HIV Screening and Care: Clinical Outcomes, Transmission and Cost

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Road Map

- Common misconceptions about cost-effectiveness analysis
- Findings from recent evaluations
- Findings on the survival benefits of AIDS treatments in the United States

Cost-effectiveness: Common Misconception #1

"Cost-Effective" = "Cheap"

"Cost-Effective" = "Saves Money"

Cost-effectiveness is about Value for Money

- comparative assessment of “worth” or “return on investment”
- the cost effectiveness ratio:

$$\frac{\textbf{Net Change in Cost (\$)}}{\textbf{Net Change in Health Effect (LY; QALY)}}$$

- can be employed to compare competing claims on scarce resources

Cost-effectiveness of Chronic Disease Screening

Screening Program	C-E ratio ($/QALY)	Reference
Hypertension asymptomatic men >20 y/o	$80,400	Littenberg *Ann Intern Med* 1990
Diabetes Mellitus, Type 2 fasting plasma glucose, adults >25 y/o	$70,000	CDC C-E Study Grp. *JAMA* 1998
Colon cancer FOBT + SIG q5y, adults 50–85 y/o	$57,700	Frazier *JAMA* 2000
Breast cancer annual mammogram, women 50–69 y/o	$57,500	Salzmann *Ann Intern Med* 1997
HIV routine, rapid testing in health settings	$50,000	Paltiel *Ann Intern Med* 2006

Cost-effectiveness: Common Misconception #2

If an intervention is cost-effective, providers should be willing to pay for it.

Cost-effectiveness does not address the question of who should pay

- Cost-effectiveness analysis is typically performed from a societal perspective
- Accounts for all costs and benefits, regardless of who incurs or enjoys them.
- *Cost-effective* from the societal perspective does not imply *cost-effective* from the hospital (or individual or provider) perspective.

Cost-effectiveness: Common Misconception #3

Cost-effectiveness geeks like Paltiel think they have the right answer. *

* This may not be a misconception.

C-E: Only one of many criteria for judging the appropriateness of screening

1) Important health problem.
2) Natural history well understood.
3) Detectable early stage.
4) More benefit from early treatment.
5) Acceptable test.
6) Intervals for repeating the test determined.
7) Adequate health service provision made for the extra clinical workload resulting from screening.
8) Physical/psychological risks less than benefits.
9) **Costs balanced against the benefits.**

Wilson JM, Jungner G. *Principles and practice of screening for disease*. Geneva: World Health Organization, 1968.

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Acknowledgments

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A model-based approach*

- Computer simulations of the natural history and detection of HIV disease.
- Capture effects of CD4, HIV-RNA, OI incidence, and the impact of ART and other therapies.
- Assemble data from observational cohorts, clinical trials, cost surveys, and other published sources.
- Project outcomes: life expectancy, quality-adjusted life-expectancy, cost, cost-effectiveness.

