

# Value-based healthcare in HIV management

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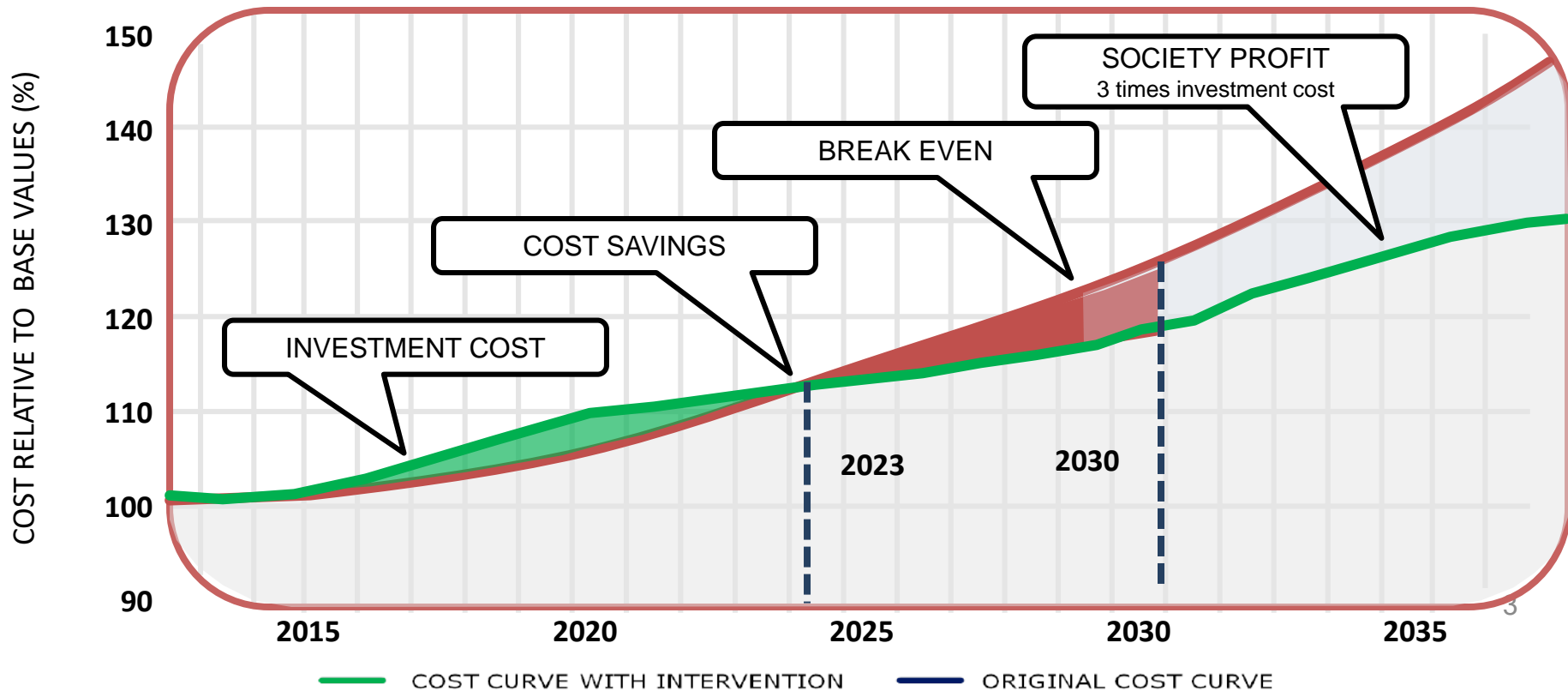
16<sup>th</sup> September 2017, Barcelona

# Health Economics

- The application of health economics reflects a desire to maximise **value for money**
- This implies the desire to maximise health benefit for the least cost – and leads to the concept of **cost-effectiveness**
- Economic evaluations require the explicit measurement of inputs (**costs**) and outcomes (**benefits**)

