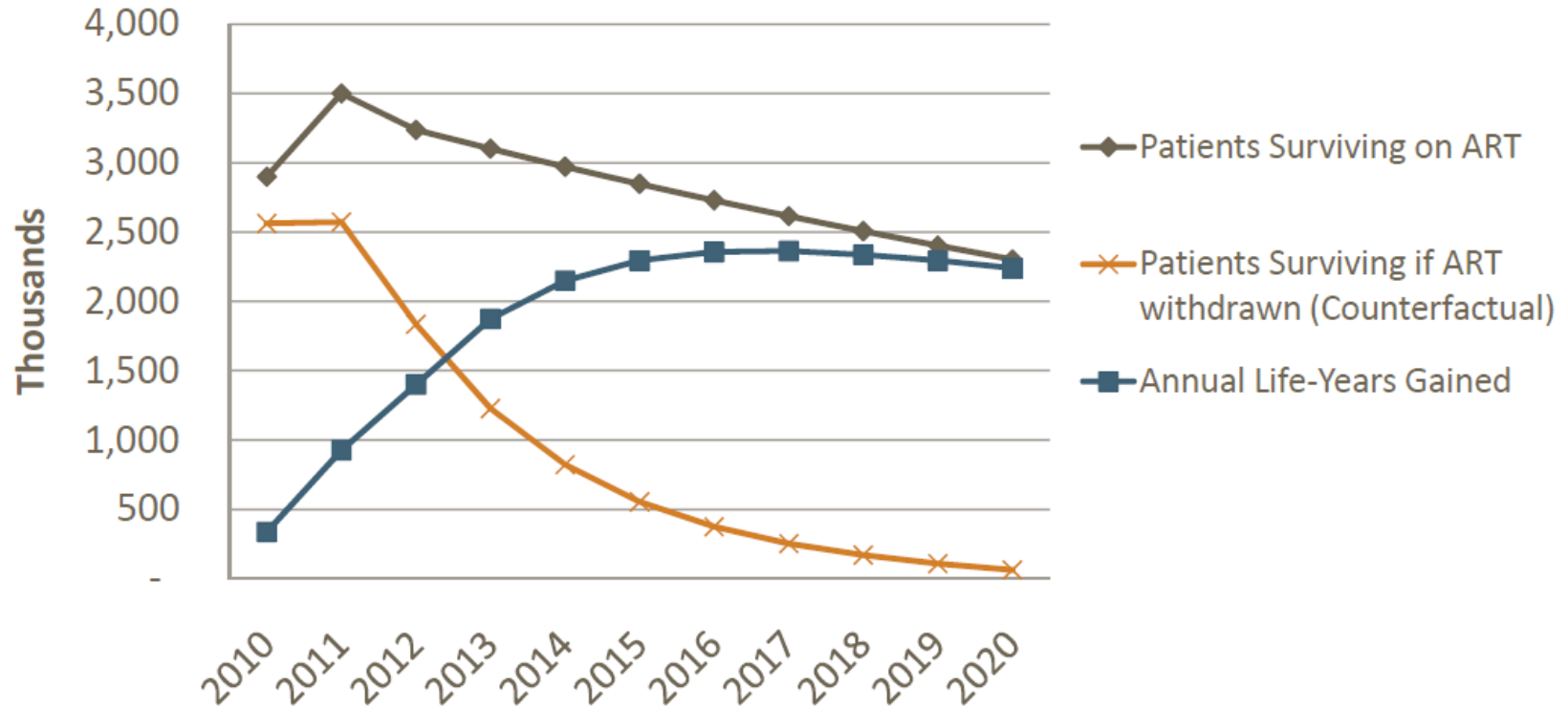
Measuring the Return on Investment in Global Fund Supported AIDS Treatment

Building from the work of Global Fund (Korenromp et al. presented yesterday) to project programmatic costs and incremental life years gained from maintaining the current GF-supported cohort on ART, our model attempts to ascribes monetary value to benefits conferred by ART.



