

**Economics of Chronic
Hepatitis B and Hepatitis C
Viral Hepatitis Prevention Board
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Health Budget Limitations

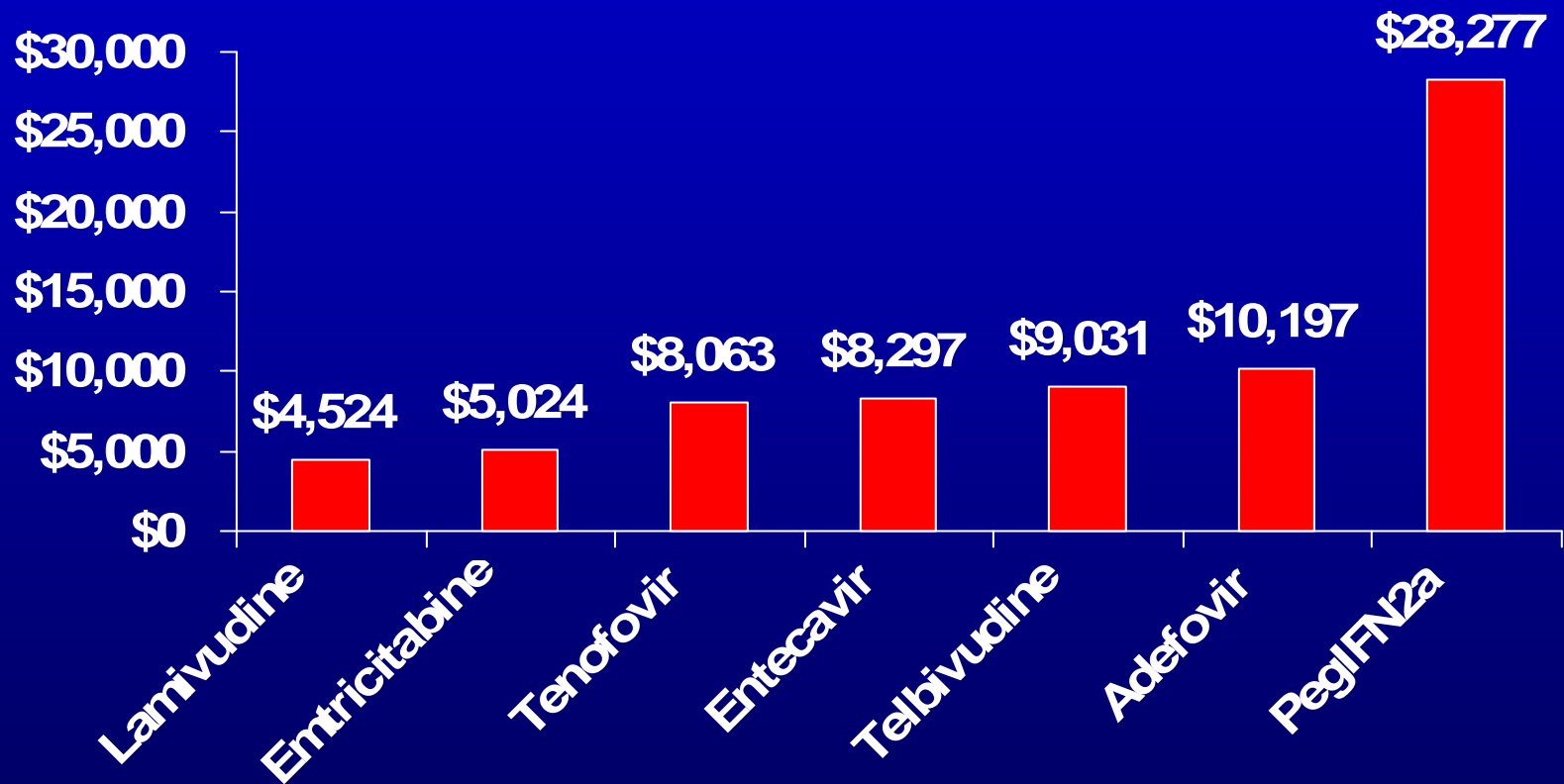
- 2009 U.S. health care expenditures estimated to be \$2.4 trillion or 17% of GDP
 - 40% more on health care: ~\$650 billion in 2008
- “Every country spends 100% of its gross domestic product on something”
- What is important is the value obtained by the spending: **opportunity costs**

Public Health Burden of HCV for 2010-2019

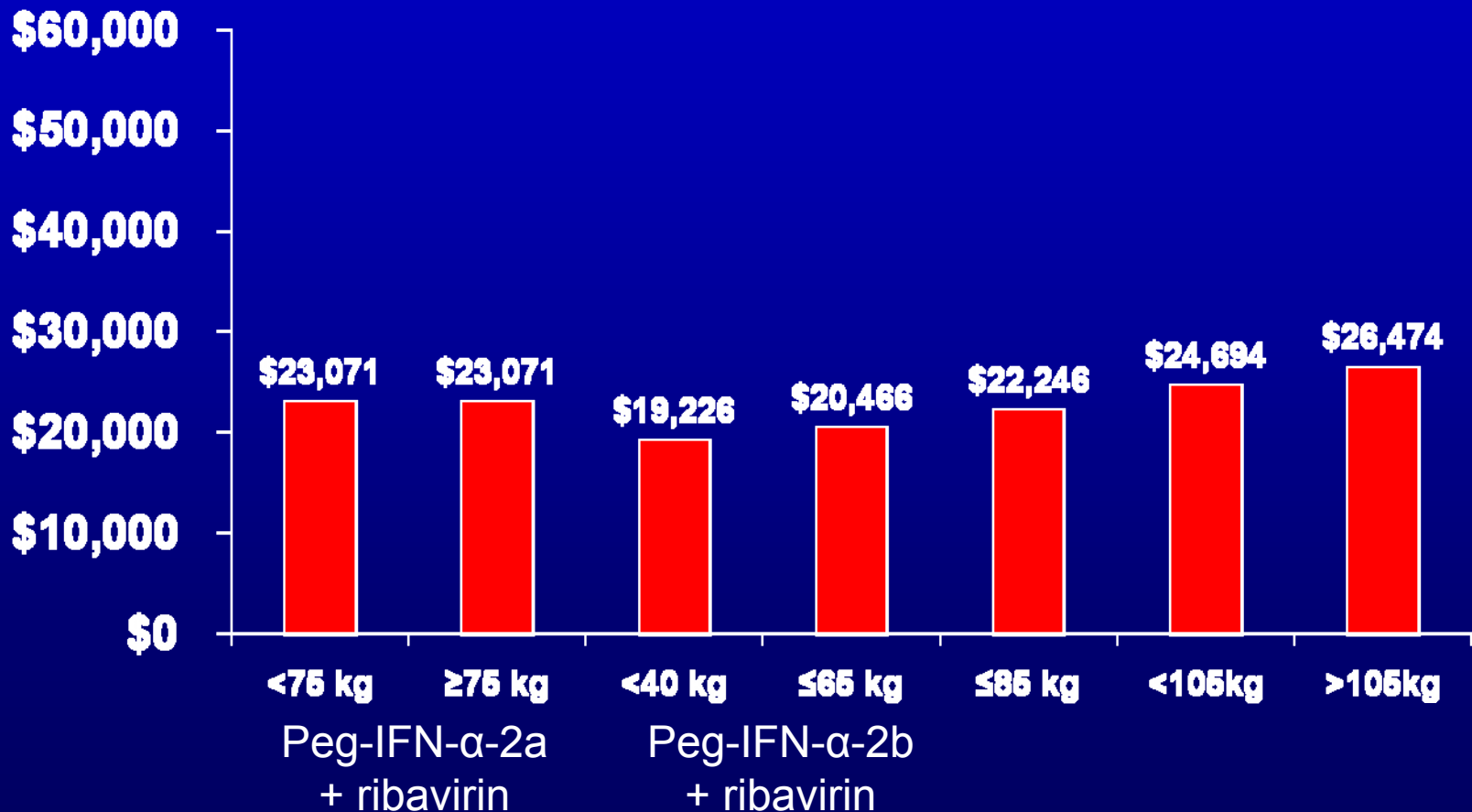
- Predicted 1.5-2-fold ↑ HCV mortality for US, France, Spain, Switzerland, England, Australia and Canada
 - 1 million years of advanced liver disease
 - \$11 billion direct medical care costs
- Observed increase
 - resource use England, US, Canada
 - mortality rates in England, US