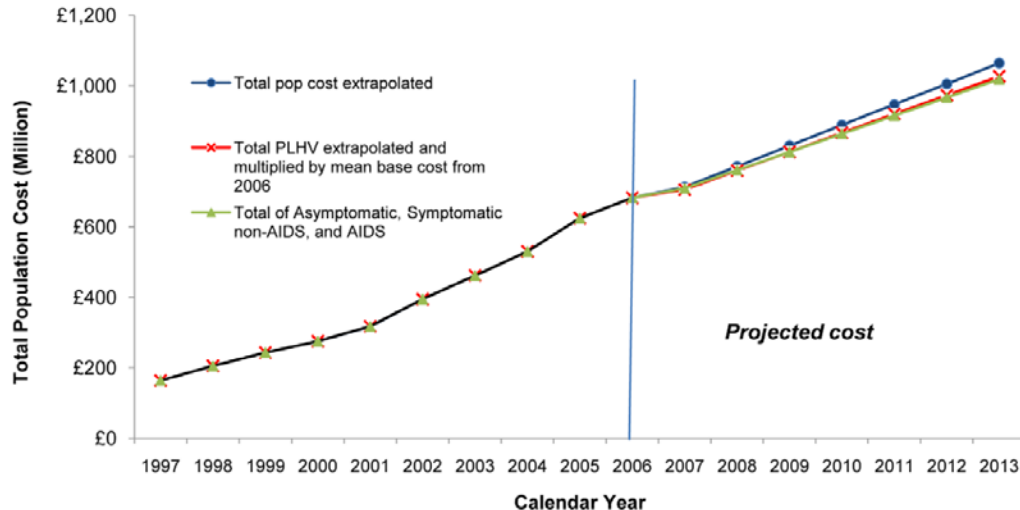


# Investing in Health



# Cost of Treating People Living with HIV

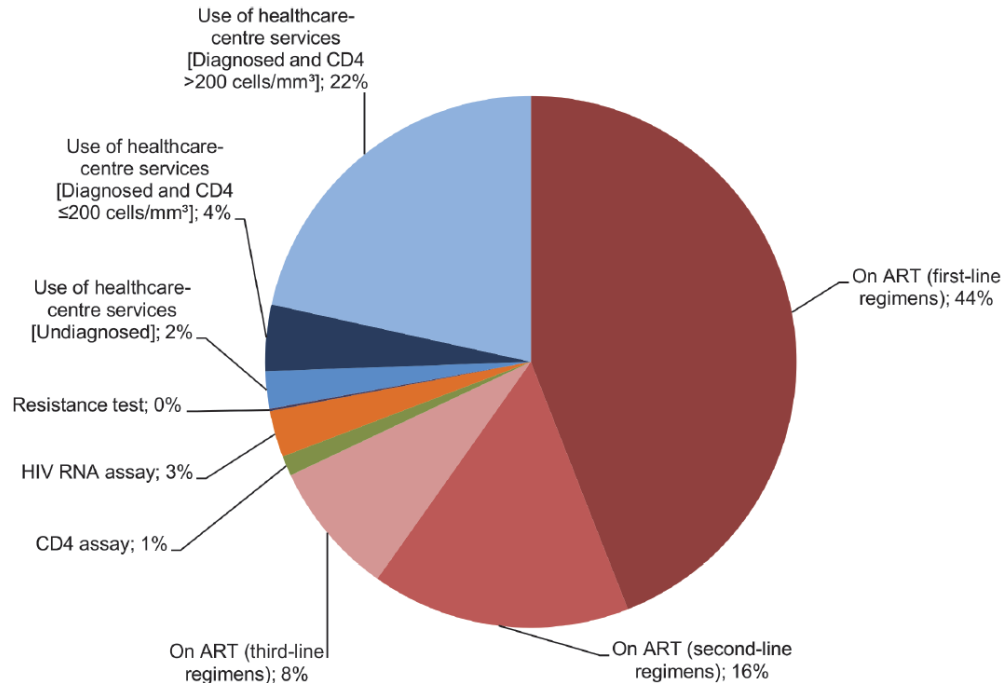
- Annual costs increased from £164 million in 1997 to an estimated £1,065 million in 2013
- Costs are expected to increase due to longer patient survival and continued new infections



Mandalia S et al.; NPMS-HHC Steering Group. Rising population cost for treating people living with HIV in the UK, 1997-2013. PLoS One. 2010 Dec 30;5(12):e15677. doi:10.1371/journal.pone.0015677. PubMed PMID: 21209893; PubMed Central PMCID:PMC3012705.

