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Measuring Cost Over Time

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Section A

Perspective and Basic Cost Calculations

- The Panel recommends the societal perspective
 - Most of the discussion will be from this perspective
- The societal perspective is not always used in policy considerations
 - Many issues cut across multiple perspectives

Concept of Societal Resource Valuation

- Key terminology
 - Opportunity costs represent the value of what is foregone by using resources in a particular way
- Example of opportunity costs
 - Community health nurse and peer counselor for breastfeeding intervention
 - What are we losing?
 - ▶ Example, community-based diabetes management
- If you knew the exact alternative use of resources, the value of the alternative use is the opportunity cost

- A researcher doesn't usually know the exact alternative use of the resources
- As a result, we usually use money spent on resources as a measure of value
- Economic theory can be used to demonstrate that in many cases the money spent on resources equals the value of the resources to the firm and the value to society

When Is It Not Acceptable to Use Dollars Spent

- Market failure (inefficiency)

- Some health care markets are monopolies
 - Hospitals in rural settings
- If monopolies were to operate in a free, unregulated market, and maximize profits, the prices they charge would not represent true opportunity costs
 - They would be an overestimate

- Some health care markets are monopolies
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- If monopolies were to operate in a free, unregulated market, and maximize profits, the prices they charge would not represent true opportunity costs
 - They would be an overestimate
- Even in today's hospital system in the U.S., where there are fewer monopolistic markets, you still find charges higher than costs and a need to adjust

- Consumers don't have all the information
- Consumers can't make sense of all the information

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- Consumers can't make sense of all the information
- Doctors are making decisions for patients
- Not everything is insured

Pricing Items That Are Not On the Market

- Is the cost of resources otherwise unemployed zero?
 - Using the resource does not sacrifice goods and services
 - However, unemployed individuals are doing something with their time
- Even if all of an unemployed individual's time is "leisure," this is valuable

Societal Value of an Unemployed Time

- Use value of similar employed resources
 - Should it be adjusted downward for unemployed resources
- Value of non-market commodities
 - What one produces at home
- Panel recommends using a single wage for all workers (perhaps age-sex specific) regardless of their actual type of employment or their employment status



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Section B

Capital Costs, Indirect Costs, and Data Sources

- Large expenditures on things that will last a long time
 - Could be as big as a new hospital
 - Could be an expensive new piece of equipment
 - Could be a vehicle for a community health program
 - Don't just use accounting-based depreciation
- Change in market value and the alternative rate of return
 - Depreciation and return on riskless asset

Capital Cost Calculation Example

- Suppose health department owns a clinic worth \$500,000
- Depreciation of \$25,000 per year
- Could invest the \$500,000 at 3% risk-free, so add \$15,000
- Total cost = \$40,000

- Depreciation is often based on accounting rules that do not always match the reality of depreciation
- Accounting rules use the original value of the asset to calculate changes rather than the current market value

- Direct costs are things for which money is actually needed
 - Health care
 - Transportation
- Indirect costs reflect the value of individuals' time that is lost because of receiving medical care or being sick
 - Different from the concept of overhead
 - ▶ Overhead costs are direct (they must be paid for in dollars)

- Administrative
 - Within a hospital or other provider
- Claims
 - From an enrollee or an insurer
- Survey
 - Ask individuals about quantity of services used or amount of money spent
- Micro-costing studies
 - Gather very detailed information about specific resources used during an intervention

- Use hospital billing records
- Have to worry about relationship between charges and costs
- If you have a multi-center clinical trial you have to worry about obtaining records from multiple hospitals
 - Worry about having data in a similar format

- IRB and HIPAA issues
- How does a hospital set prices for goods and services?
- Can we find and apply a standardized price and just use quantity information from hospital or other provider data

- May be easier to get claims data than billing records
 - Especially if all study subjects are with same insurer
 - ▶ For example, in a study of care for older adults you might be able to get Medicare data for all of them

- Know what is reimbursed as well as what was charged
 - May be more closely related to economic costs
- May be difficult to compare across payers

- Potential problem with recall bias
- Ask people not only the number of times they went to see a health care provider but what for
 - Even if the reason for a visit is known, how do you put a price on the visit
 - ▶ Will there be data about labs?
 - ▶ Will there be data about prescriptions?