Wong JB *Am J Pub Health* 2000;90:1562; Armstrong GL *Hepatology* 2000;31:777; Kim WR *Hepatology* 2002;36:S30; El-Serag H *Hepatology* 2002;36:S74; Sagmeister M *Eur J Gastroenterol Hepatol* 2002;14:25; Davis GL *Liv Transpl* 2003; 9:331; Deuffic J *Hepatology* 2004;40:319; Buti M *J Hepatology* 2005;42:639; Grant WC *Hepatology* 2005;42:1406; Nguyen GC *Clin Gastroenterol Hepatol* 2007;5:1092; Sweeting MJ *J Vir Hep* 2007;14:570; Wise M *Hepatology* 2008;47:128; Mann *Epi Infect* 2009;137:513

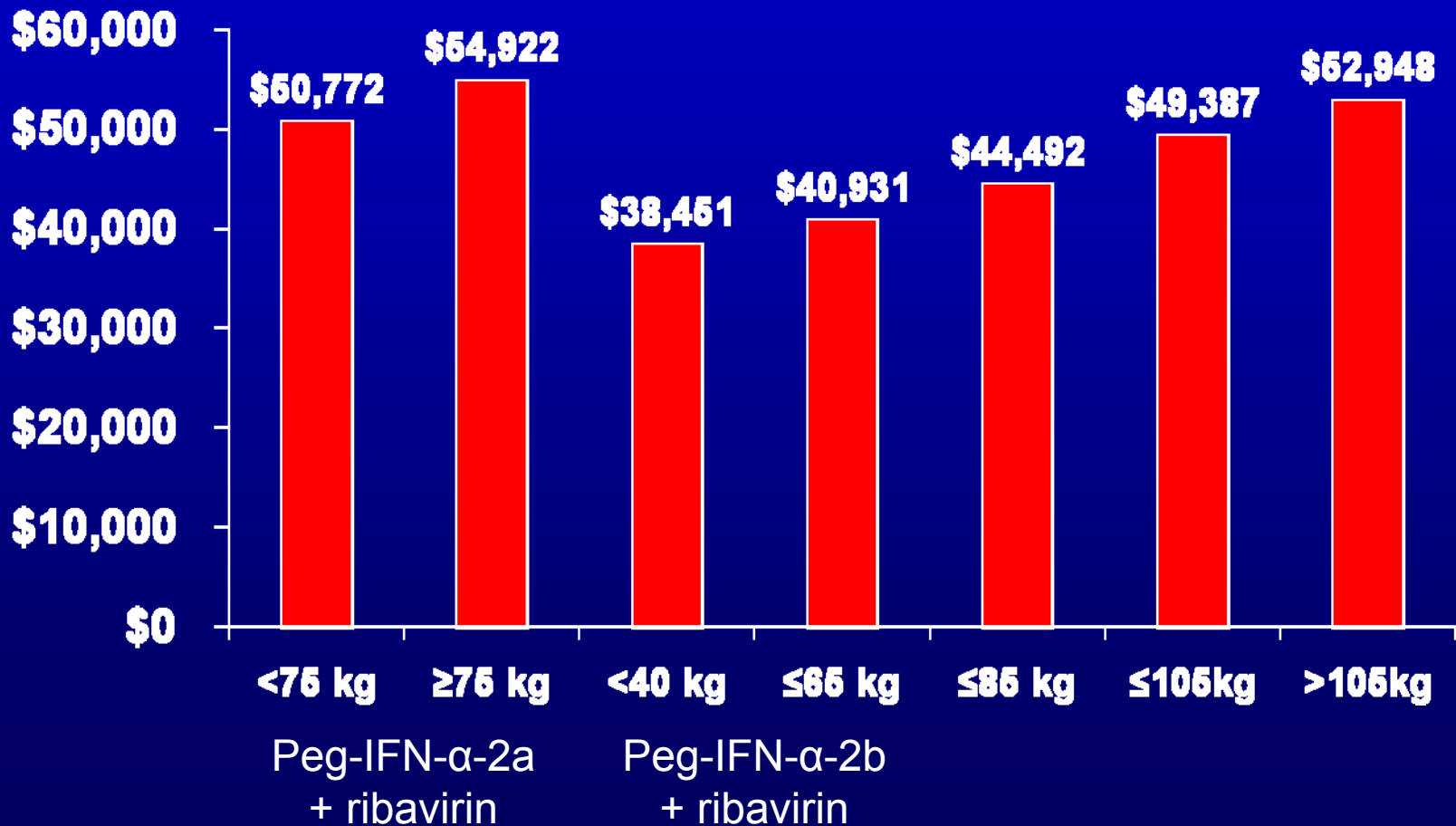
1-Year Average Wholesale US HBV Drug Costs



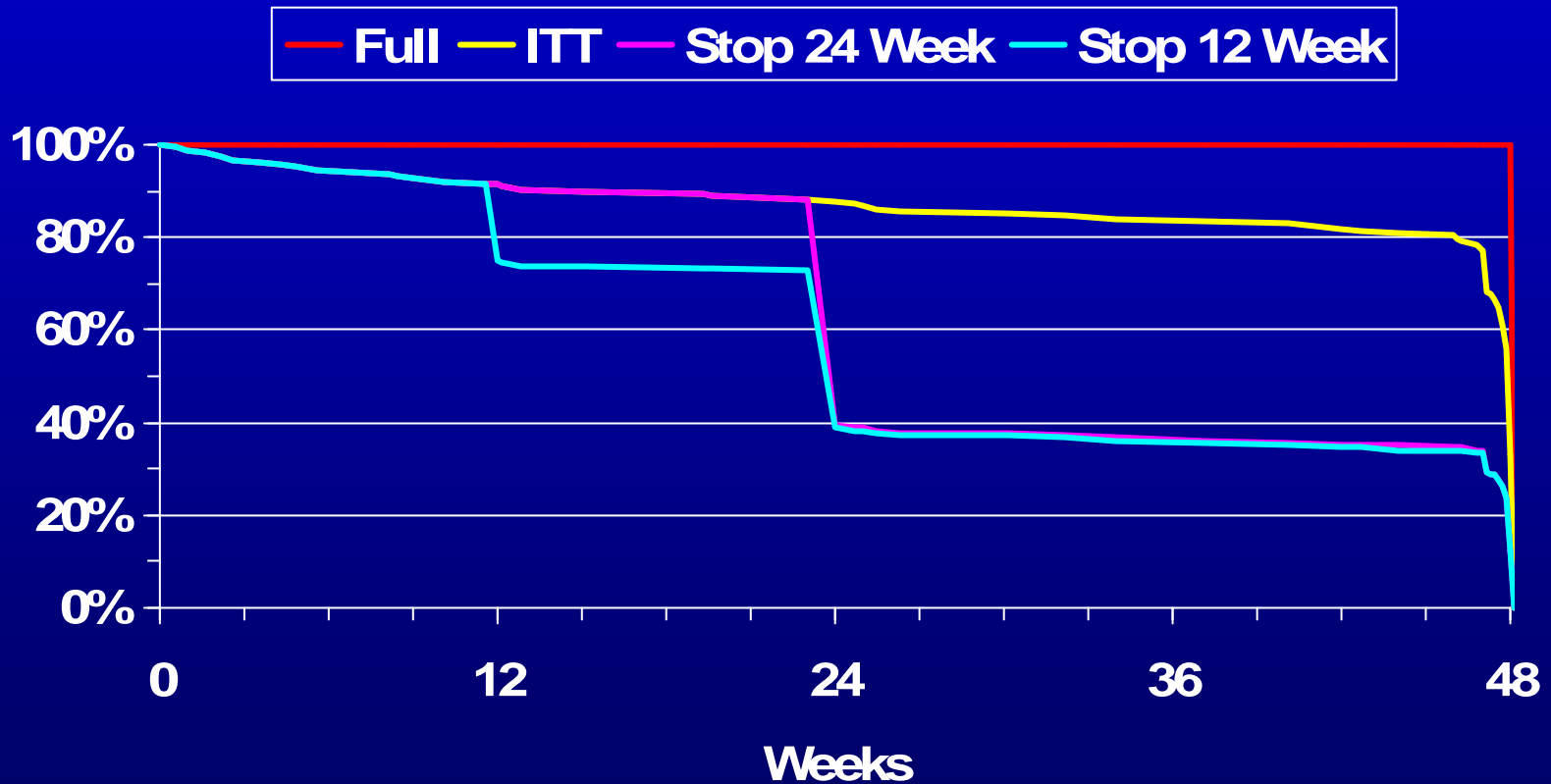
24-Week Average Wholesale US HCV GT2-3 Drug Costs



48-Week Average Wholesale US HCV GT1-4 Drug Costs



Continuing Treatment %



Management algorithms decrease drug costs by ~43%

Wong JB, et al. *Am J Gastroenterol.* 2003;98(11):2354-2362.

