

Health Economics and Cancer Effectiveness Research

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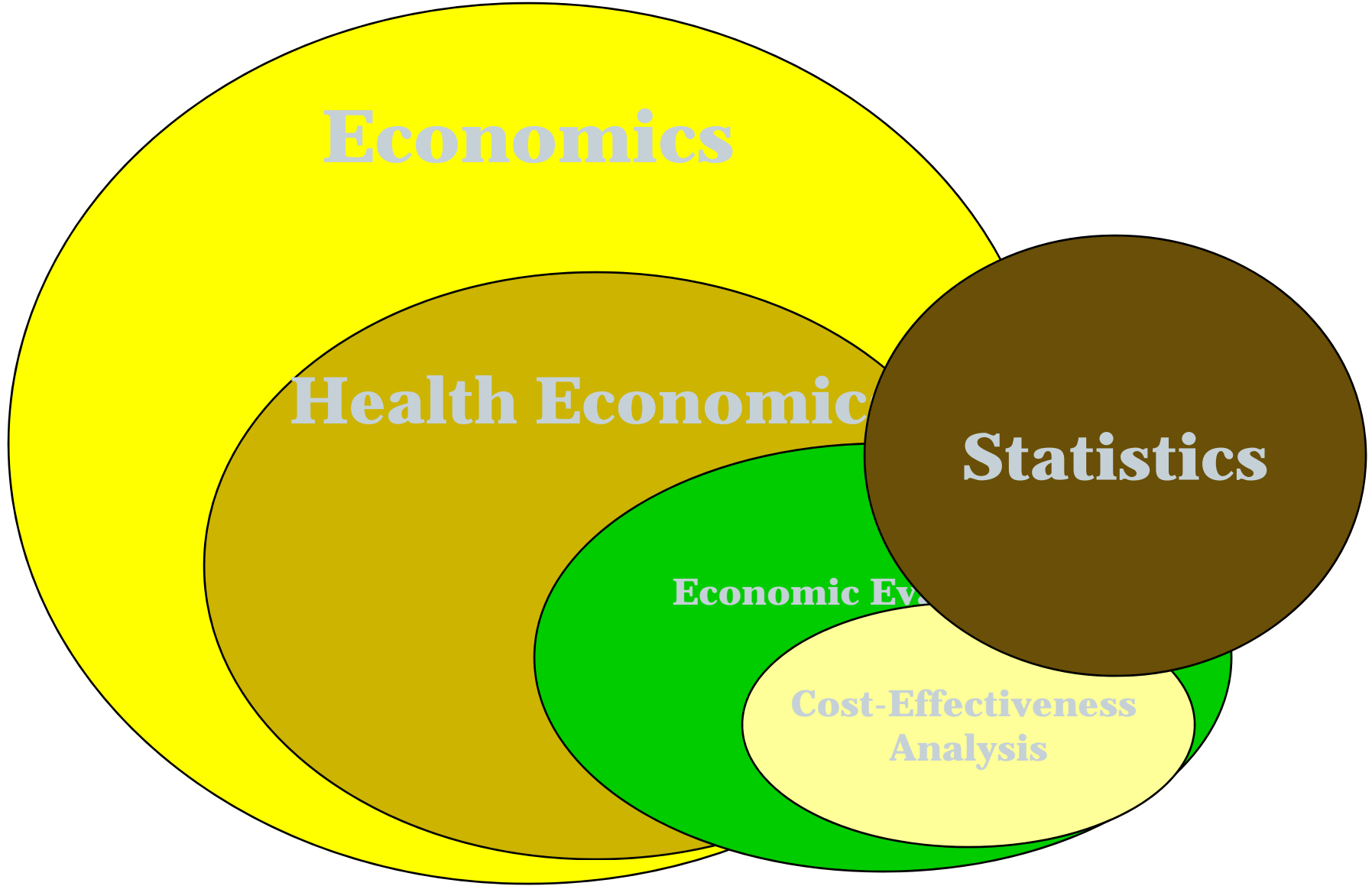


“Great news! The shareholders have approved your heart bypass!”

Health Economics

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- The allocation of scarce resources.
 - How do people and firms respond to economic incentives?
 - How do economic factors combine with regulations/institutions to influence the cost and quality of care?
 - Is it economically "favorable" to adopt a new technology over an older one?



What is Economic Evaluation?

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Definition: Economic Evaluation is ...

the identification, measure, and comparison of the costs (i.e. resources consumed) and outcomes (clinical, economic, and humanistic) of interventions (pharmaceuticals, non-drug therapies, public health programs).