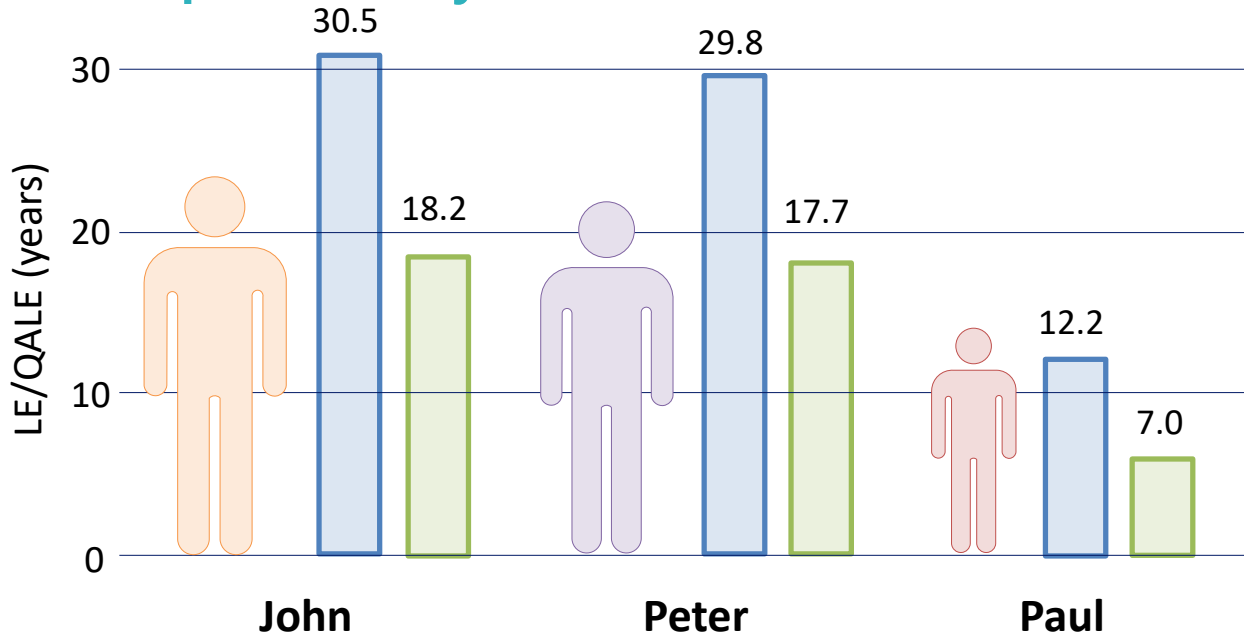
# Mean Lifetime Costs of HIV in UK

- Estimated mean per patient cost: £360,800
- Using generic therapies only: £179,600



Nakagawa F, Miners A, Smith CJ, Simmons R, Lodwick RK, Cambiano V, et al. (2015) Projected Lifetime Healthcare Costs Associated with HIV Infection. PLoS ONE 10(4): e0125018. doi:10.1371/journal.pone.0125018

# Life expectancy and quality-adjusted life expectancy



**John** – Maintains virologic suppression with first treatment

**Peter** – Cycles through treatments until virologic suppression achieved (average patient)

**Paul** – Fails to achieve maintained virologic suppression

 Life expectancy (LE)