Current Global Fund ART commitment:

- Maintain end-2009 ART patients supported by GF-financed programs and achieve additional service delivery targets of Round 8 and 9 grants
- Peak program size is 3.5 million patients in 2011
- Total program cost (undiscounted) = \$19.6 billion (GF share ~1/4th)
- Life years gained = 20.6 million over 10 years



Methodology Summary (1)

Two different methods for calculating return on investment

1. Selected benefits through a components approach

- Incremental benefits computed by constructing a hypothetical counterfactual scenario in which ART was abruptly discontinued in 2010.
- For incremental life years, we estimated 1) the monetary value of gains in labor productivity and 2) the value of orphan care expenses averted.

2. Full benefits through the willingness-to-pay approach

- We considered a valuation of 2.5 times per capita income (GNI) for a life year gained, consistent with WHO criteria for cost-effectiveness.
- We alternatively assumed willingness to pay to reduce health risks was more sensitive to income (elasticity = 1.5) yielding a monetary value of a year of life gained that ranged from 1.0 to 3.6 times GNI across countries.



Methodology Summary (2)

With both methods, the projected costs of GF-supported AIDS treatment (from Korenromp et al.) were then subtracted from the estimated benefits to calculate net benefits.

$$\text{Net benefit} = \text{Total benefits} - \text{total costs}$$

For both methods, benefits and costs were reported undiscounted and with discounting at 3% per year.

We also report the ratio of benefits to costs as a percentage of ART program cost.

We conducted sensitivity analysis on key assumptions regarding productivity.



Selected benefits through a components approach

Calculating productivity gains

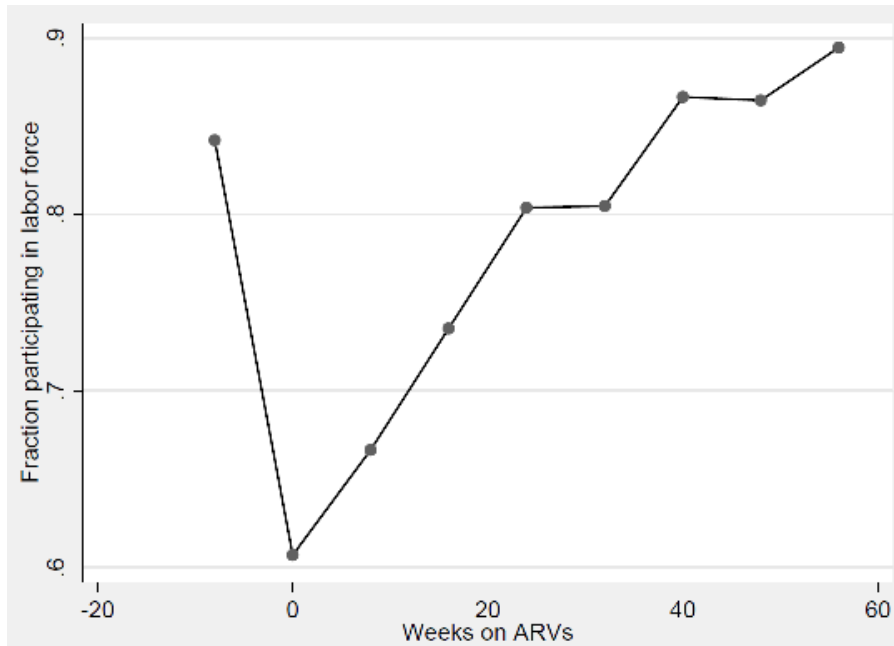
- Most studies that informed our assumptions regarding ART and productivity look at a cohort of patients before and after initiating ART.
- In general, these studies find a V-shaped pattern of economic productivity around the time of ART initiation.
- Sharp declines in productivity in the months leading up to treatment initiation are substantially reversed after ART is started.



