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Cost-Effectiveness Analysis: The Bare Essentials

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Why Economic Evaluation?

- Health care is expensive
- U.S. spends more on health care than other developed countries
- Higher spending has not produced demonstrable evidence of better health or longevity
- Widespread gaps in quality of care exist
- Current incentives encourage more care, not better care
- Payers/purchasers increasingly looking for value



Cost-Effectiveness Analysis

- Compares 2 or more alternative interventions or programs with respect to their resource use and expected outcomes
[Drummond et al. JAMA 1997;277:1552-7.](#)
- Primarily concerned with efficiency or VALUE
- Two main approaches
 - Piggyback economic evaluation on clinical trial
 - Modeling study
- Examples
[Fowler et al. JAMA 2014;312\(20\):2135-2145.](#)
[Suman et al. BMC Public Health 2015;15:522.](#)



Types of Economic Evaluations

- Cost-minimization study
 - Assumes alternatives equally effective
- Cost-benefit analysis
 - All outcomes expressed in monetary terms
- Cost-effectiveness analysis (CEA)
 - Health effects expressed in natural units, e.g. life-years gained, cases of pneumonia averted
- Cost-utility analysis
 - Special type of CEA



Cost-Utility Analysis

- Health outcomes measured in quality-adjusted life years (QALYs)
- QALYs capture longevity and quality of life in single metric
- Use “utilities” to measure QOL
 - “Preferences for a state of health, measured under conditions of uncertainty”
 - Scaled from 0 to 1, with 1 representing perfect health
 - Interpretation?