Why Economic Evaluation?

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- The pressure of cost containment
- The need for methods to evaluate medical interventions, **especially emerging technologies**
- Purpose of economic evaluation
→ efficient resource allocation
NOTE: equity is often not addressed

Who uses Economic Evaluation? (cont.)

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- Hospital and health plan managers
 - What drugs should be included on the hospital formulary or PBM services?
 - Which drug delivery system is the best for the hospital?
- Pharmaceutical companies
 - What is the best drug for a pharmaceutical company to develop or disease area to target?
 - Should the company discontinue a clinical trial?
 - What is the economic benefit of a new product?

Who uses Economic Evaluation? (cont.)

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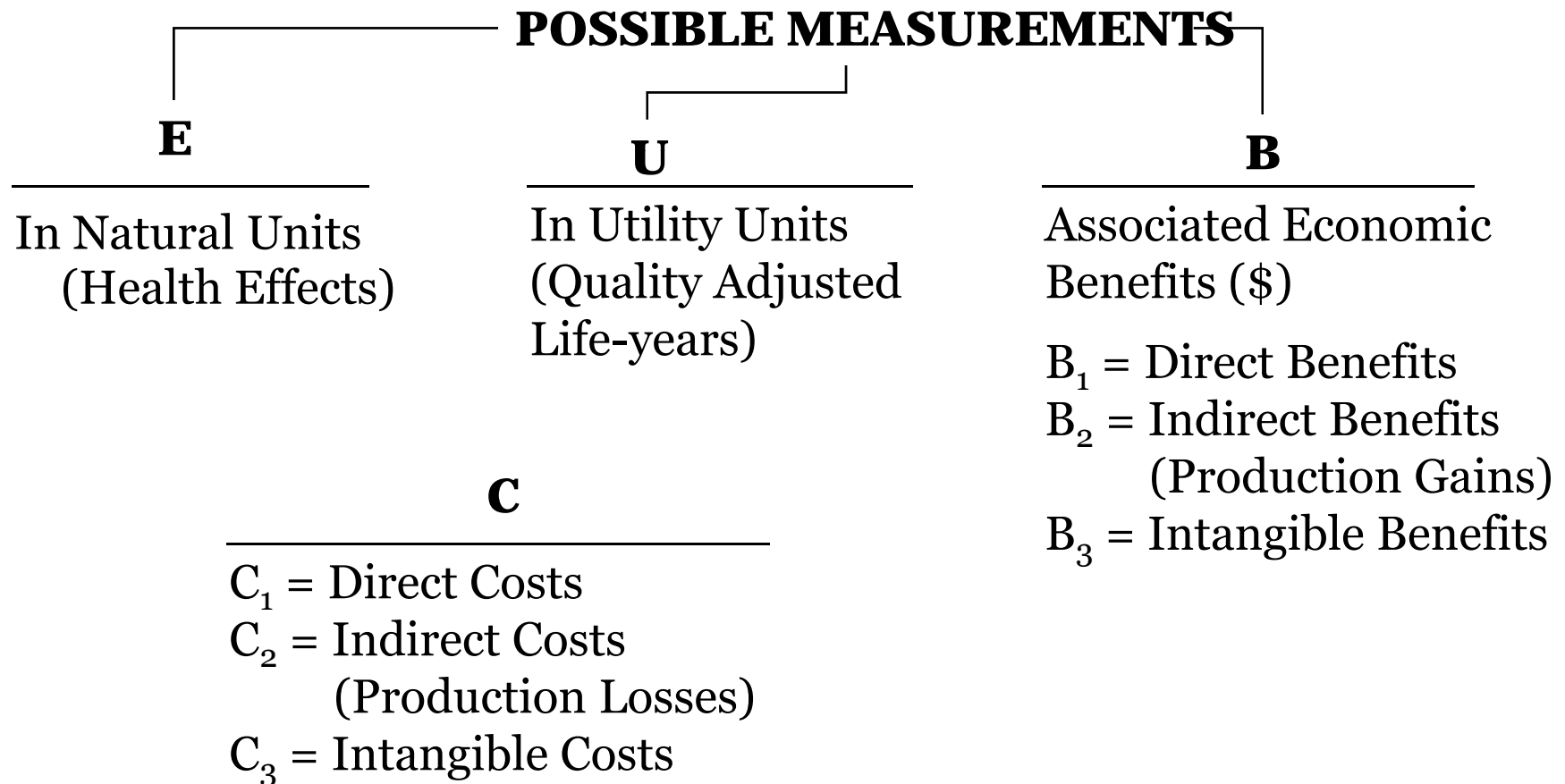
- Government
 - Which drugs should be included in a Medicaid formulary?
 - Is it cost effective for Medicare to cover annual mammography?
 - Is patient navigation program cost effective for Medicare?
- Researchers
 - All of the above !!
 - How to improve the analytical credibility of economic evaluation ?