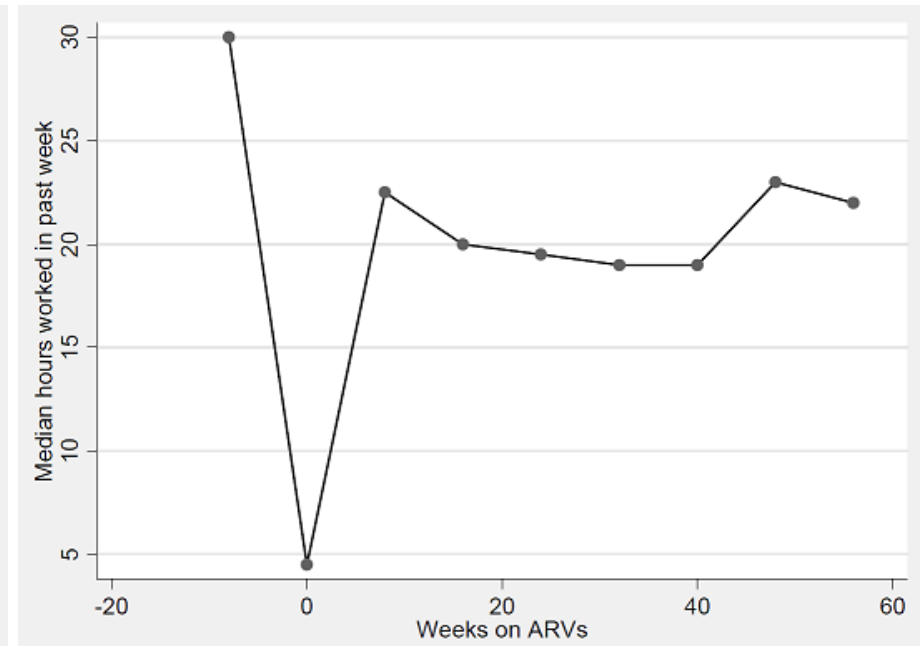
The impact of ART on labor productivity

The experience of tea pickers in Kenya starting ART

Labor force participation



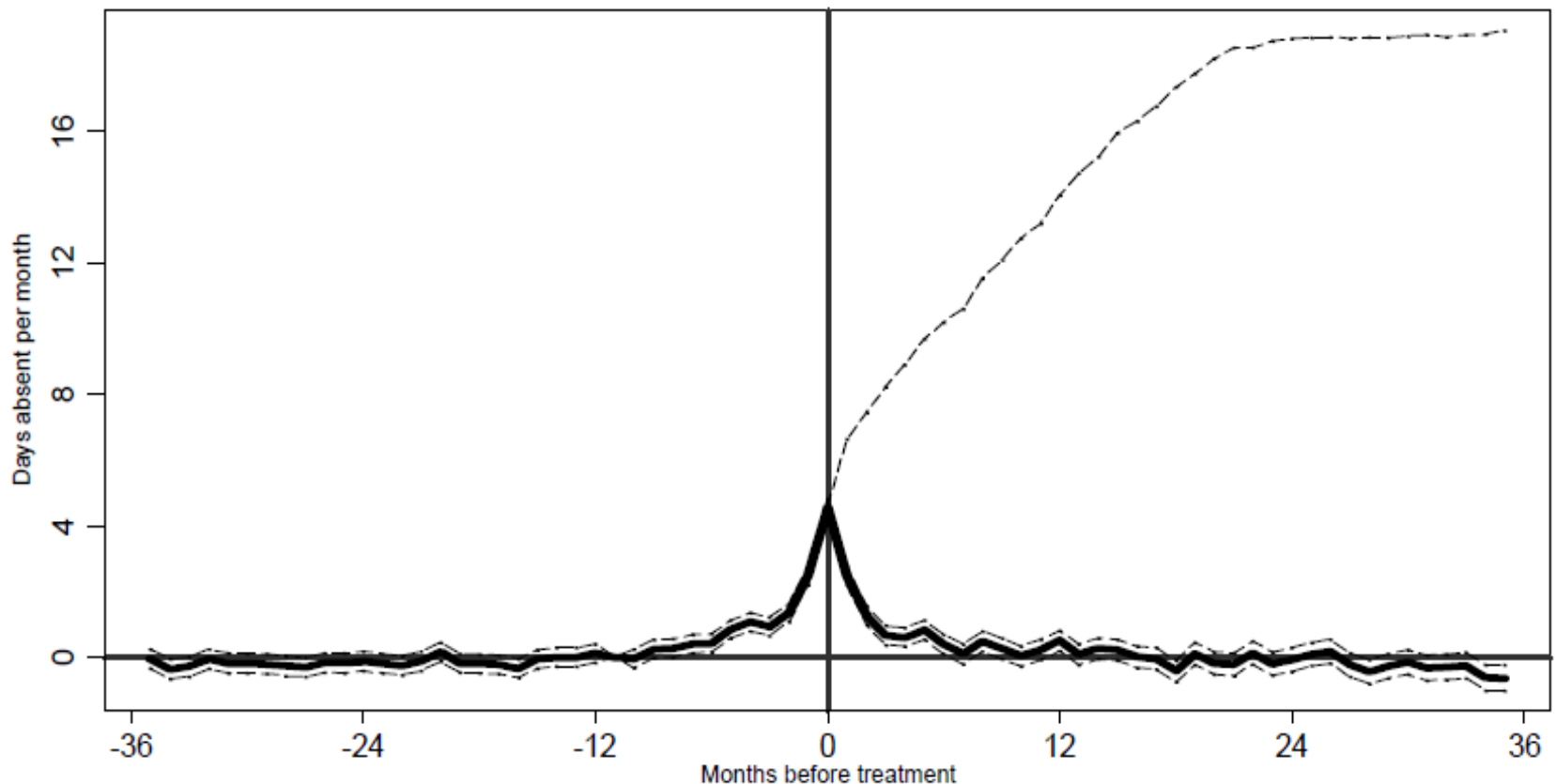
Hours worked



Source: Thirumurthy H, Graff Zivin J, Goldstein M. The Economic Impact of AIDS Treatment: Labor Supply in Western Kenya. Economic Growth Center, Yale University. Paper 947 (2006)

The impact of ART on labor productivity