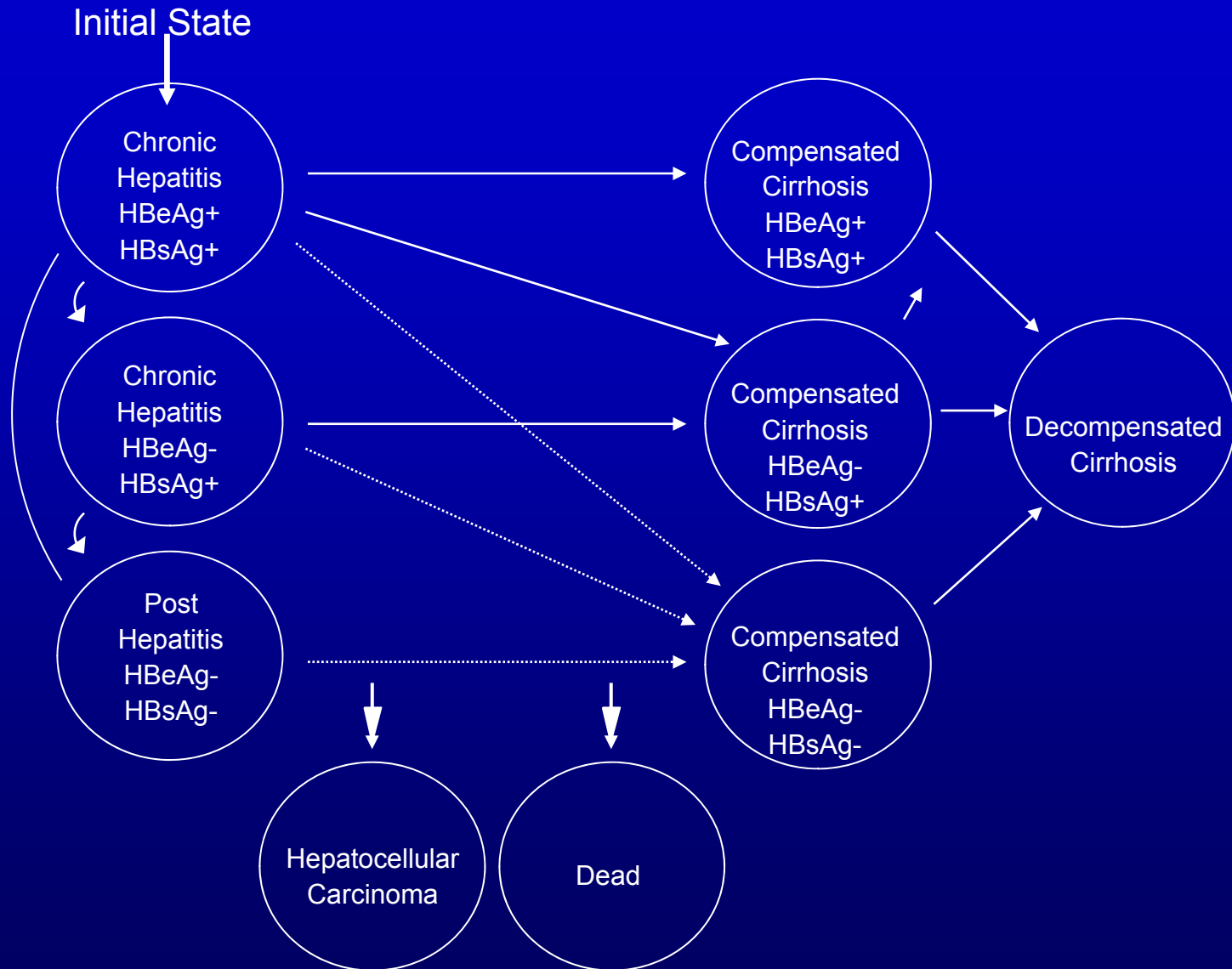
Cost-Effectiveness Analysis

- Considers costs of drugs, drug monitoring, side effects, and effects of disease
- Relies on understanding natural history of the disease and effect of therapy, accounting for death and morbidity
- Randomized lifetime clinical trial impractical, so use computer simulation Markov model

“Essentially, all models are wrong, but some are useful.

-George EP Box

Hepatitis B Model



Hepatitis B Model

	Lifetime Cost	Life Expectancy
HBeAg+	\$63,200	24.0
HBsAg+	\$20,500	34.0

^aExcludes liver transplantation, HCC screening, and nucleoside analogues for compensated or decompensated cirrhosis

“Our advice: Beware of geeks
bearing formulas.”

-Warren Buffett

Marginal or Incremental Cost-Effectiveness Analysis

- Additional cost divided by additional benefit

$$\frac{\text{Cost With New Drug} - \text{Cost With Standard Care}}{\text{Effectiveness With New Drug} - \text{Effectiveness With Std Care}}$$