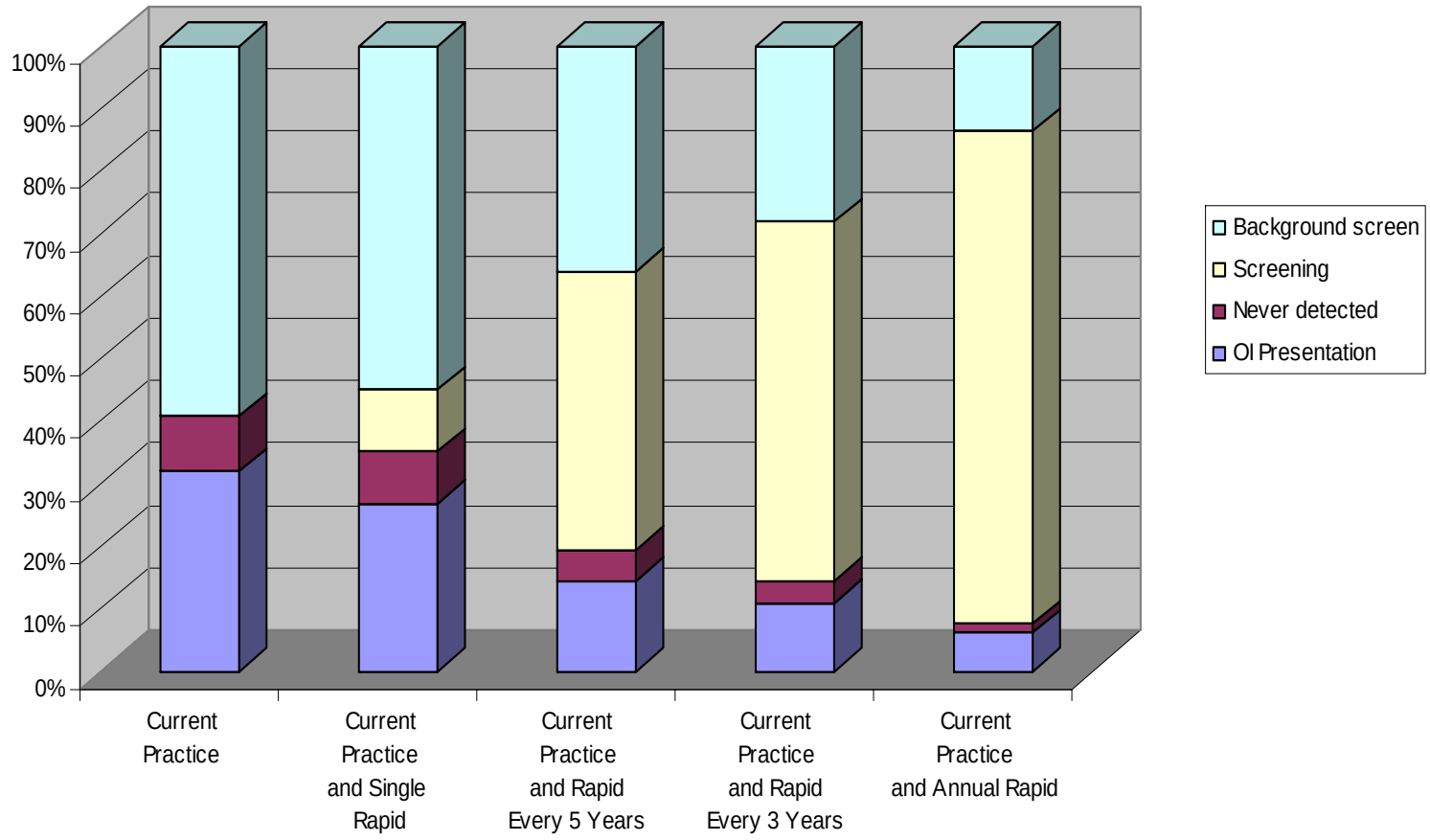
* So many assumptions/limitations, so little time…

Routine HIV screening is cost effective, even in very low-risk populations

Screening Program	C-E ratio ($/QALY)	Reference
Inpatient antibody testing	$38,600	Walensky *Am J Med* 2005
"Routine" standard antibody testing in populations with prevalence = 1%	$41,700	Sanders *NEJM* 2005
"One-time" rapid antibody testing in populations with prevalence = 0.2%	$50,000	Paltiel *Ann Intern Med* 2006
Standard antibody test, every 5 years, in high-risk populations	$50,000	Paltiel *NEJM* 2005

Why HIV screening is cost-effective

1. It changes the mechanism of HIV detection



2. It results in earlier detection of illness

	Current Practice	*Current Practice & One-Time EIA*	*Current Practice & EIA Every 5 Years*	*Current Practice & EIA Every 3 Years*	*Current Practice & Annual EIA*
CD4 Count at Detection					
Prevalent Cases	**154**	**210**	**211**	**213**	**227**
Incident Cases	**347**	**347**	**397**	**421**	**473**

Paltiel, *NEJM*, 2005

3. Earlier detection improves survival

	Current Practice	*Current Practice & One-Time EIA*	*Current Practice & EIA Every 5 Years*	*Current Practice & EIA Every 3 Years*	*Current Practice & Annual EIA*
CD4 Count at Detection					
Prevalent Cases	**154**	**210**	**211**	**213**	**227**
Incident Cases	**347**	**347**	**397**	**421**	**473**
Discounted Survival (months)	**254.41**	**254.88**	**256.17**	**256.66**	**257.41**

Paltiel, *NEJM*, 2005

4. And while it does increase costs…

	Current Practice	*Current Practice & One-Time EIA*	*Current Practice & EIA Every 5 Years*	*Current Practice & EIA Every 3 Years*	*Current Practice & Annual EIA*
CD4 Count at Detection					
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Per Person, Discounted Lifetime Costs ($)					
	32,700	**33,800**	**37,300**	**38,900**	**41,700**

Paltiel, *NEJM*, 2005

4. …it's worth it!