Absenteeism among HIV-infected miners in Botswana



- Solid black line shows absenteeism over time around the time of ART initiation. Thin dashed line shows predicted counterfactual (no ART) trajectory of absenteeism. Source: Habyarimana JL et al (2007)

Assumptions behind estimation of productivity gains

Impact of ART is modeled relative to country labor market realities

Parameter	Base Case Value
Employment Without ART	20% of country average employment (labor force participation minus unemployment)
Employment With ART	90% of country average employment, except for the first six months of ART and the last year of life. 20% of country average employment in first six months of ART and last year of life.
Value of full-time employment	Annual income per capita (PPP-adjusted GNI)



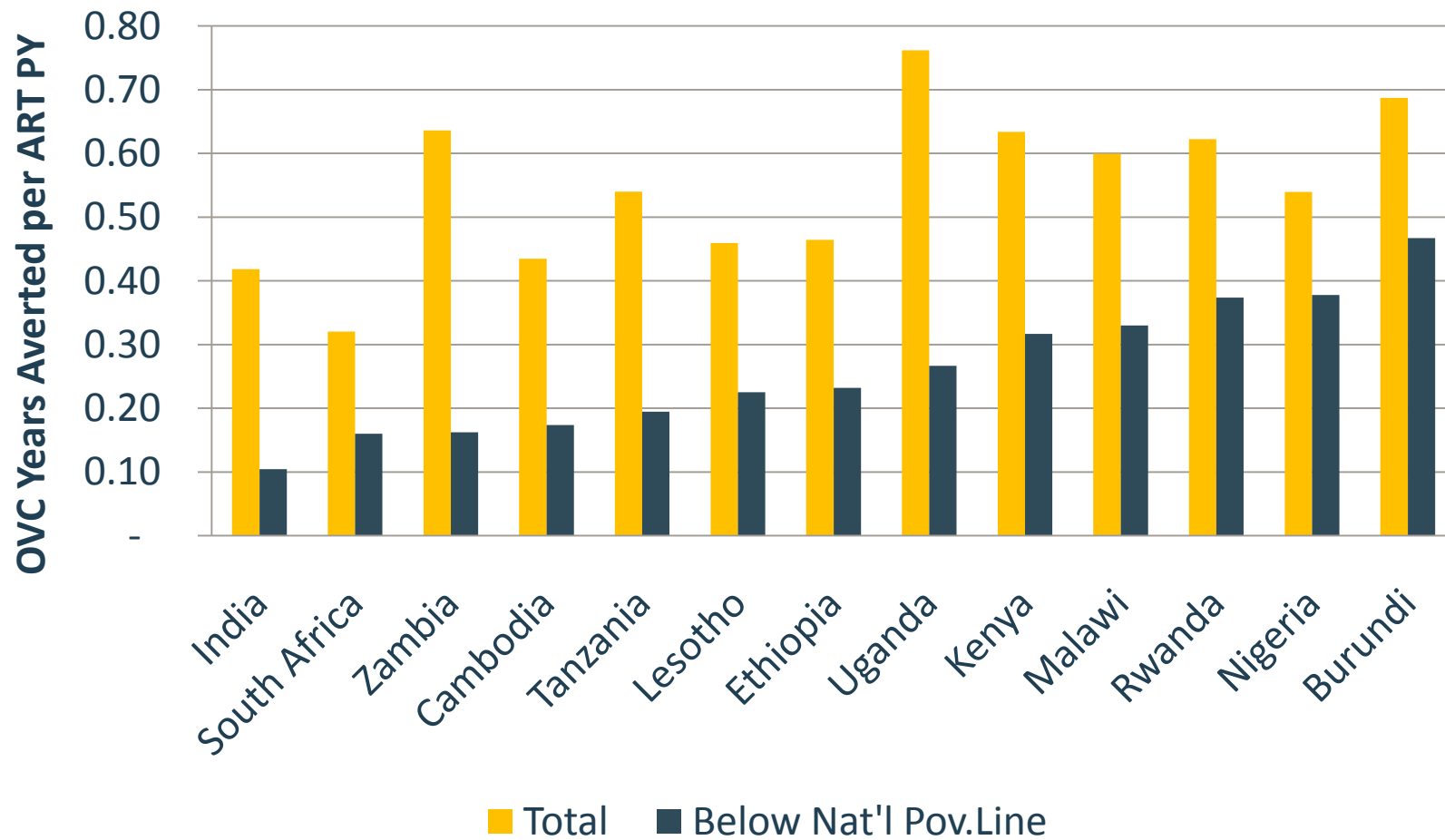
Selected benefits through a components approach