Incremental Costs

Dominated

Cost-Effectiveness Ratio

↑ Costs
↓ Effectiveness

↑ Costs
↑ Effectiveness

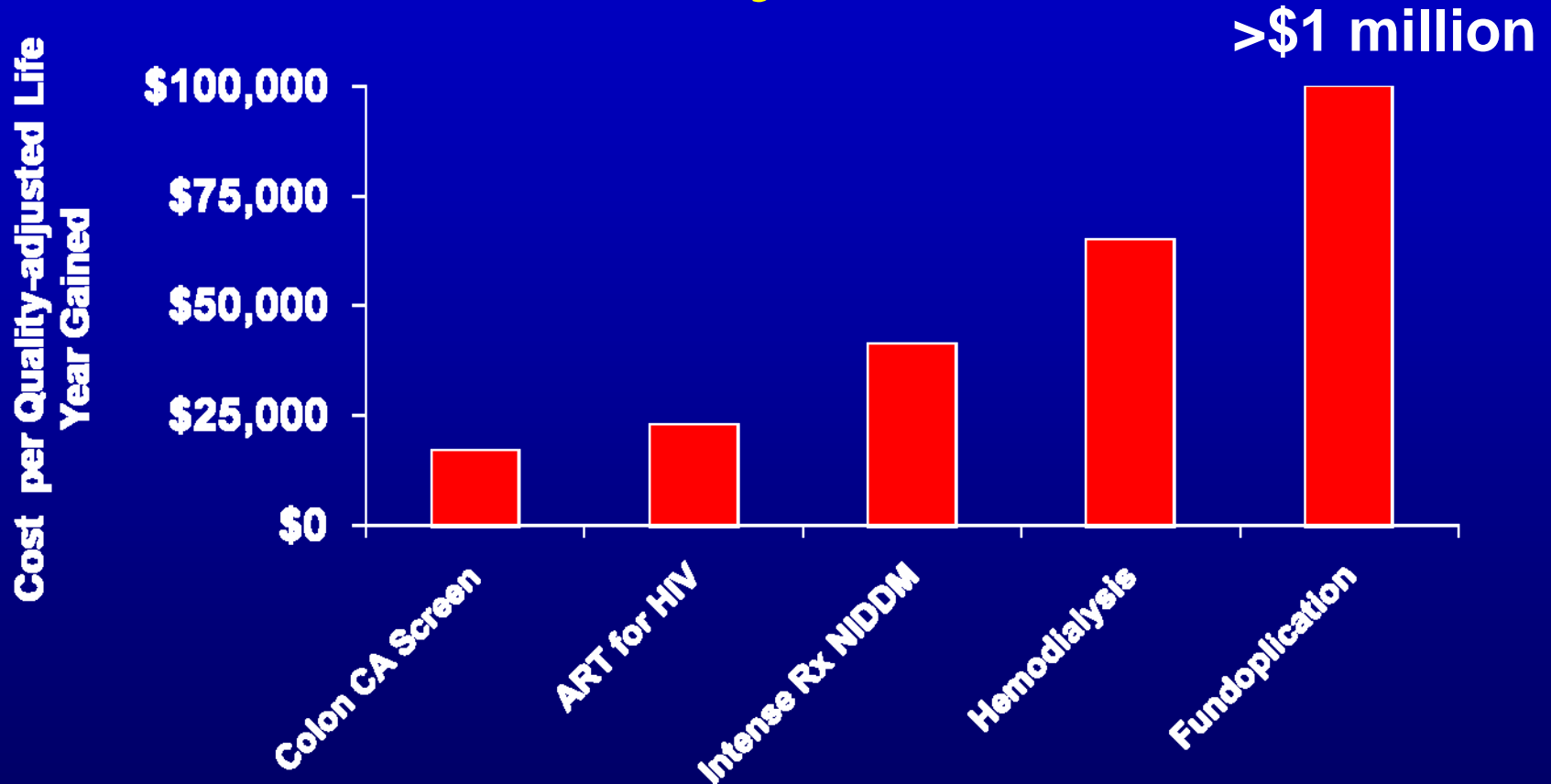
**Incremental
Effectiveness**

↓ Costs
↓ Effectiveness

↓ Costs
↑ Effectiveness

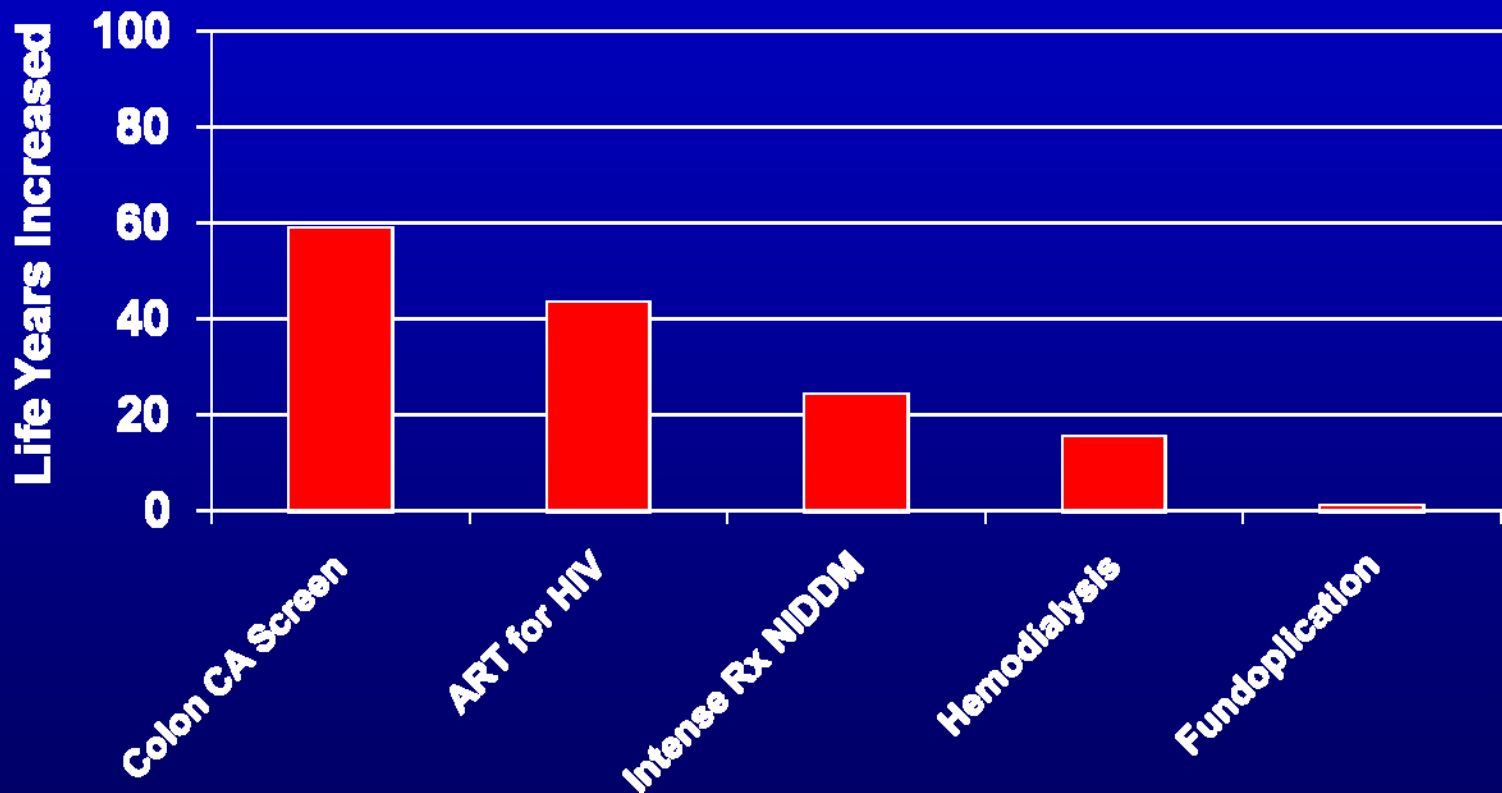
Cost-Saving

Incremental Cost-Utility Analysis

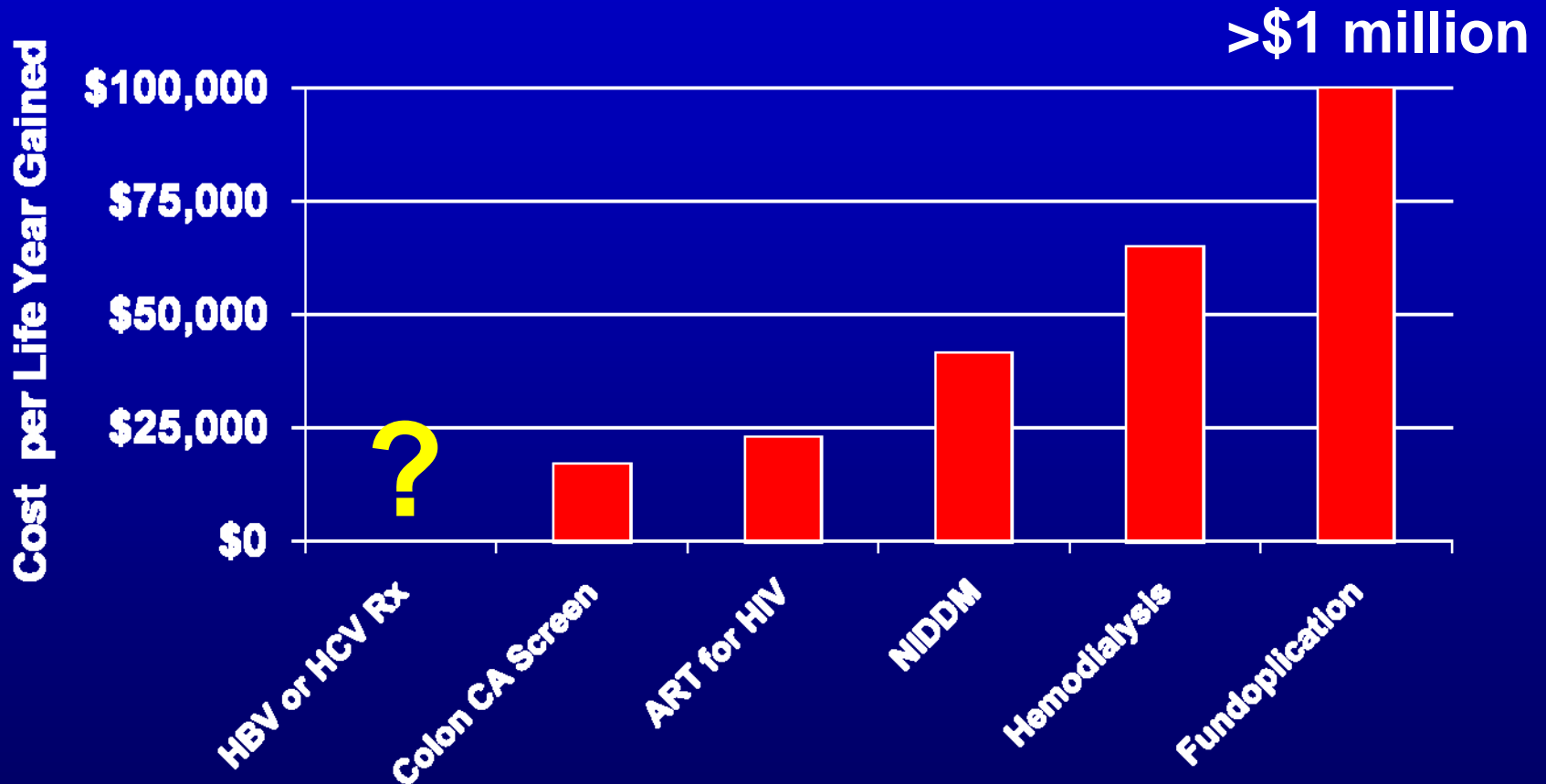


Pignone, *Ann Intern Med* 2002; Freedberg, *N Engl J Med* 2001; CDC, *JAMA* 2002; Winkelmayr, *Med Decis Making* 2002; Heudebert, *Gastroenterology* 1997.