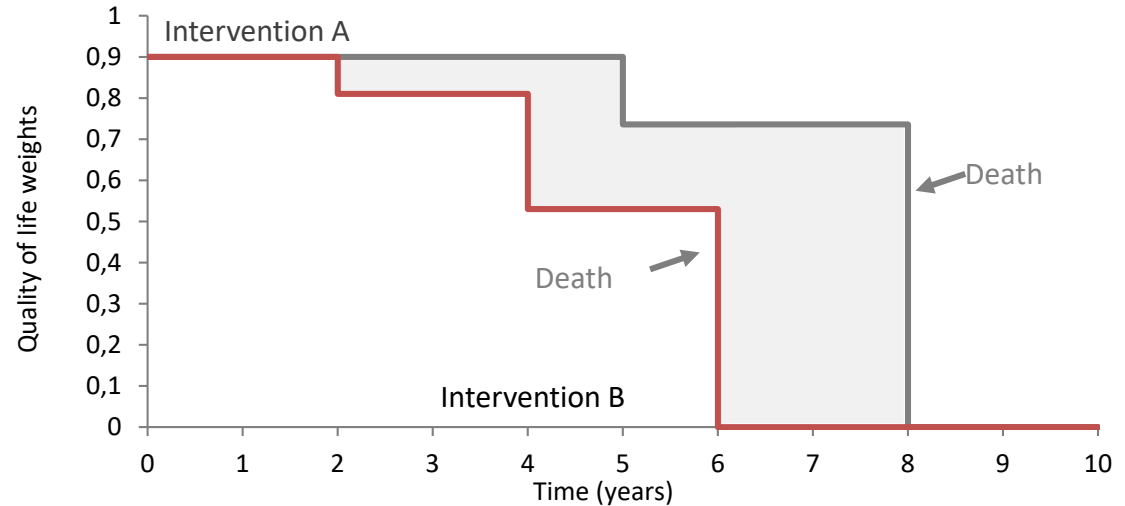
 Quality-adjusted life expectancy (QALE)

QALE/LE based on a treatment-naïve patient aged 43; estimated by contemporary cost-effectiveness model parameters and are indicative only

# Combining Length and Quality of Life Lived

## The Quality Adjusted Life Year (QALY)

- Desirable interventions increase both the length and quality of life, factors captured by the QALY - e.g. through avoidance of complications



# Informing Healthcare Decisions

- Health economics is dominated by the simple concept of cost effectiveness
- The Incremental Cost Effectiveness Ratio (ICER)

$$\frac{(\text{Total cost}_A - \text{Total cost}_B)}{(\text{Total benefit}_A - \text{Total benefit}_B)} = \frac{\text{Incremental cost}}{\text{Incremental benefit}}$$

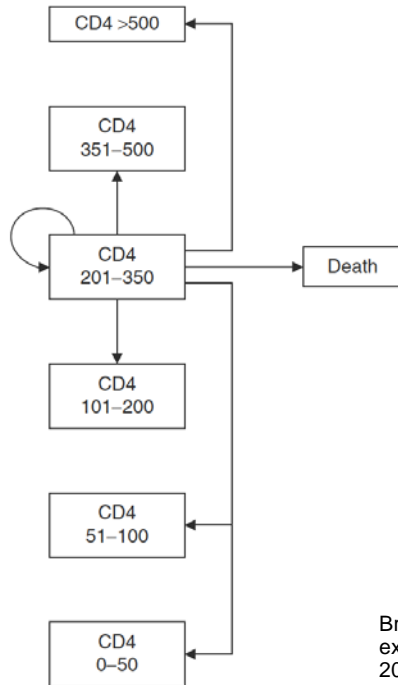
- Benefit often measured using quality adjusted life years (QALYs)
- New technologies deemed cost effective if ICER < £20,000 per QALY gained<sup>1</sup>

Source: 1. McCabe et al. The NICE cost-effectiveness threshold: what it is and what that means. *Pharmacoeconomics*. 2008;26(9):733-44.