Quantifying ART's impact on orphans

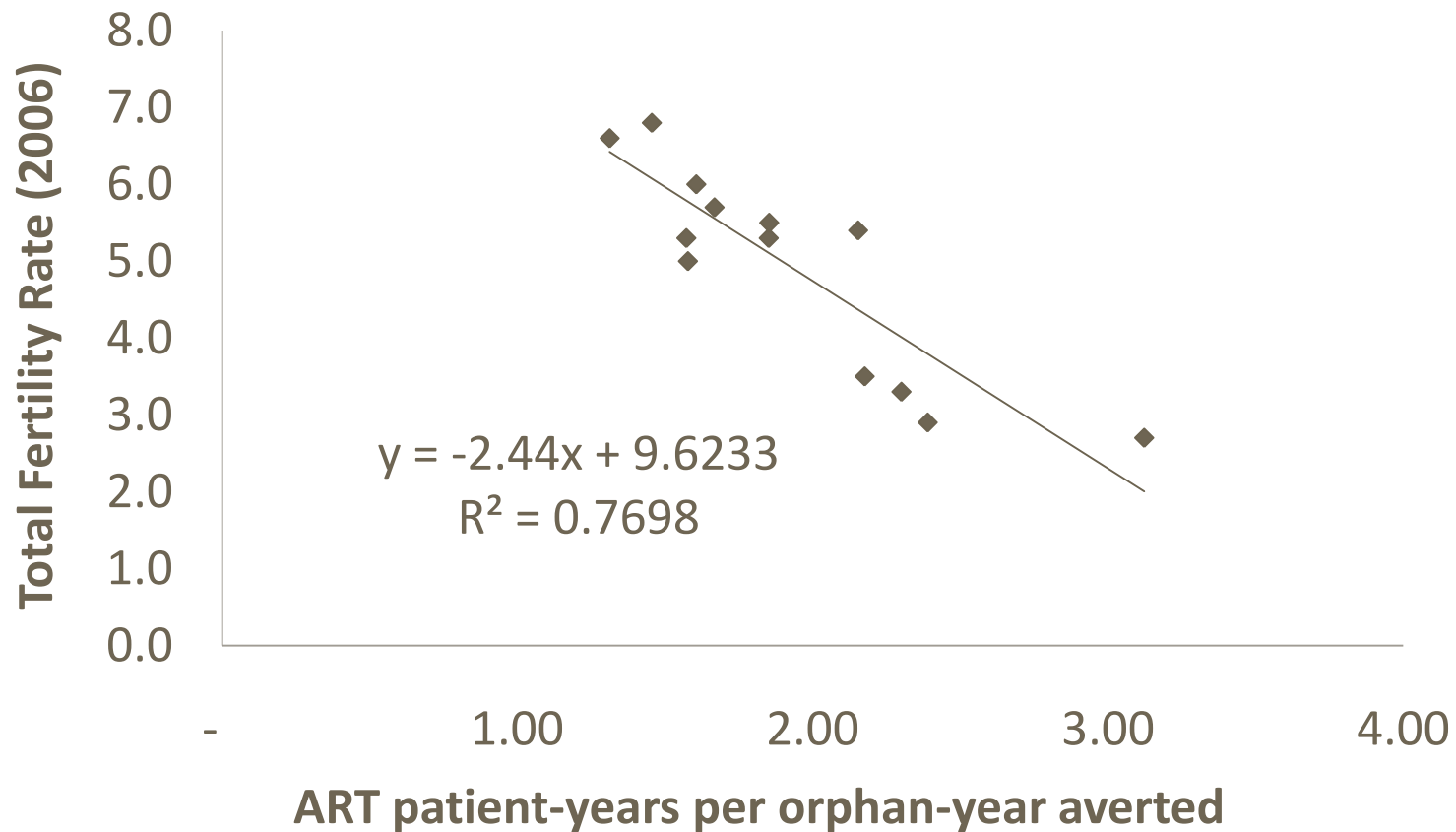
- Using SPECTRUM, we computed the number of orphan years averted by current ART programs in 14 countries with largest GF-supported ART and OVC programs.
- For the remaining countries, we extrapolated from the results of these 14 countries, exploiting the strong relationship between fertility rate and orphan years averted by ART.
- **Result:** 10 million orphan-years averted (4.9 million below national poverty lines)