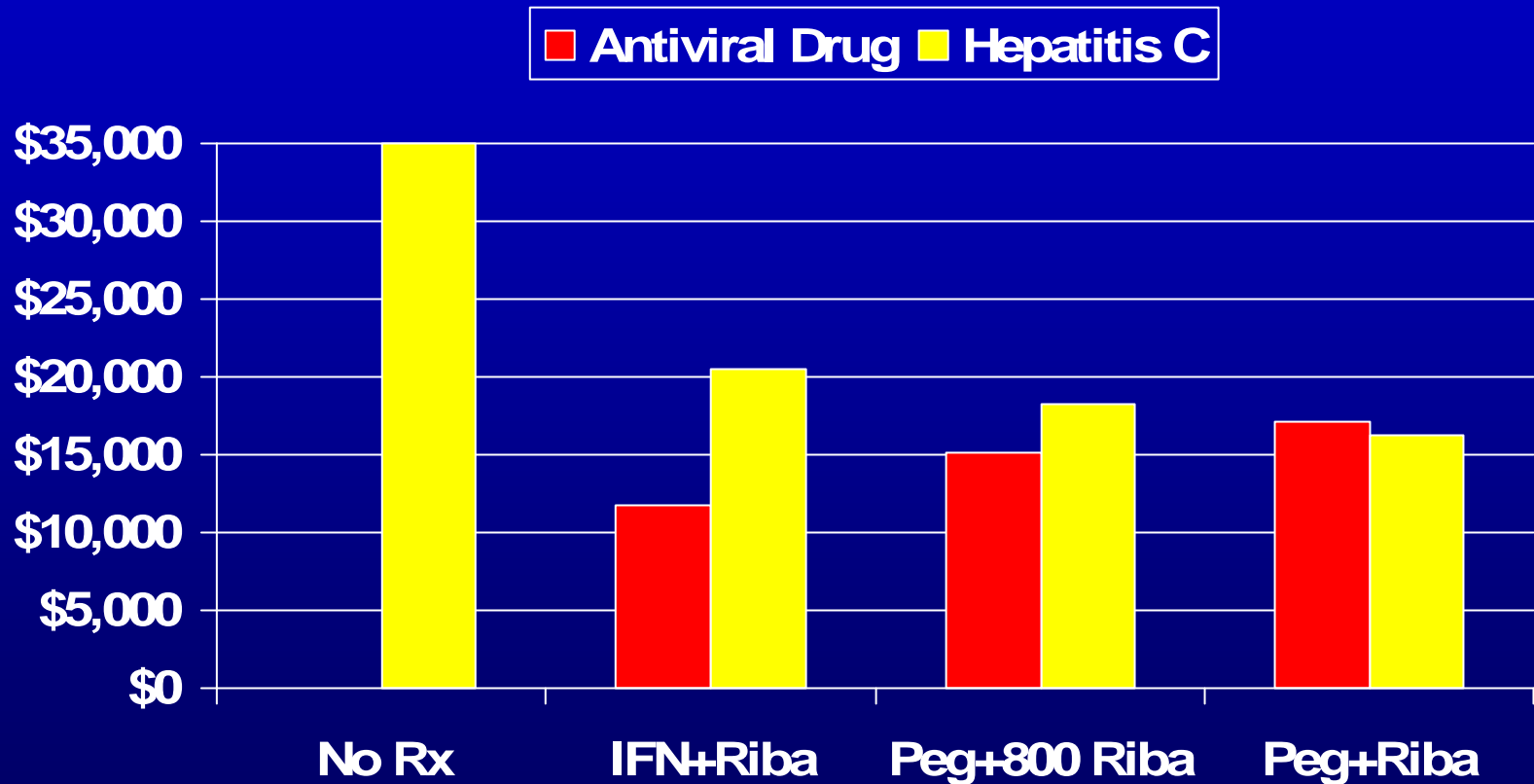
Buying Health for \$1 Million



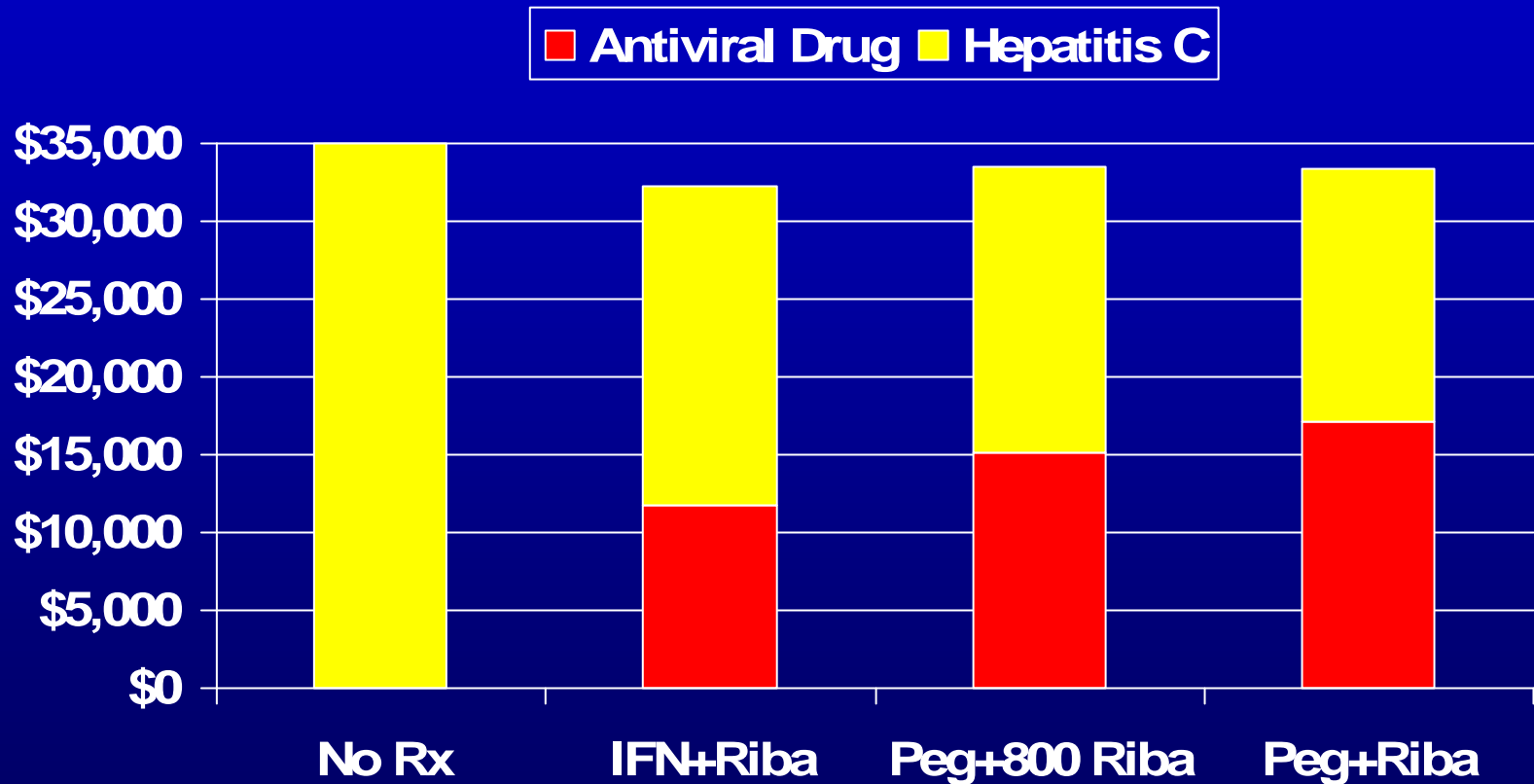
Does HBV or HCV Treatment Provide Good Value?