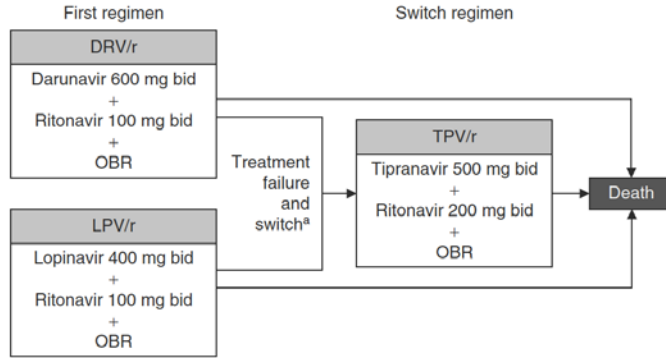
# Illustrating a Typical Cost-Effectiveness Application

US Cost Effectiveness of Darunavir/Ritonavir 600/100mg bid in Treatment-Experienced, HIV-Infected Adults with Evidence of Protease Inhibitor Resistance Included in the TITAN Trial

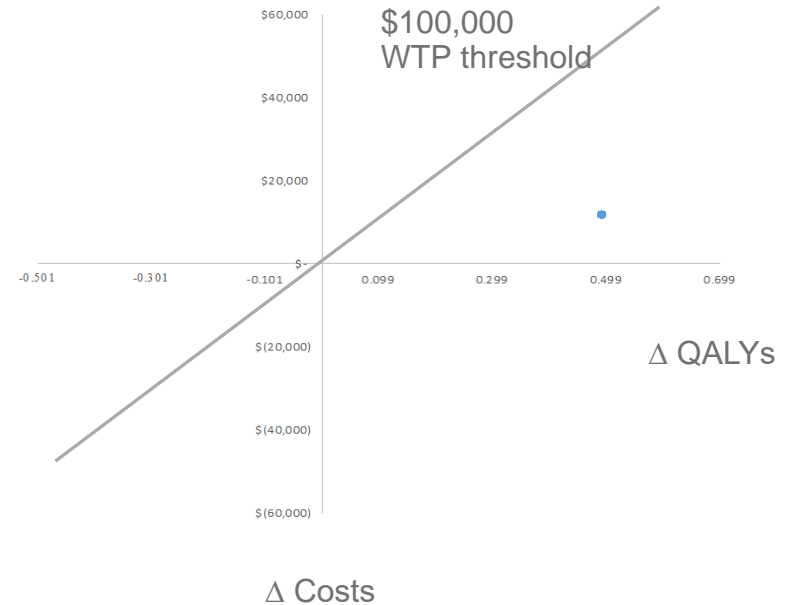


CD4 range	HIV mortality (annual %)	Utility	Non-ART Costs
0-100	17.6	0.781	\$12,442
51-100	5.5	0.853	\$6,301
101-200	2.2	0.853	\$6,301
201-350	0.8	0.931	\$4,406
351-500	0.4	0.933	\$4,406
>500	0.4	0.946	\$3,114

# Comparators and Key Results



## Cost Effectiveness Plane



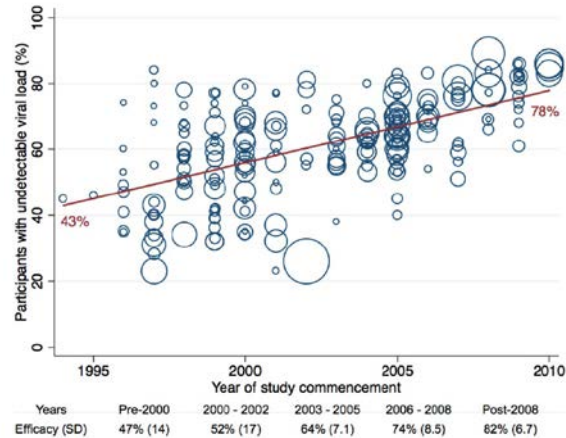
## Results

	DRV/r	LPV/r	Difference
Cost (\$)	593,024	581,666	11,358
QALYs	12.512	12.020	0.493