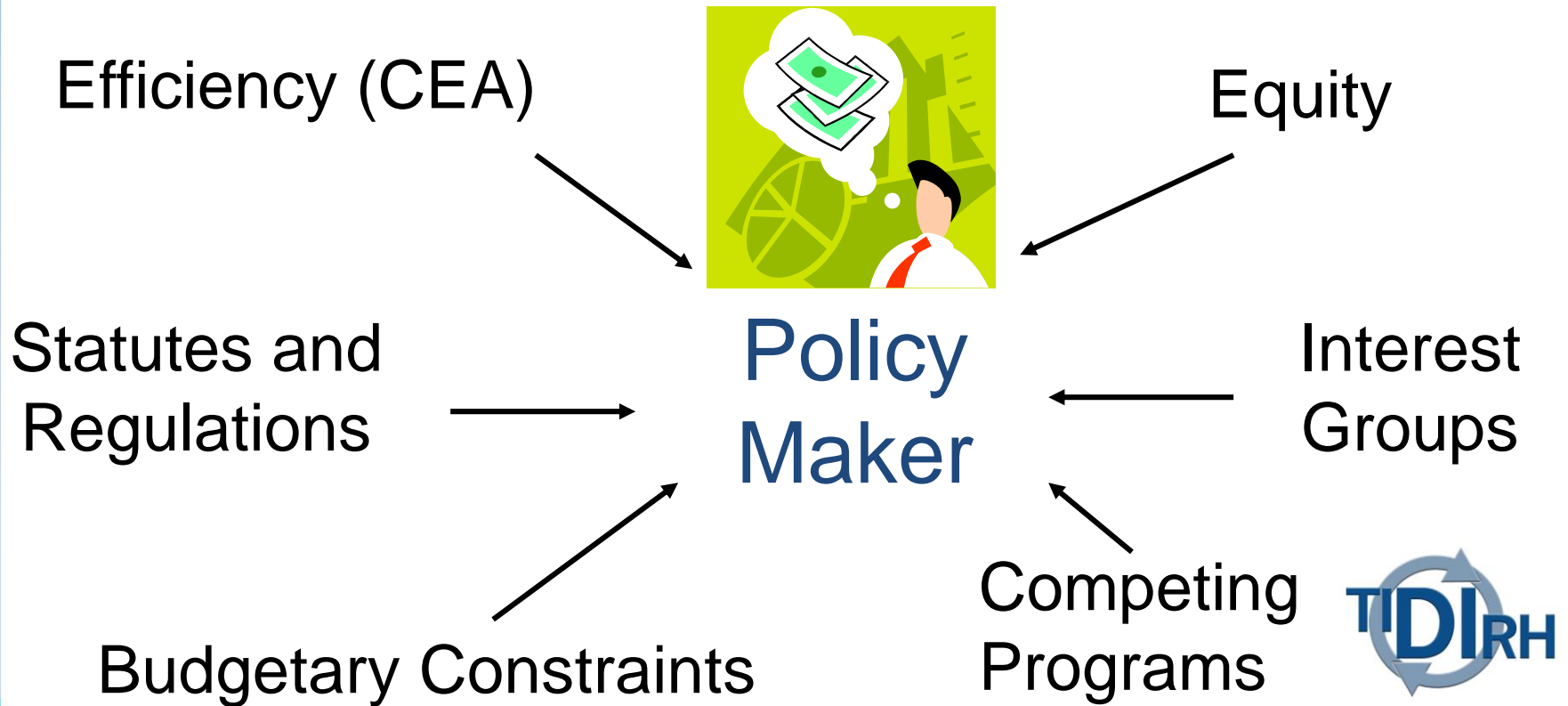


Who Uses CEA?

- In general, most appropriate for policy-level decision-making
 - Used by NICE, some private insurers
 - Not used by Medicare
 - PCORI not authorized to fund CEA or cost analysis
- Best thought of as an aid to decision making, not a complete resource allocation procedure



Policy-Level Decision-Making



Importance of Perspective and Time Horizon

- Perspective determines which costs to include
 - Societal: all costs included regardless of who bears them
 - Health system
 - Department
 - Individual patient: would consider only out of pocket costs and insurance premiums
- Time horizon
 - Reference standard is patient lifetime (to capture downstream costs and effects)
 - Impractical to measure, requires modeling to project future costs
 - Shorter time horizons often more informative to local decision makers



Interpreting CEA Results

Incremental cost-effectiveness ratio (ICER)=
 $(\text{Cost}_E - \text{Cost}_C) / (\text{Effect}_E - \text{Effect}_C)$

$\text{Cost}_E = \$1080$

$\text{Cost}_C = \$600$

$\text{Effect}_E = 8.8 \text{ QALYs}$

$\text{Effect}_C = 8.6 \text{ QALYs}$

$\text{ICER} = \$480 / 0.2 \text{ QALYs} = \$2,400 \text{ per QALY gained}$



Interpreting CEA Results

- Cost-effective does not mean less expensive!
- “Dominant” or “cost-saving” interventions are:
 - More effective
 - Less expensive
- “Cost-effective” interventions are:
 - More effective
 - More expensive
 - Judged to be a good value for the health care dollar