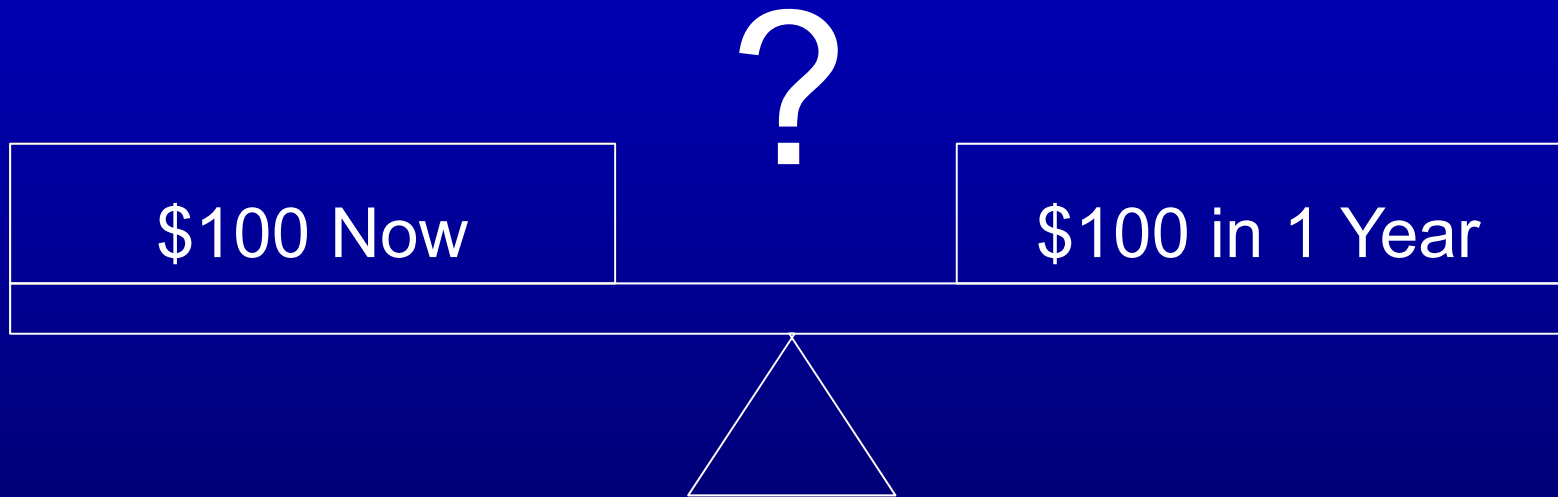
Hepatitis C Costs



Lifetime Costs



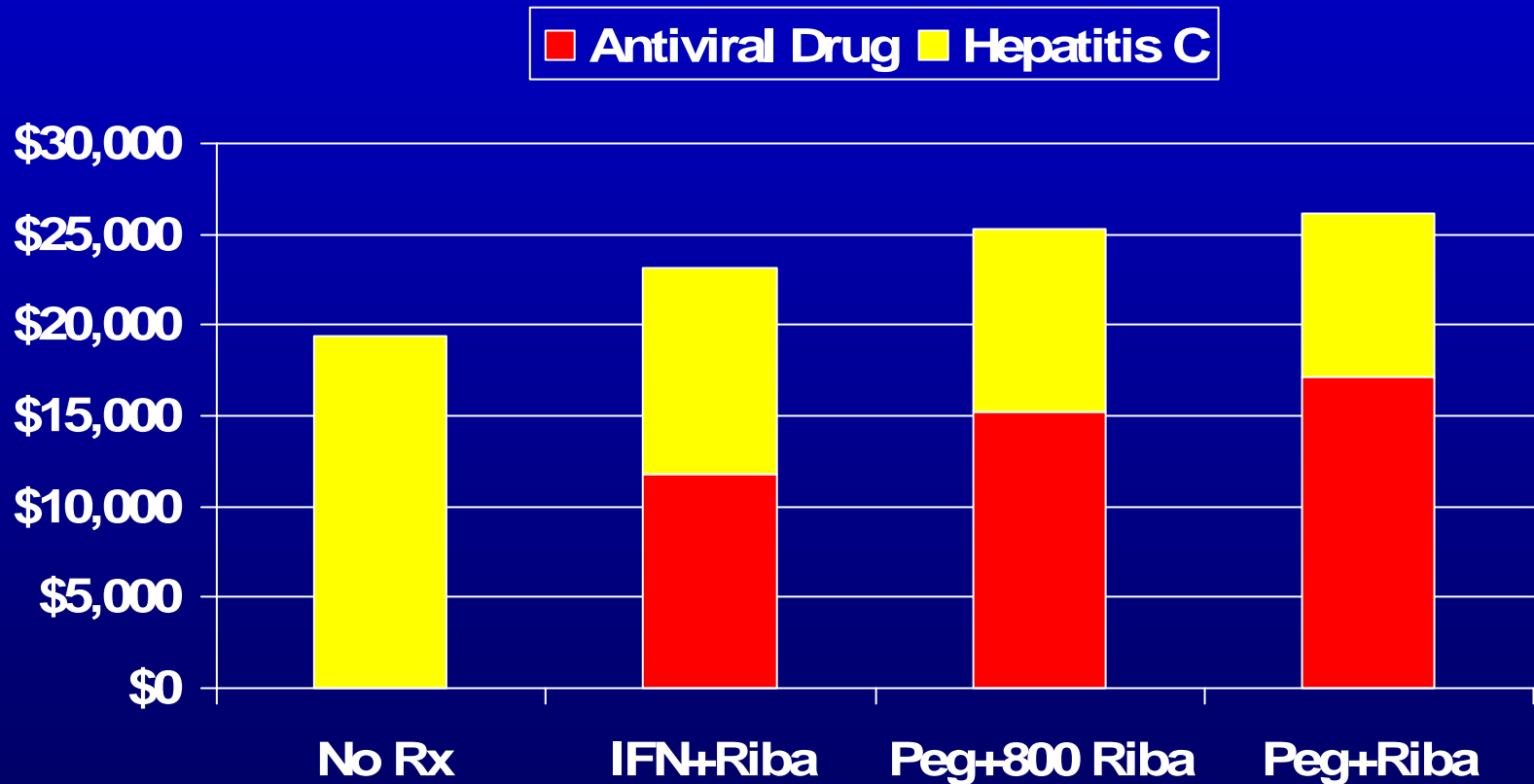
Which Option Would You Prefer:



Annual discount rate = 3%

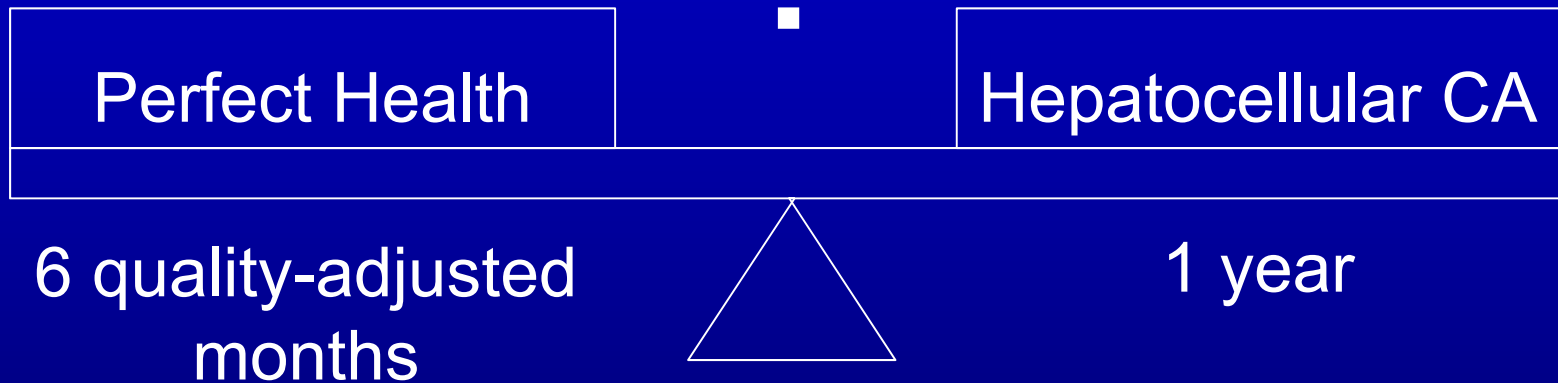
\$10 000 10 years from now = \$7441 now

Discounted Lifetime Costs



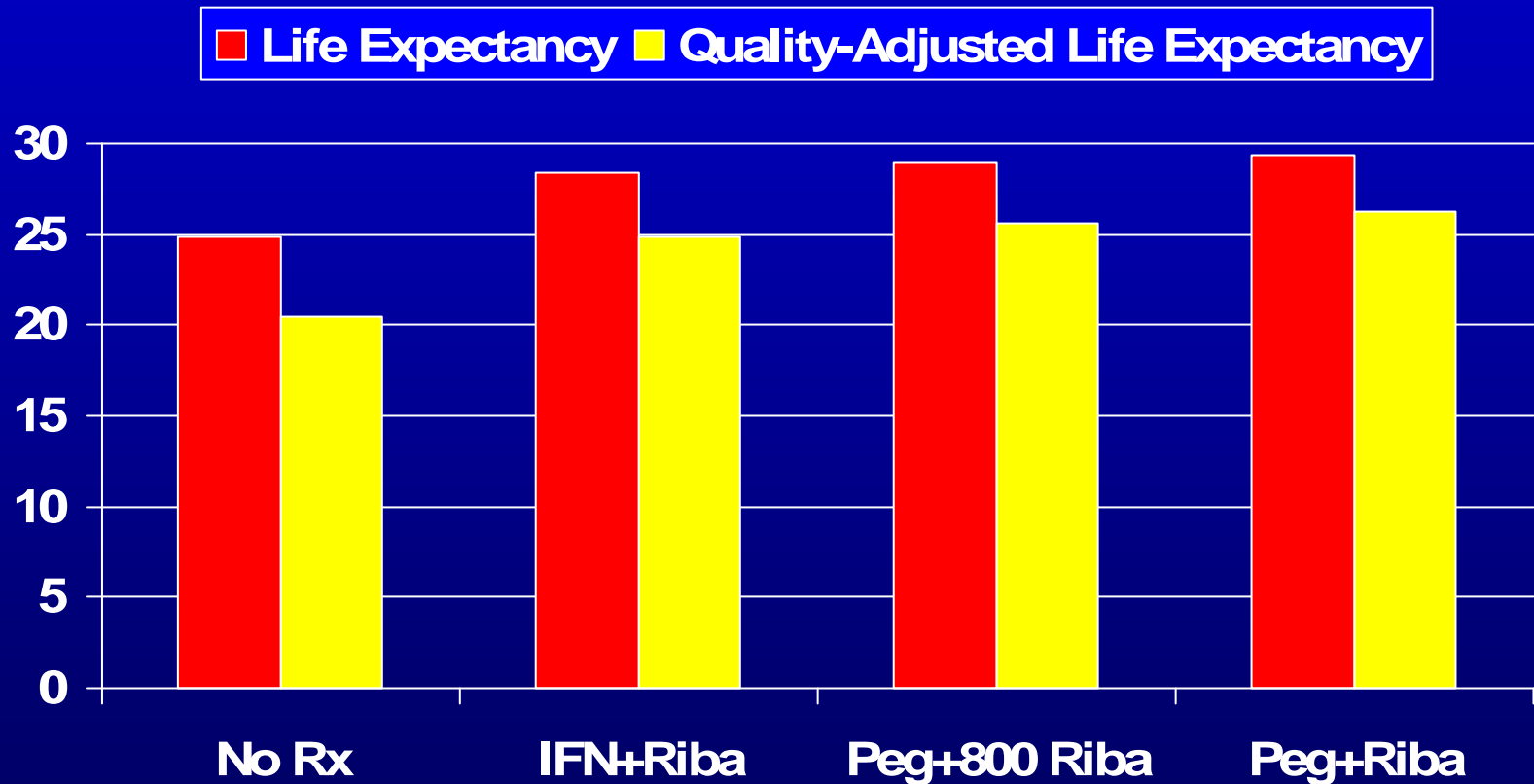
Would You Prefer to Live 1 Year With:

?

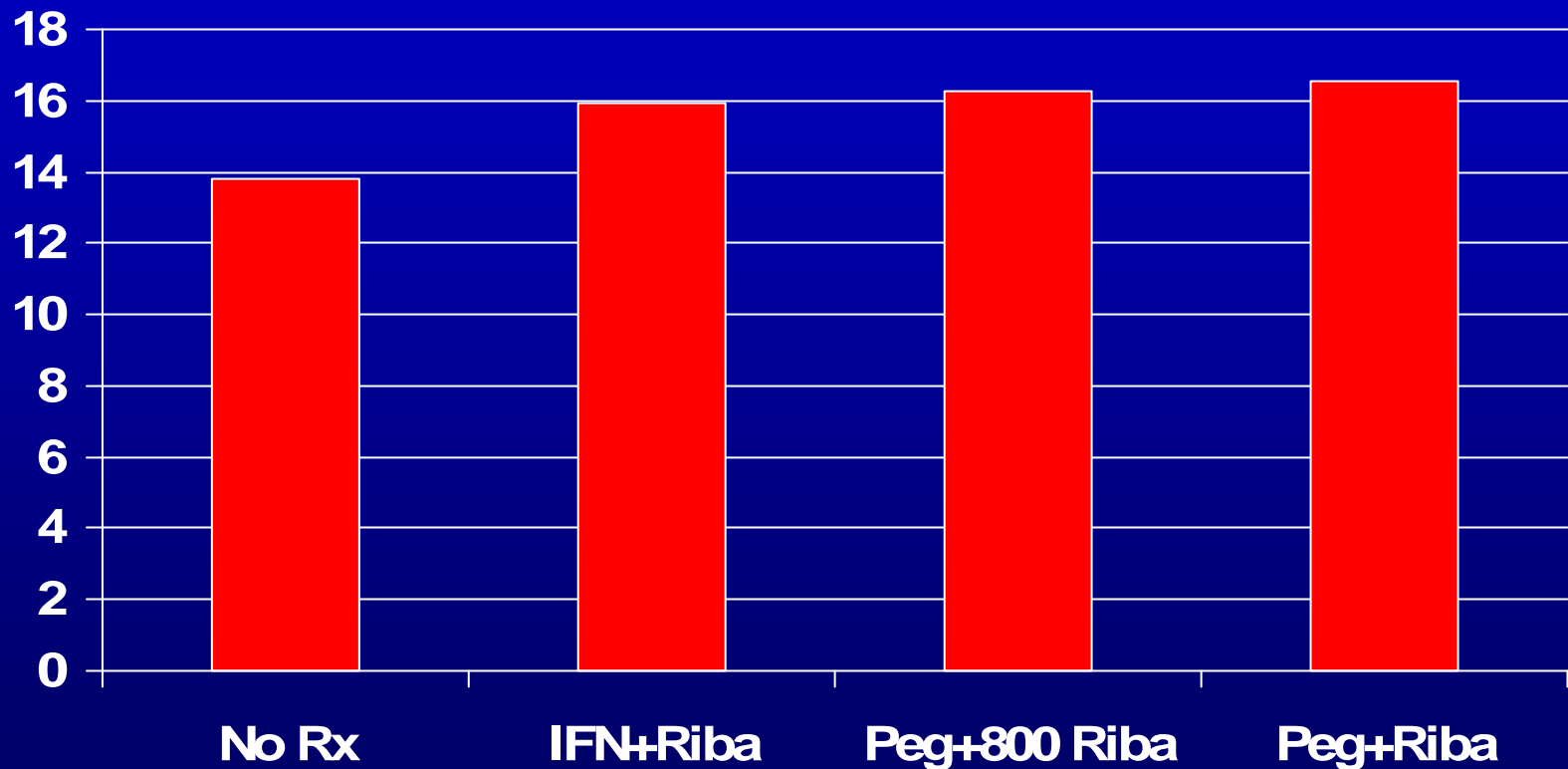


Quality weights adjust life expectancy for the morbidity or toxicity associated with the disease or drug