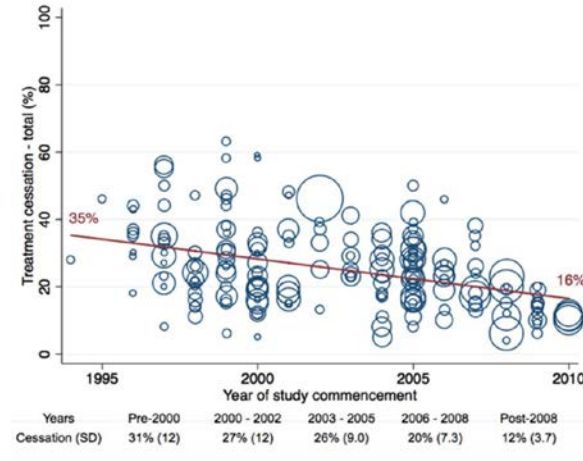
$$\text{ICER} = \$11,358 / 0.493 = \$23,039$$

# Efficacy of Initial Antiretroviral Therapy for HIV-1 Infection in Adults

A Systematic Review and Meta-Analysis of 114 Studies with up to 144 Weeks' Follow-Up



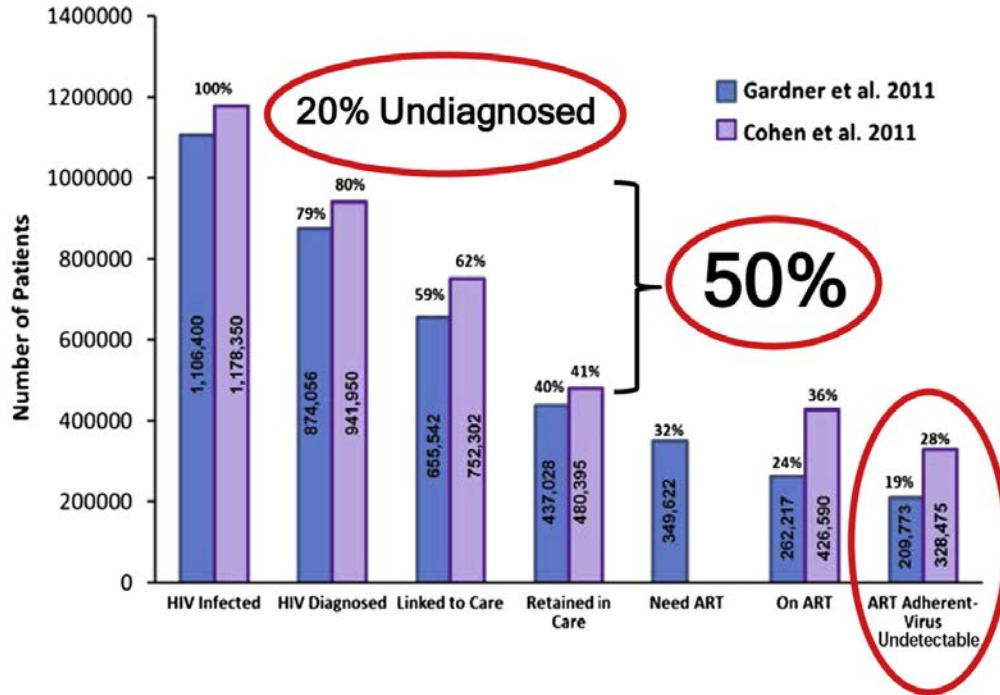
Efficacy by year of study commencement



Premature cessation of initial antiretroviral therapy by year of study commencement