	Current Practice	*Current Practice & One-Time EIA*	*Current Practice & EIA Every 5 Years*	*Current Practice & EIA Every 3 Years*	*Current Practice & Annual EIA*
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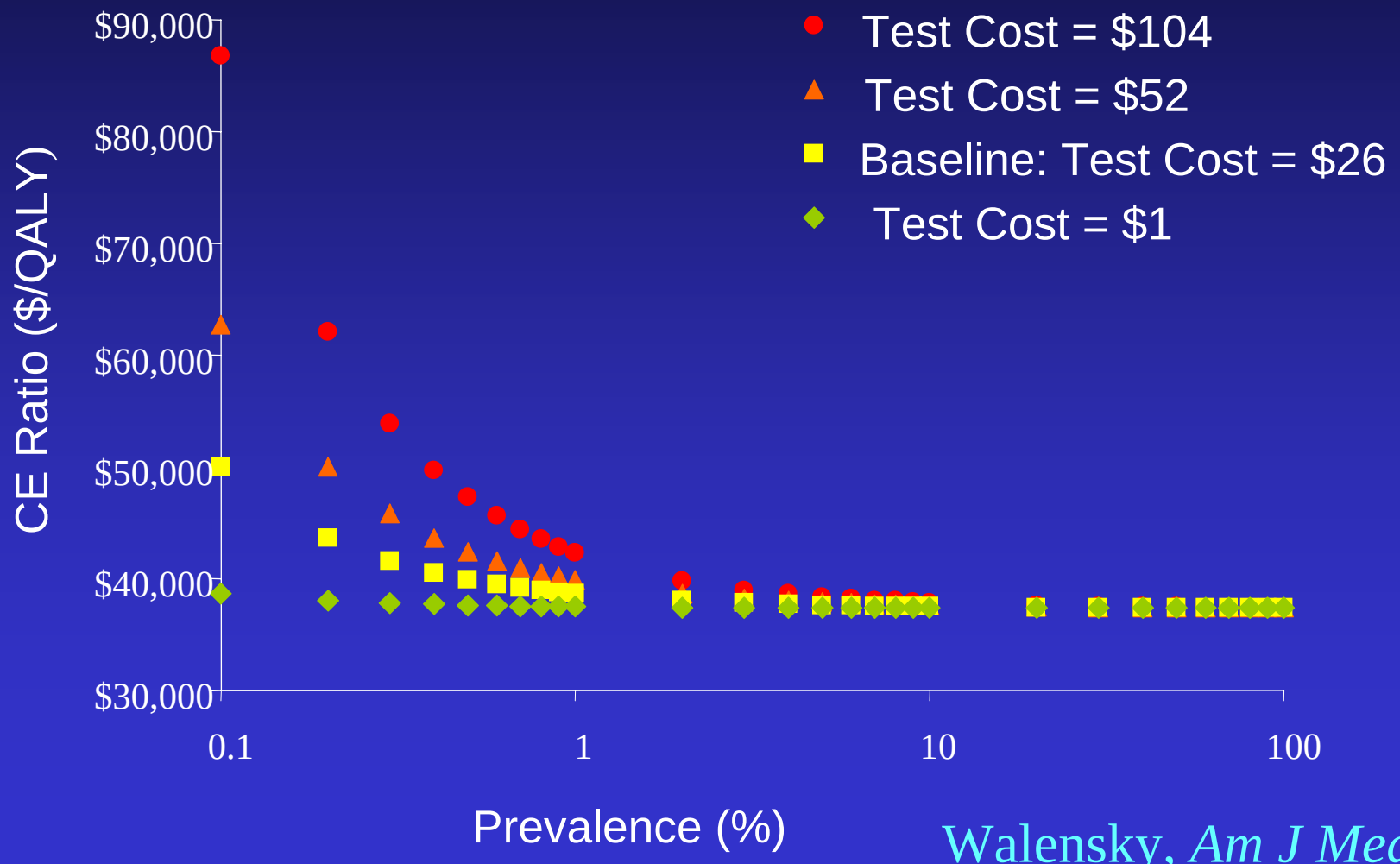
Per Person, Discounted Lifetime Costs ($)					
	32,700	**33,800**	**37,300**	**38,900**	**41,700**
Cost-effectiveness ($/QALY)	**---**	**36,000**	**50,000**	**63,000**	**100,000**

Paltiel, *NEJM*, 2005

Insensitivity to both undetected prevalence and the cost of the test



Walensky, *Am J Med* 2005

What about the secondary transmission benefits of HIV screening?

Annals of Internal Medicine | ARTICLE

Expanded HIV Screening in the United States: Effect on Clinical Outcomes, HIV Transmission, and Costs

A. David Paltiel, PhD; Rochelle P. Walensky, MD, MPH; Bruce R. Schackman, PhD; George R. Seage III, ScD, MPH; Lauren M. Mercincavage, AB; Milton C. Weinstein, PhD; and Kenneth A. Freedberg, MD, MSc

Background: An extensive literature supports expanded HIV screening in the United States. However, the question of whom to test and how frequently remains controversial.

Objective: To inform the design of HIV screening programs by identifying combinations of screening frequency and HIV prevalence and incidence at which screening is cost-effective.

Design: Cost-effectiveness analysis linking simulation models of HIV screening to published reports of HIV transmission risk, with and without antiretroviral therapy.