Number of years of orphan care averted by each patient-year of ART



Estimating orphan-years averted based on fertility rate



Selected benefits through a components approach

Valuing averted orphan-years

- We focused on the direct costs of providing orphan care and support through social programs.
- Cost of a year of orphan care = \$224 based on a cost study in 22 countries (Stover et al. 2007)
- In the base case, benefits were estimated only for orphans in families below the poverty line.



Results Summary

Total and Net Benefits of Global Fund Investment in ART

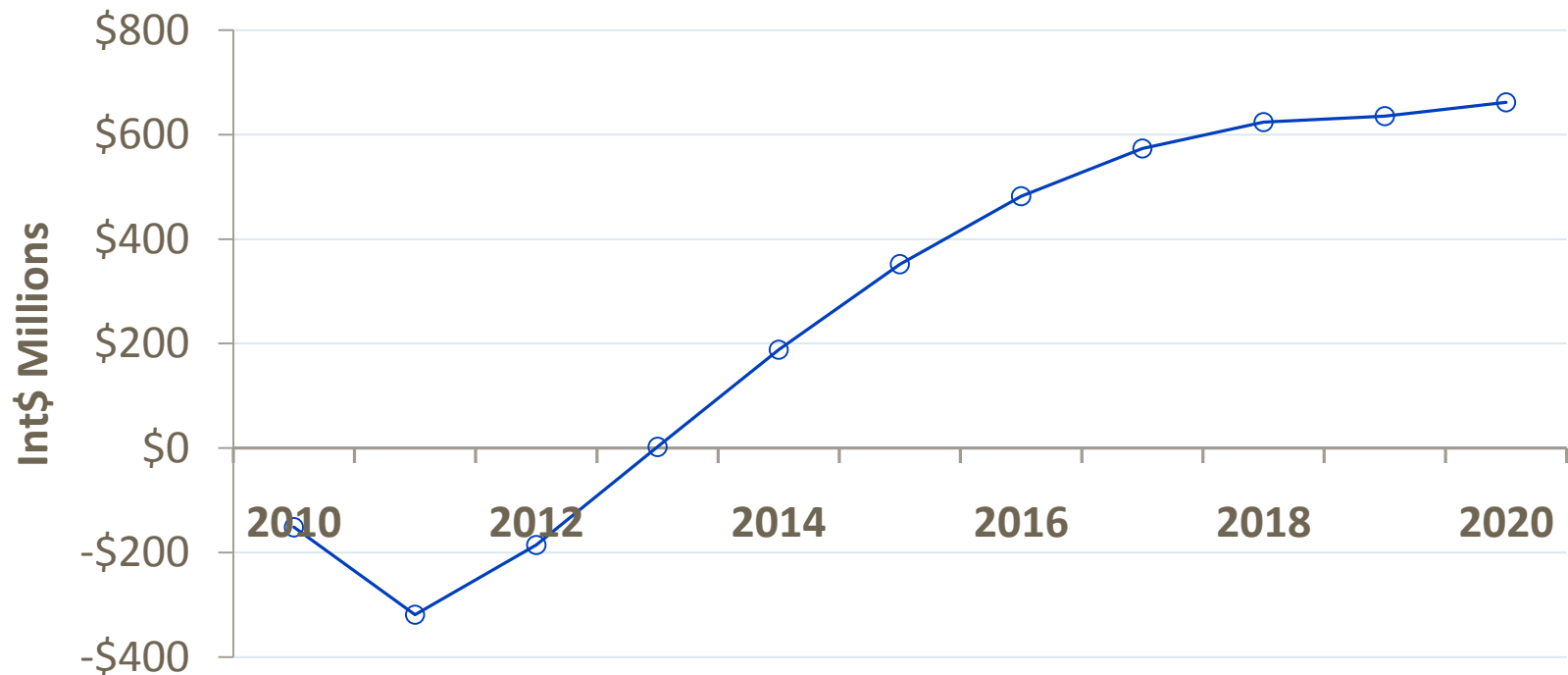
Monetary Value of Benefits: Components Based Approach		
Component	Undiscounted	Discounted (@3%)
Incremental Productivity	\$19.1 billion	\$16.6 billion
Value of Orphan Care Averted	\$1.1 billion	\$0.9 billion
Total Benefit	\$20.2 billion	\$17.5 billion
Program Cost	\$19.6 billion	\$17.0 billion
Cumulative Net Monetary Benefit	\$0.66 billion	\$0.54 billion
Benefit-to-Cost Ratio	103%	103%



Benefits of investments in Global Fund AIDS treatment programs, component method

Figure 3: Cumulative net monetary benefits

(Productivity Gains + Orphan Care Averted – ART Program Costs)



Sensitivity Analysis

Uncertainty in productivity levels of treated and untreated

Cumulative Net Monetary Benefit in Billions of Dollars

(Benefit-to-Cost Ratio in parentheses)

			Productivity of Treated Patient	
			90%	75%
Productivity of Untreated Patient	0%	Undiscounted	\$2.0 (110%)	-\$1.4 (93%)
		Discounted	\$1.8 (111%)	-\$1.2 (93%)
	20%	Undiscounted	\$0.66 (103%)	-\$2.8 (86%)
		Discounted	\$0.54 (103%)	-\$2.4 (86%)
	40%	Undiscounted	-\$0.67 (97%)	-\$4.1 (79%)
		Discounted	-\$0.71 (96%)	-\$3.7 (78%)