# Engagement in HIV Care

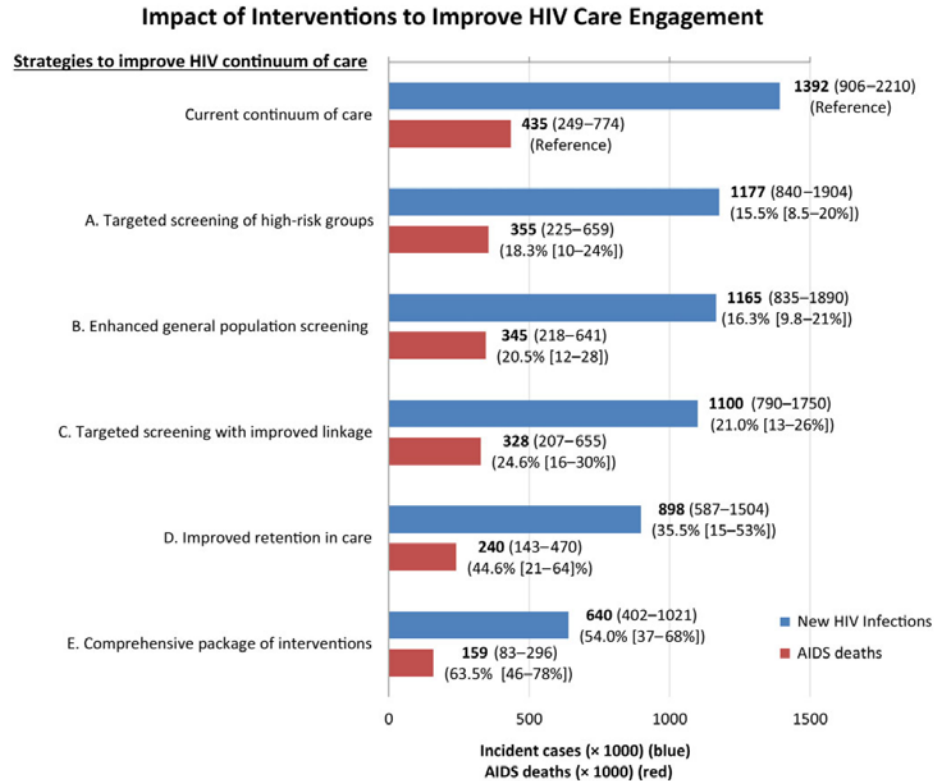
- Timely diagnosis, linkage and retention in care and early treatment is related to reduced morbidity, mortality and HIV transmissions



Eaton et al. Engagement in Human Immunodeficiency Virus Care Linkage, Retention, and Antiretroviral Therapy Adherence. Infect Dis Clin N Am 28 (2014) 355–369

# Engagement in HIV Care

- Focus often on screening and and early treatment
- Suboptimal linkage and retention in care are important drivers of ongoing HIV transmission and cost of care



Shah M, Risher K, Berry SA, Dowdy DW. The Epidemiologic and Economic Impact of HIV Care in the United States. Clin Infect Dis. 2016 Jan 15;62(2):220-229.

# The Health Economic Benefit of Linkage to Care

- Primary HIV
  - Costs: lifetime costs estimated in region of \$200,000 to \$400,000
  - QALYs: lifetime QALY gains in region of 4 to 7 QALYs
- Secondary HIV
  - Costs: \$300,000 to \$500,000 costs saved per infection avoided
  - QALYs: 5-13 QALYs saved per infection avoided
- These figures exclude the impact on lifestyle, relationships, social exclusion, work and income

1. Holtgrave DR, Pinkerton SD. Updates of cost of illness and quality of life estimates for use in economic evaluations of HIV prevention programs. *J Acquir Immune Defic Syndr.* 1997;16:54–62.
2. Hutchinson AB, Patel P, Sansom SL, et al. Cost effectiveness of pooled nucleic acid amplification testing for acute HIV infection after third-generation HIV antibody screening and rapid testing in the United States: a comparison of three public health settings. *PLoS Med.* 2010;7:e1000342.
3. Holtgrave D, Wolitski R, Pals S, et al. Cost utility analysis of the housing and health intervention for homeless and unstably housed persons living with HIV. *AIDS Behav.* 2013;17:1626–1631.
4. Farnham PG, Gopalappa C, Sansom SL, et al. Updates of lifetime costs of care and quality of life estimates for HIV-infected persons in the United States: late versus early diagnosis and entry into care. *J Acquir Immune Defic Syndr.* 2013;64:183–189.

# Summary

- Improved identification, linkage and retention can be associated with significant gains in LE and QALE but also an increase in costs in the short term
- Cost effective  $\neq$  cost saving
- Over the longer-term the cost offsets associated with reduced transmission risk significantly impact predicted cost-effectiveness
- The efficient allocation of scarce resources requires acknowledgement of all the relevant outcomes
- The economic consequences associated with barriers to care extend well beyond those directly affecting the healthcare system