Benchmarking Cost-Effectiveness

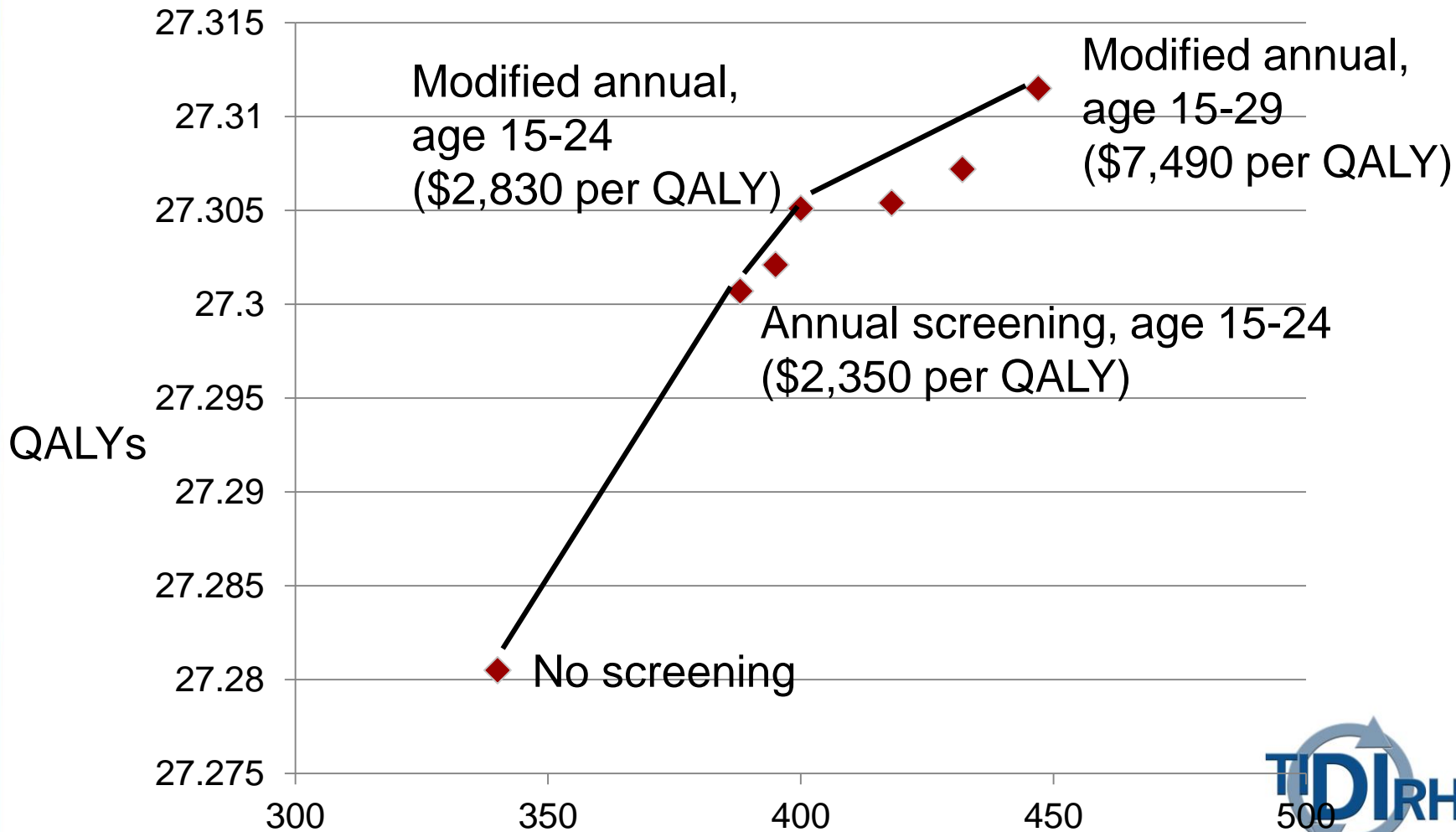
<u>Intervention</u>	<u>CE ratio</u>
Warfarin vs. no therapy in Afib	\$15,000/QALY
Driver-side airbag vs. no air bag	\$27,000/QALY
Treatment of moderate HTN	\$47,000/QALY
Empirical omeprazole vs. testing for <i>H. pylori</i> in dyspepsia	\$780,000/QALY
WHO “highly cost-effective”	<1X GDP (~45K)
WHO “cost-effective”	1-3X GDP
WHO “not cost-effective”	>3X GDP



Interpreting CEA Results

- Cost-effective does not mean less expensive!
- “Cost-effective” interventions are:
 - More effective
 - More expensive
 - Judged to be a good value for the health care dollar
- “Dominant” or “cost-saving” interventions are:
 - More effective
 - Less expensive
- Always compare with next most effective alternative
 - Strict dominance: less effective, more expensive
 - Extended dominance: less effective, less cost-effective





Average lifetime cost, \$



Summary

- CEA is a type of economic evaluation that is often used to determine the incremental VALUE of novel health care and public health interventions
- There is no absolute threshold that defines cost-effectiveness (or the absence of cost-effectiveness)
- CEA is potentially useful but controversial for many reasons
 - Uncertain value of life and health
 - QALYs are potentially discriminatory
 - Some policy-makers worry that rigorous comparisons will stifle innovation