Published Guidelines of Economic Evaluation

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- Australia
- Canada – Ontario
- US – BC/BS HTA, AMCP guideline
- UK – National Institute of Clinical Excellence (updated guideline published in 2008)
 - Guide to the Methods of Technology Appraisal
 - Guide to the Technology Appraisal Process

Different forms of economic evaluation.



More Costly

Intervention is less effective and costs more.

Intervention is more effective and costs more.

**Decrease in Health/
Quality of Life**

**Increase in Health/
Quality of Life**

Intervention is less effective and costs less.

Intervention is more effective and costs less.

Less Costly

Another CE example

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A Decision-Analytic Evaluation of the CE of Family History-Based Colorectal Cancer Screening Programs

(S.D. Ramsey et al, American Journal of Gastroenterology 2010)

What is the marginal CE of conducting family history screening (FHS) during annual checkup to identify persons with a first-degree relative (FDR) with colorectal cancer (CRC)?

- Persons w/ an FDR w/ CRC will receive colonoscopy and follow-up, and those with a polyp will be screened and treated for CRC if necessary.
- What are the lifetime costs and years of life saved for each alternative screening strategy?

Ramsey et al CE

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Usual care: colonoscopy screening for entire population at ages 50, 60, 70, and 80.

W/ screening, look at marginal CE of each of the following possible strategies:

- Colonoscopy at age 40, then every 10 years to age 80 (40/10).
- Colonoscopy at age 50, then every 5 years to age 80 (50/5).
- Colonoscopy at age 40, then every 5 years to age 80 (40/5).

MISCAN-COLON microsimulation model

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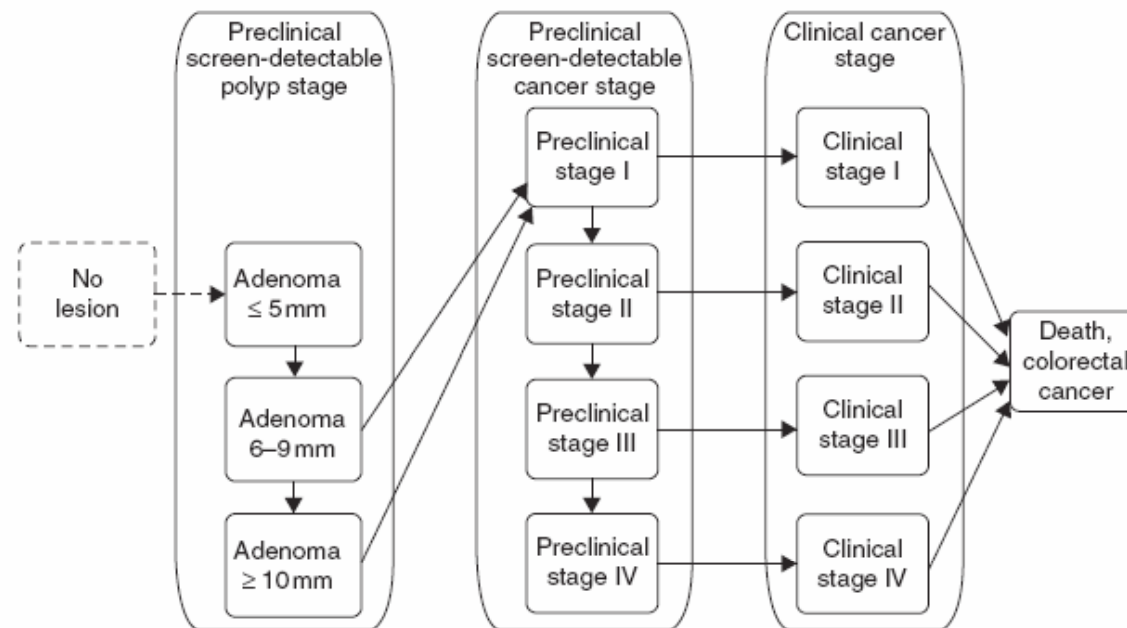


Figure 1. Adenoma and cancer stages in the MISCAN-COLON microsimulation model. The size-specific prevalence of adenomas, as well as the proportion of adenomas that develop into cancer, is dependent on age and family history for colorectal cancer (1).