Data Sources: Published randomized trials, observational cohorts, national cost and service utilization surveys, the Red Book, and previous modeling results.

Target Population: U.S. communities with low to moderate HIV prevalence (0.05% to 1.0%) and annual incidence (0.0084% to 0.12%).

Time Horizon: Lifetime.

Perspective: Societal.

Interventions: One-time and increasingly frequent voluntary HIV screening of all adults using a same-day rapid test.

Outcome Measures: HIV infections detected, secondary transmissions averted, quality-adjusted survival, lifetime medical costs, and societal cost-effectiveness, reported in discounted 2004 dollars per quality-adjusted life-year (QALY) gained.

Results of Base-Case Analysis: Under moderately favorable assumptions regarding the effect of HIV patient care on secondary transmission, routine HIV screening in a population with HIV prevalence of 1.0% and annual incidence of 0.12% had incremental cost-effectiveness ratios of $30 800/QALY (one-time screening), $32 300/QALY (screening every 5 years), and $55 500/QALY (screening every 3 years). In settings with HIV prevalence of 0.10% and annual incidence of 0.014%, one-time screening produced cost-effectiveness ratios of $60 700/QALY.

Results of Sensitivity Analysis: The cost-effectiveness of screening policies varied within a narrow range as assumptions about the effect of screening on secondary transmission varied from favorable to unfavorable. Assuming moderately favorable effects of antiretroviral therapy on transmission, cost-effectiveness ratios remained below $50 000/QALY in settings with HIV prevalence as low as 0.20% for routine HIV screening on a one-time basis and at prevalences as low as 0.45% and annual incidences as low as 0.0075% for screening every 5 years.

Limitations: This analysis does not address the difficulty of determining the prevalence and incidence of undetected HIV infection in a given patient population.

Conclusions: Routine, rapid HIV testing is recommended for all adults except in settings where there is evidence that the prevalence of undiagnosed HIV infection is below 0.2%.

Ann Intern Med. 2006;145:797-806. www.annals.org

For author affiliations, see end of text.

Early detection and timely access to medical care can substantially improve the course of HIV disease among infected persons (1, 2). Whether they also reduce the risk for transmitting the virus to others (3–7) is not clear because survival gains from antiretroviral therapy prolong infectious lifetimes and may lead to complacency toward HIV risk behavior (8). Recent studies report increases in HIV infections, other sexually transmitted diseases, and sexual risk behaviors in vulnerable populations (9–11); access to effective antiretroviral therapy may also be associated with sexual risk-taking (12–14).

As with any new method of screening for chronic disease (for example, hypercholesterolemia and breast, cervical, prostate, and colon cancer [15–19]), the challenge facing both physicians and public health experts is to determine whom to test for HIV infection and how frequently. We address the particular difficulties posed by HIV infection, an infectious disease whose detection and treatment have implications for both the individual being tested and the broader population.

METHODS

Study Design

We used a simulation model (20) to project the performance of increasingly frequent HIV screening of all adults using a rapid testing protocol (21–23) in communi

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Appendix
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Appendix Figure
CME quiz
Conversion of figures and tables into slides

- Population-level effects are comparatively small.
- The principal costs and benefits of HIV screening are those that accrue to the infected individual.
- Individual-level outcomes alone justify expansion of HIV screening in all but the lowest-risk populations.