Effectiveness



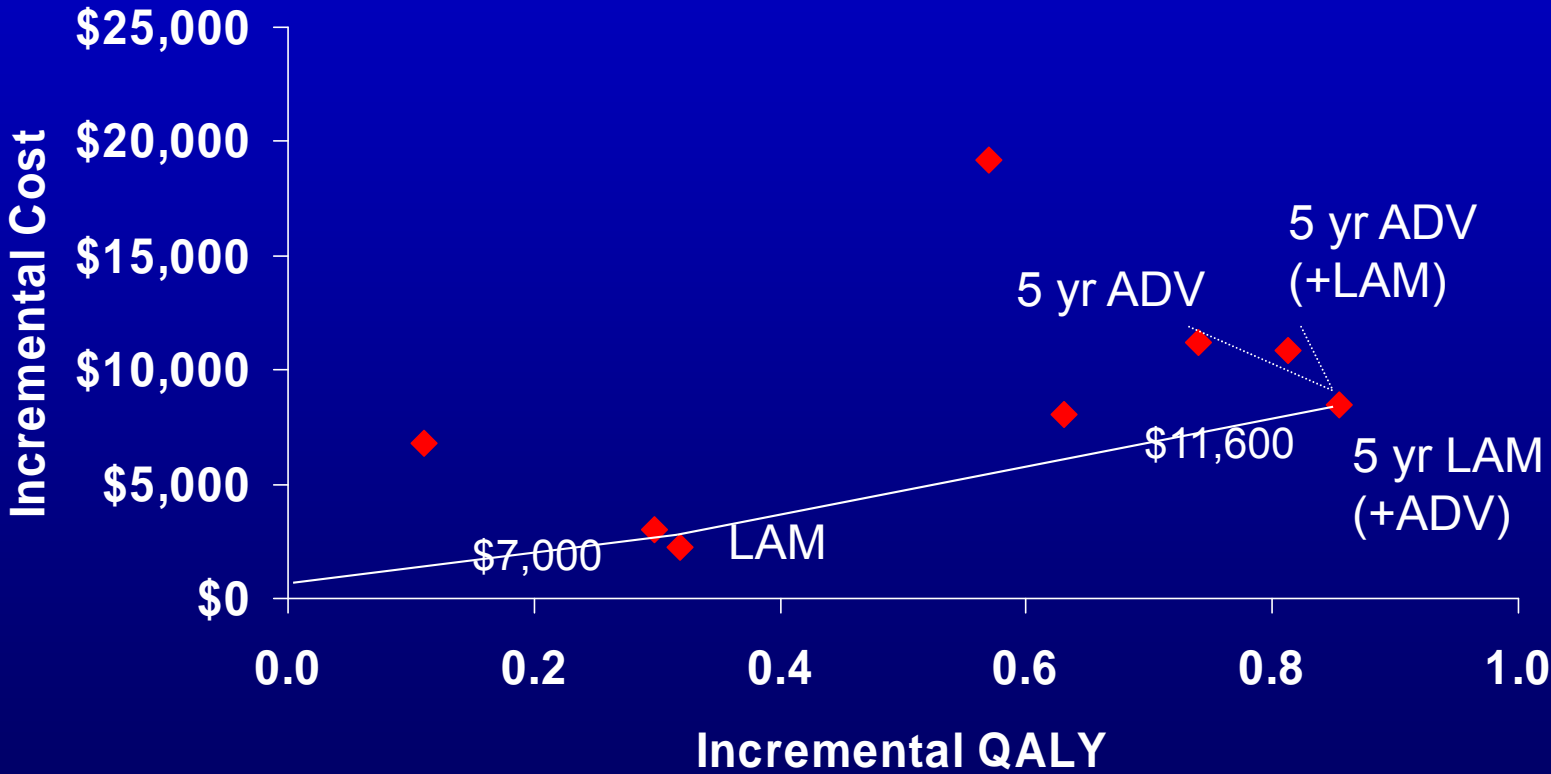
Discounted Quality-Adjusted Life Expectancy (years)



Cost-Effectiveness Analyses

- Depend on comparative effectiveness of the therapies examined and patient population
 - Chronic HBV therapy (15 studies)
 - Cost-saving to \$33 900 per QALY gained
 - Chronic HCV therapy (24 studies)
 - Cost-saving to \$120 000 per QALY gained
- WHO: highly cost-effective < GDP; 1-3x GDP = cost-effective (\$23 000-91 000 in 2005)

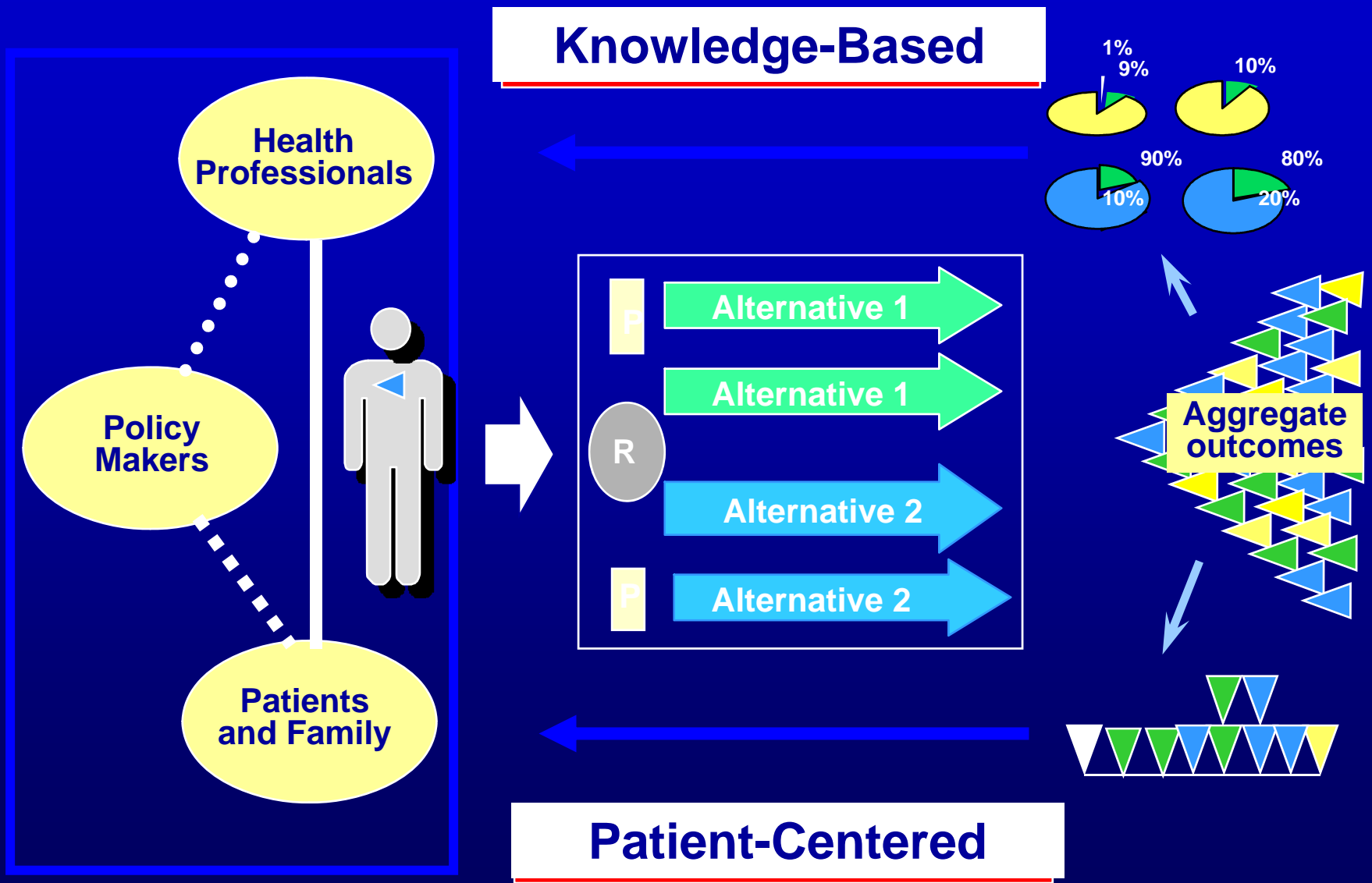
Cost-effectiveness Frontier vs. Lamivudine 1 year



Institute of Medicine: Comparative Effectiveness Research

- Direct comparison of effective interventions in patients typical of day-to-day clinical care
- Identify the clinical characteristics that predict which intervention would be most successful in an individual patient
- “Improve health care at both the individual and population levels”

Future Research Agenda



Conclusions

- Hepatitis B and C are associated with substantial morbidity, mortality, and costs
- Prior studies suggest that treatments for hepatitis B and C should be cost-saving or cost-effective
- There is a need to continue to perform health economic analyses to assess value