Ramsey et al CE, Costs

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- Costs of FHS and CRC screening based on Medicare fee schedules; other costs from the literature.
- Assume 1/3 of a level III (history/exam) office visit used to take family history.
- 2 hour time cost for patient and driver for travel and time for colonoscopy.
(time costs based on US median hourly wage).
- Treatment costs of adenomas found and pathology.
- Costs of colonoscopy-related complications.

Ramsey et al CE, Costs (cont.)

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- Costs of care for persons with CRC by stage.
- Costs are expressed in 2005 US dollars.
- Future costs and YOLS discounted at 3%.

Ramsey et al CE, Costs (cont.)

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Table 3: Lifetime costs and effects from the societal perspective, per thousand 40-80 year-old in 2000

	No screen	50/10	40/10	50/5	40/5
Screening tests	0	983	997	1001	1,027
Colorectal cancer deaths	23	17	17	17	17
Life years	48,285	48,350	48,351	48,351	48,352
Total lifetime cost	4,269	5,458	5,495	5,496	5,521

Table 4. Incremental cost-effectiveness ratios for colorectal cancer screening considering Usual Care (no family history screening) and alternative schedules following family history screening, all using colonoscopy; comparison groups appear within table, all amounts are in 2005 US dollars^a

Strategy	Usual Care 50/10	FHS 40/10	FHS 50/5	FHS 40/5
No screening	18,069	18,555	18,449	18,678
Usual Care 50/10		12,1722	53,727	51,022
FHS 40/10			896	27,455
FHS 50/5				47,411
FHS 40/5				

FHS, family history screening.

^aSee text for the definition of Usual Care, 40/10, 50/5, and 40/5.

Real vs. Nominal Dollars

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When costs are incurred over many years, one should adjust for inflation.

- Inflation is a rise in the general level of prices of goods and services in an economy over time.
- Even though the content of a history/exam office visit is the same in 2011 vs. 2006, the cost of the visit will be higher in 2011.

Real vs. Nominal Dollars (cont.)

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Economists track inflation using various different market baskets of goods and services.

- Prices for medical care tend to rise faster than for other items.
- But economic evaluation tends to be from a societal perspective.
 - Is it worthwhile to spend \$ on a new treatment vs. new roads or more education?
 - → use a general price index rather than one for medical services.

All Urban Consumers – Consumer Price Index; 1982-84=100

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Year	All Items		Medical Care	
	Index	% change	Index	% change
2000	172.2	3.4	260.8	
2001	177.1	2.8	272.8	4.6
2002	179.9	1.6	285.6	4.7
2003	184.0	2.3	297.1	4.0
2004	188.9	2.7	310.1	4.4
2005	195.3	3.4	323.2	4.2
2006	201.6	3.2	336.2	4.0
2007	207.3	2.8	351.1	4.4
2008	215.3	3.8	364.1	3.7
2009	214.5	-0.4	375.6	3.2
2010	218.1	1.6	388.4	3.4

Real vs. Nominal Dollars (cont.)

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Example: To convert \$250 of costs incurred in 2005 to 2009 dollars:

$$\$250 \times \left\{ \left[\frac{\text{CPI}_{2009} - \text{CPI}_{2005}}{\text{CPI}_{2009}} \right] + 1 \right\}$$