Paltiel, *Ann Int Med*, 2006

Implicit Assumption: Adequate linkage to lifesaving care

1) Important health problem.
2) Natural history well understood.
3) Detectable early stage.
4) More benefit from early treatment.
5) Acceptable test.
6) Intervals for repeating the test determined.
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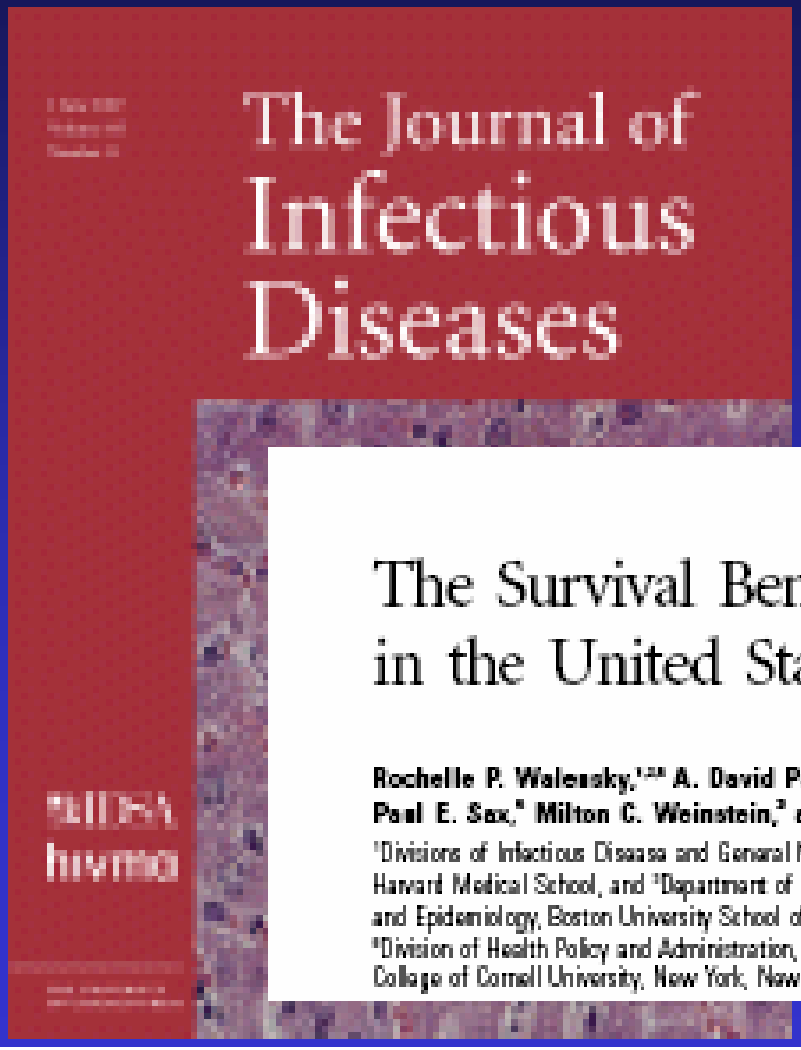
Why bother testing?



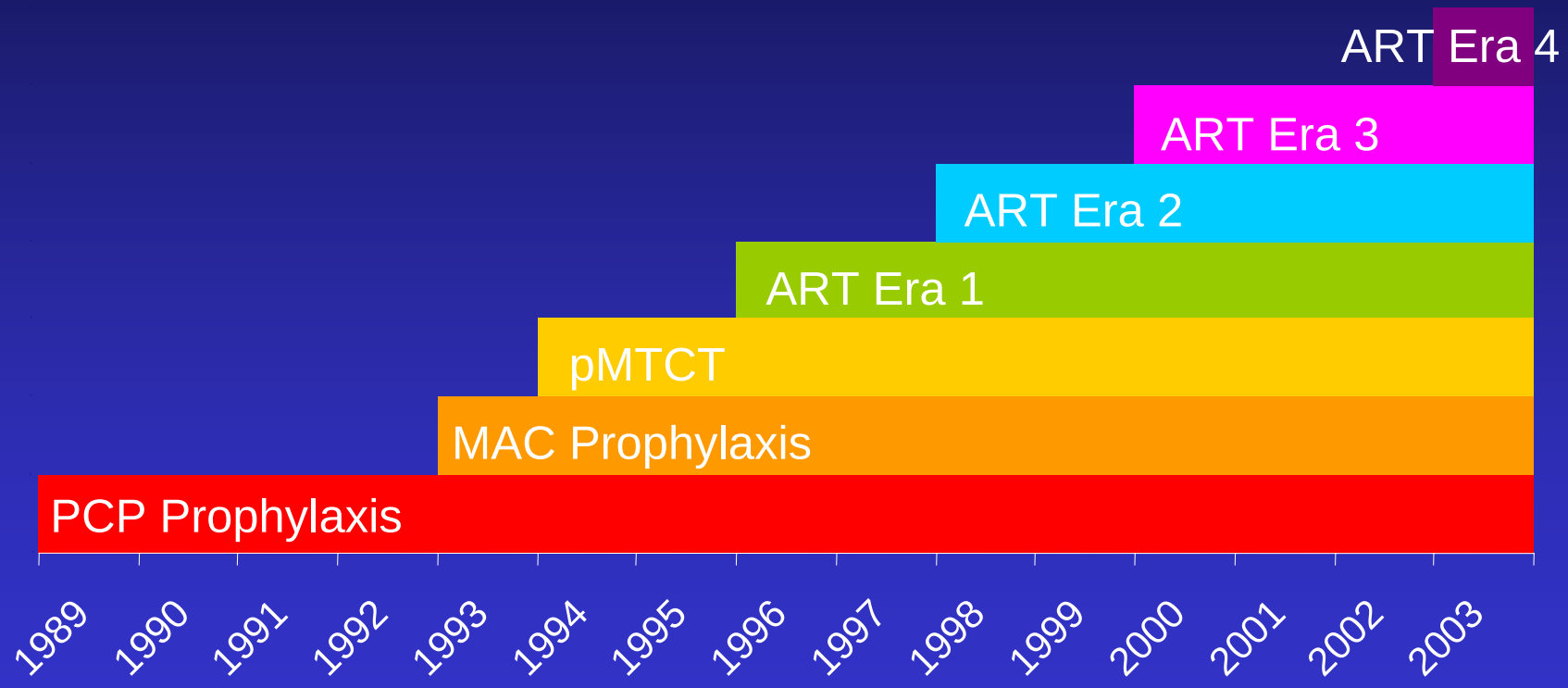
The Survival Benefits of AIDS Treatment in the United States