Full benefits using willingness to pay approach

Calculating Value of Statistical Life Years

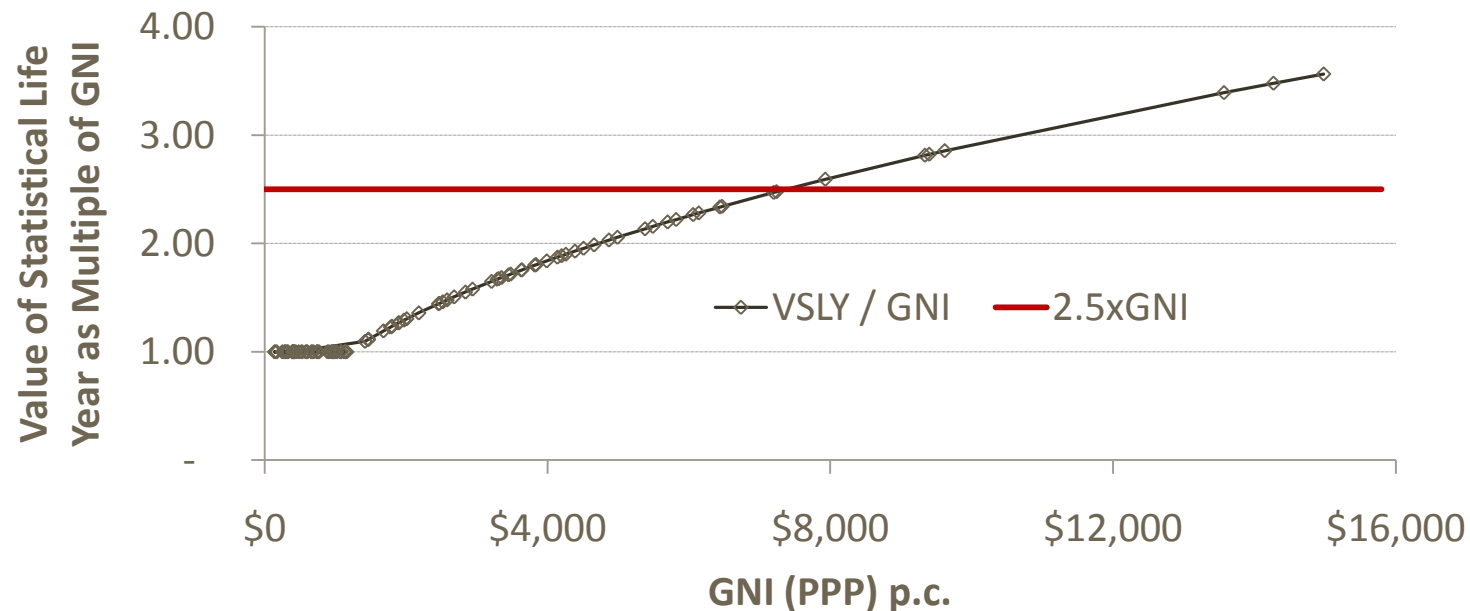
Method A: 2.5 times GNI (income elasticity = 1)

Method B: Income elasticity = 1.5, with floor VS LY = per capita GNI

Remaining life years (RLY) of working age persons = 25 years

US VSL = \$5 million, US VS LY = \$200k, US GNIpc = \$46k

Country VS LY = $\text{MAX} [\text{US_VSL} / \text{RLY} * ((\text{CntryGNIpc} / \text{US_GNIpc})^{\text{IncElas}}), \text{CntryGNIpc}]$



Results Summary

Total and Net Benefits of Global Fund Investment in ART

Monetary Value of Benefits: Willingness-to-Pay Approach

	Undiscounted	Discounted (@3%)
2.5 times GNI		
Total Benefit	\$66.9 billion	\$56.4 billion
Cumulative Net Benefit	\$47.3 billion	\$39.4 billion
Benefit-to-Cost Ratio	342%	332%
Income-dependent multiple of GNI		
Total Benefit	\$43.4 billion	\$36.6 billion
Cumulative Net Benefit	\$23.8 billion	\$19.5 billion
Benefit-to-Cost Ratio	222%	215%



Interpretation issues (1)

- **The productivity gains from ART accrue at the societal level, but they do not have a direct impact on the resource envelope for ART**
 - However, these gains may impact resource envelope indirectly through taxation or out-of-pocket expenditures for ART and reduced demand for orphan care.
- **The monetary value of labor hours worked by ART patients may be overestimated by per-capita GNI if ART patients are disproportionately in the poorer socioeconomic strata of society**
 - However, studies to date suggest that there is not clear negative relationship between relative socioeconomic status (within a country) and HIV infection risk or ART access (Gillespie, Kadiyala, Greener 2007)



Interpretation issues (2)

- **Macroeconomic impact may not be fully captured in our model**
 - Where HIV prevalence is high, productivity losses and treatment costs may reduce savings, investment, and capital formation, thereby slowing economic growth.
 - If a portion of workers (e.g. those in unskilled formal sector) lost to AIDS are easily replaced from a pool of unemployed persons, societal level productivity loss for this portion of workers may be limited. *Within the country, some households will suffer, but others will benefit.*
- **The benefit-cost relationship observed for the current level of ART programs may not hold as programs scale up.**
 - Service delivery costs could be higher or lower.
 - Per-patient productivity gains may be smaller if, in scaling up, new patients are less likely to be employed, or healthier at treatment initiation