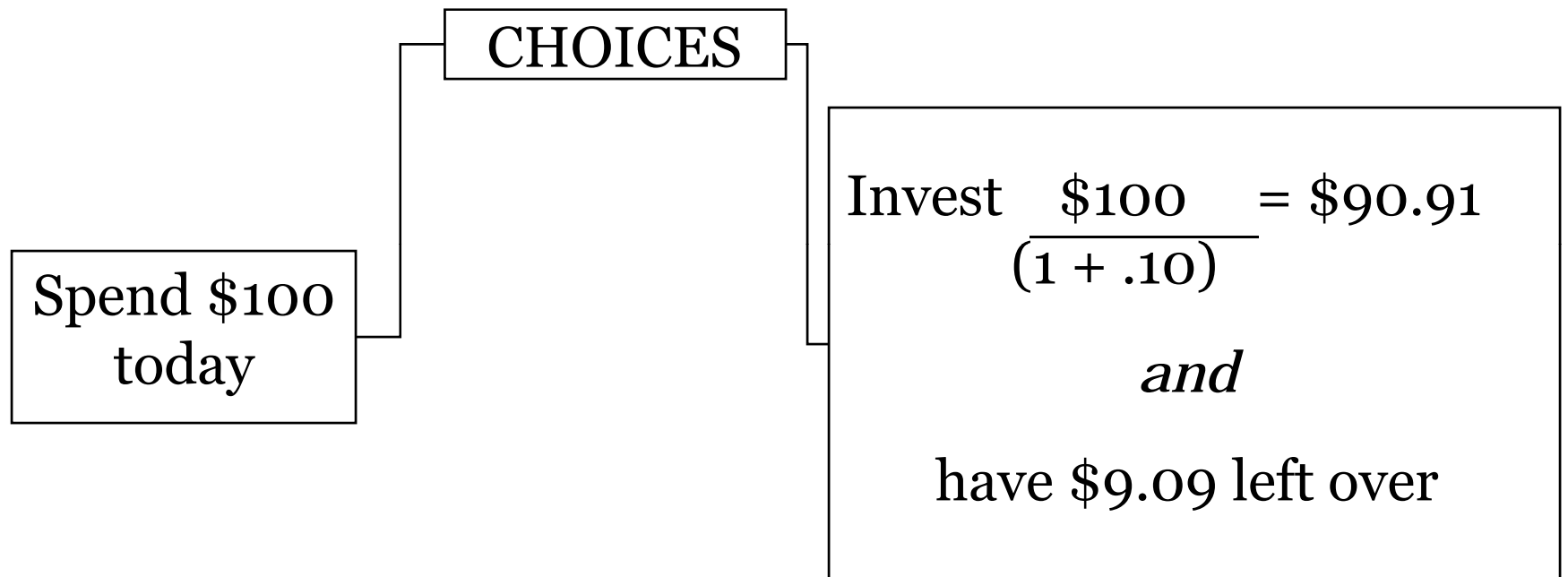
$$= \$250 \times \left\{ \left[\frac{(214.5 - 195.3)}{214.5} \right] + 1 \right\} = \$272.50$$

DISCOUNTING

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- Required when costs are incurred in the future
 - Why? Individuals have a positive value of time preference
 - ✦ If $r = 10\%$, then \$100 invested today yields \$110 next year
- Spending \$100 one year from now is “*cheaper*” than spending \$100 today

DISCOUNTING





DISCOUNTING

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- If costs occur over multiple time periods, we must calculate the *present discounted value* (PDV) of these costs:

$$\text{PDV} = \sum_{t=0}^T \frac{1}{(1+r)^t} \text{COSTS}_t$$

- Example:

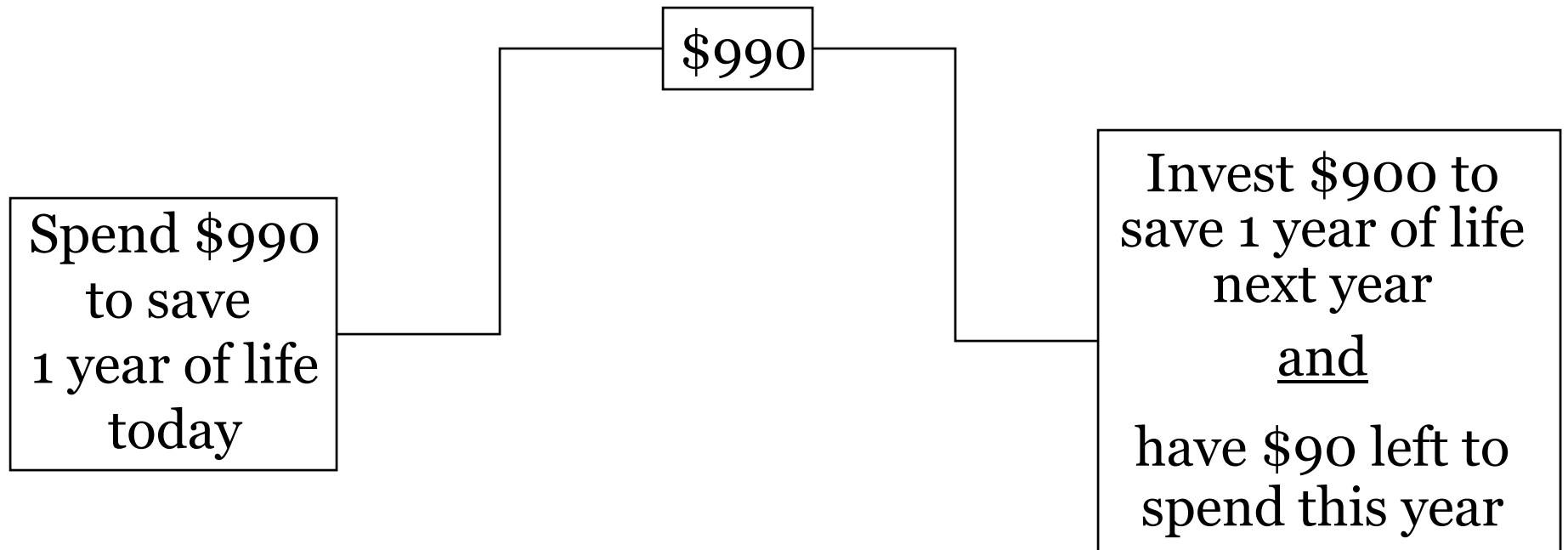
A project requires: \$100 in year 1
\$ 75 in year 2
\$ 50 in year 3