Rochelle P. Walensky,[1,2,a] A. David Paltiel,[3] Elena Losina,[4] Lauren M. Mercincavage,[1] Bruce R. Schackman,[5] Paul E. Sax,[6] Milton C. Weinstein,[7] and Kenneth A. Freedberg[1,2,8,a]

[1]Divisions of Infectious Disease and General Medicine, Department of Medicine, Massachusetts General Hospital, and [2]Center for AIDS Research, Harvard Medical School, and [3]Department of Health Policy and Management, Harvard School of Public Health, [4]Departments of Biostatistics and Epidemiology, Boston University School of Public Health, and [6]Division of Infectious Disease, Brigham and Women's Hospital, Boston; [5]Division of Health Policy and Administration, Yale School of Medicine, New Haven, Connecticut; [7]Department of Public Health, Weill Medical College of Cornell University, New York, New York

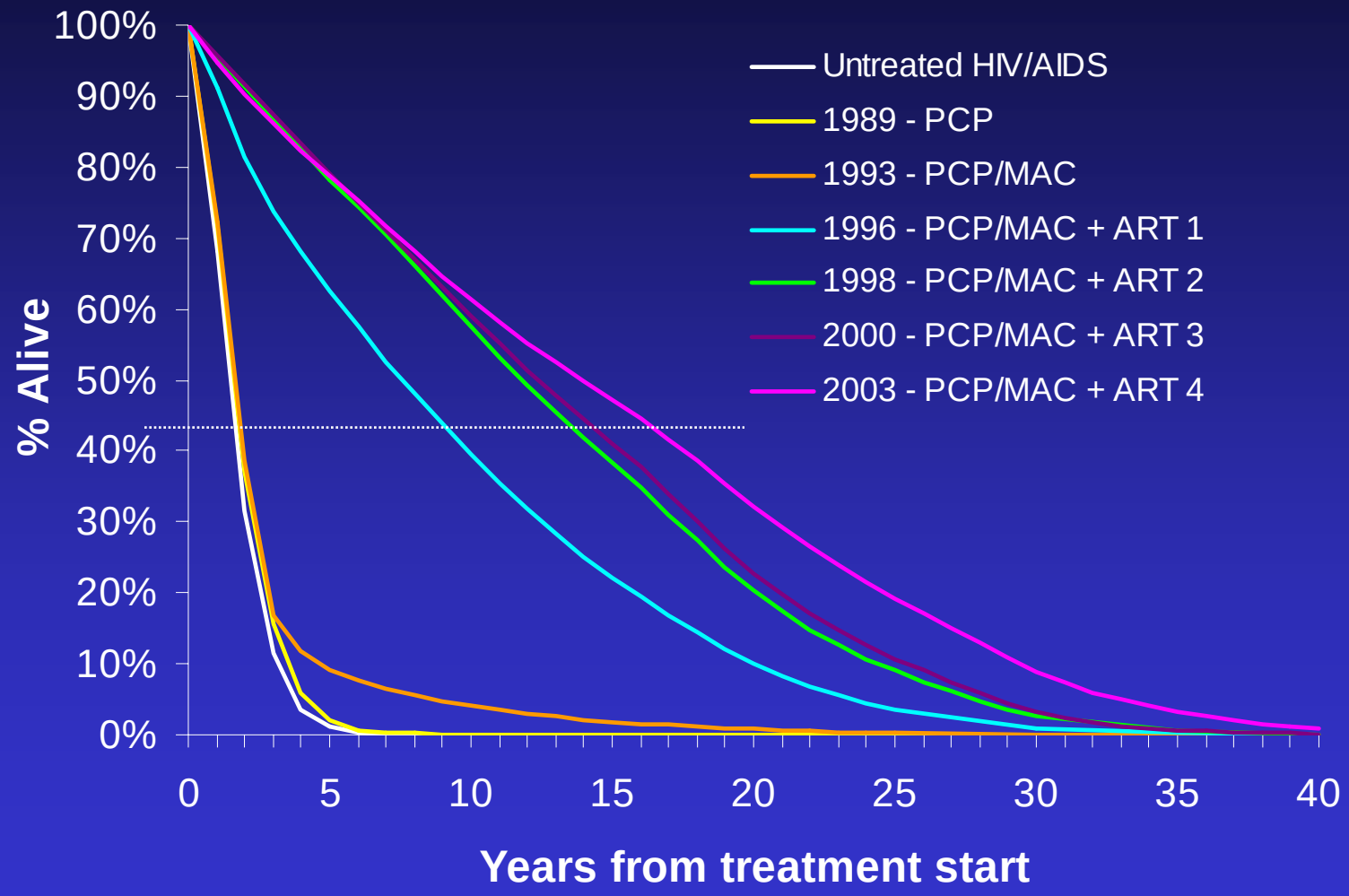
Walensky, *J Infect Dis* 2006

Timeline of Major HIV Interventions



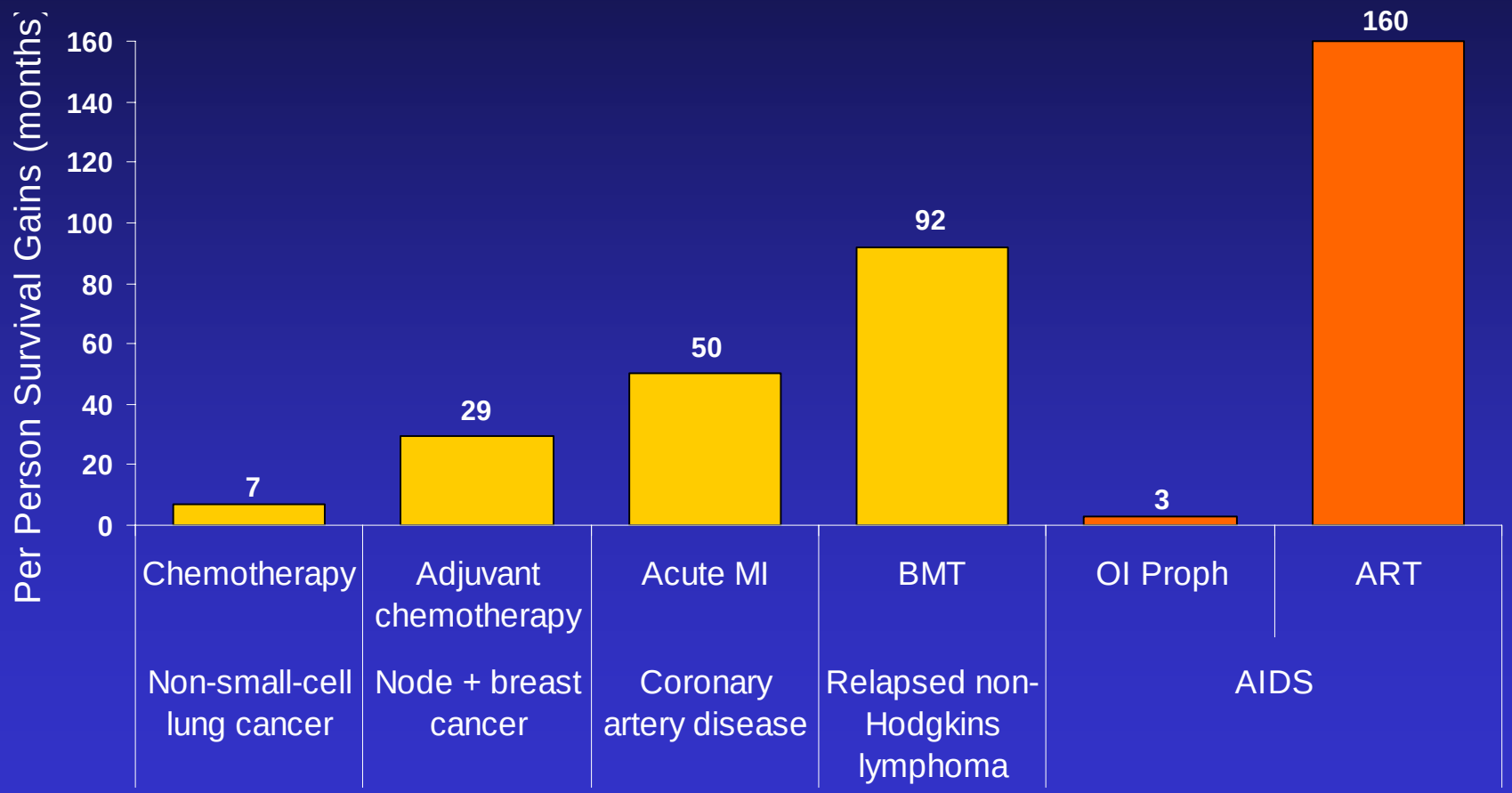
Walensky, *J Infect Dis* 2006

AIDS Survival by Era



Walensky, *J Infect Dis* 2006

Survival Gains Compared with Various Disease Interventions



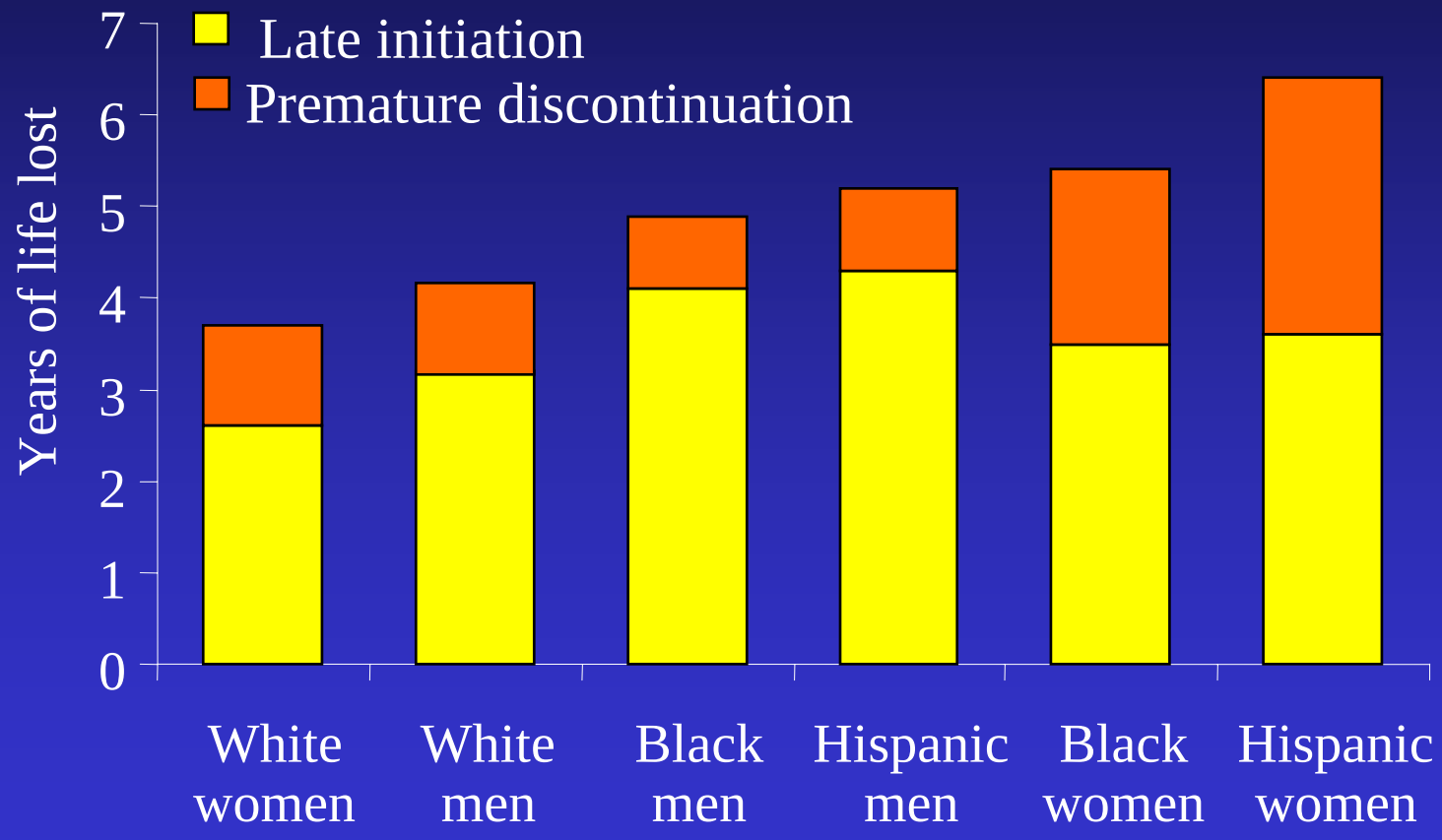
Walensky, *J Infect Dis* 2006

“A celebration with challenges”

– Sten Vermund

- At least 3 million years of life have been saved in the US as a direct result of AIDS patient care
- An additional 740,000 years of life might have been saved, had all patients with AIDS received appropriate treatment on diagnosis.

Not every one has shared equally in the gains



Losina, *CROI* 2006

Conclusions

- HIV screening delivers better value than many other diagnostic tests in routine use.
- Our findings support the CDC recommendation of routine HIV testing for all adults in all health care setting in the US.
- Not all Americans share equally in the huge survival benefits of AIDS therapy. Women from racial and ethnic minorities are at particular risk.
- Effective HIV testing programs must be accompanied by a simultaneous commitment to improved linkage to care and to paying for that care.