$$\text{PDV} = \$100 + \$ \frac{75}{(1+.10)} + \$ \frac{50}{(1+.10)^2} = \$209.50$$

DISCOUNTING

- If we discount costs, we must also discount benefits.

Assume $r = 10\%$



Why we discount cost AND benefits

- Consider an intervention which costs \$100 and saves 10 years of life
 - Also assume $r = 10\%$

Option 1:

Spend \$100 today:
$$\frac{C}{E} = \frac{100}{10} = 10$$

Option 2:

Invest for 1 year \rightarrow \$110, saves 11 YOL. If we discount costs to present value, but don't discount YOL:

$$\frac{C}{E} = \frac{100}{11} = 9 \frac{1}{11}$$

- If we discount both costs and benefits:

$$\frac{C}{E} = \frac{\frac{1}{(1 + .10)} 110}{\frac{1}{(1 + .10)} 11} = 10$$

Sources of Cost Data

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- Direct Costs
 - Medicare fee schedules.
 - Insurance claims data.
 - Hospital billing data from individual hospitals.
 - Charges deflated by a cost-to-charge ratio.
- Indirect Costs
 - Patient surveys.
 - Bureau of labor statistics/census data.

Fee schedules/claims data

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- These may be the only data you have.
 - Although these do not capture all of society's costs, they are likely to be a large share and are of interest to policy makers or insurers.
- Use hospital/physician payments in MedPAR & carrier files if available.
 - If not, try ResDAC Technical Publication TN-004, 11-2006.
Calculating Hospital Specific DRG payments.
 - There is a way to estimate average physician prices using fiscal intermediary data combined with other sources.

Sources of Cost Data (cont.)

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Hospital billing data from individual hospitals.

(J.B. Dimick et al, *J Am Coll Surg* 2004; 199(4): 531-537)

- Hospital costs associated with complications: a report from the private-sector National Surgical Quality Improvement Program.
- Came from a VA hospital, but private non-profit hospitals also have an internal accounting system that can pull billing data.

Sources of Cost Data (cont.)

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Charges deflated by a cost-to-charge ratio.

Ho, V and Aloia T, *Medical Care* 2008; 46(7):718-725).

Charges in a hospital discharge abstract are multiplied by the hospital's average ratio of cost to charges as derived from its Medicare Cost Report.

ResDAC Technical Publication TN-008, 8-2009)

Using Medicare Hospital Cost-to-Charge Ratios in Research.

AHRQ HCUP Cost-to-Charge Ratio Files

Final Thoughts

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- An intervention that is not effective will never be cost-effective.
- Determining the effectiveness of an intervention is much harder than determining its costs.
- Estimating the cost-effectiveness of an intervention is likely to require data from multiple different sources.

Additional Readings

- M.F. Drummond et al, *Methods for the Economic Evaluation of Health Care Programmes*, 3rd edition, Oxford Medical Publications.
- M.R. Gold et al, *Cost-Effectiveness in Health and Medicine*, Oxford University Press.
- M.L. Brown et al, *Medical Care* 2002; 40(8): Supplement, pp. IV 104-117, Estimating health care costs related to cancer treatment from SEER-Medicare data.
- K.R. Yabroff et al, *Nature Clinical Practice Oncology* 2007; 4(11): 643-656. Costs of cancer care in the USA: a descriptive review.