- You can ask about things that are not provided by a physician or in insurance claims
 - Use of over the counter drugs or herbal products

- Measure exact amount of resources used
- You can look at variation within a procedure if you gather data on quantities of resources used in surgeries
- You can look at resources used for a community health intervention

- Allows for a separation of different activities
 - Community health care providers may have multiple roles or may be doing both research and service provision
- Balance between needing enough information, making a credible cost estimate, and overburdening provider with a need for information



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Section C

Costs Over Time

Issues with Multiple Year Calculations

- Inflation
 - Make sure all dollars are worth the same amount in terms of what they can purchase
- Discounting
 - Make sure that the dollar value is expressed in terms of the money that is needed at the present time rather than the total cash flow

- Inflation adjustments converts dollar values to the same scale
 - Analogy—Fahrenheit and Celsius are both measures of temperature but you need to convert to the same scale to make a comparison
 - 1994 and 2004 dollars both measure prices, but you need to convert to the same scale to make a comparison

- Inflation adjustments converts dollar values to the same scale
 - Analogy—Fahrenheit and Celsius are both measures of temperature but you need to convert to the same scale to make a comparison
 - 1994 and 2004 dollars both measure prices, but you need to convert to the same scale to make a comparison
- End up with calculation in real dollars
 - Easier to think of a constant value of effects and changes in effects

- Look up consumer price index or medical care consumer price index numbers (www.bls.gov)
 - Index is set to 100 at some point in time
 - Index is available monthly or annually
 - Multiply by index value for time converting to divided by index value for time converting from
 - ▶ 2000 average—172.2
 - ▶ 2003 average—184.0
 - ▶ Conversion—2000 Costs x (184.0/172.2)
- Use “inflation calculator” at Bureau of Labor Statistics web site for general inflation

Relative Price Change Is Not Inflation

- Suppose we have a sudden run on community health nurses and the cost of hiring a community health nurse increases to 110% of its current value
- Changes the results of the cost outcome analyses substantially

- Costs and benefits are accrued at present and in the future
 - Need to calculate value of costs and benefits now
- Examples
 - Think corrective cosmetic surgery (cleft palate)
 - ▶ Benefit from surgery over your entire life
 - ▶ Costs are incurred at a single point in time
 - Dysfunctional uterine bleeding surgery
 - Elimination of a blinding condition in developing countries
 - Investment in averting low birth weight

- Idea of present value (PV)
 - What's the value of \$1 received today?
- If \$1 will not be received until next year, is the value higher or lower?
 - Lower because you have to wait
 - ▶ Interest rate
 - ▶ General impatience
 - ▶ Not because of inflation in this case

Sum of Payments is Not the Present Value

- Elaboration on reasons for non-equality
 - Basic impatience
 - ▶ People don't want to wait for benefits and are willing to pay in order to get benefits sooner rather than later
 - Behavior reflected in money markets
 - ▶ Cost to borrowing and a reward for lending
 - ▶ People have uses for money now
 - ▶ For money markets the degree of impatience is quantified by the interest rate, r

Example for Present Value

- Want to know present value now for \$1 received every year for five years?
- Each value is in present dollars
 - Dollars measured at time zero (assume that the adjustments for inflation have already been made)
 - Value at start of year 1 = \$1.00
 - Value at start of year 2 = \$0.97
 - Value at start of year 3 = \$0.94
 - Value at start of year 4 = \$0.92
 - Value at start of year 5 = \$0.89
 - Total value = \$4.72

How We Actually Calculate Present Value

- The concept of present value is the concept of value at time zero
- We use “ r ” to denote the interest rate
- Return to PV of \$1 received each year for five years with a constant r ?
 - PV of \$1 at start of year 1 = \$1
 - PV of \$1 at start of year 2 = $\$1/(1+r)$
 - PV of \$1 at start of year 3 = $\$1/(1+r)^2$
 - PV of \$1 at start of year 4 = $\$1/(1+r)^3$
 - PV of \$1 at start of year 5 = $\$1/(1+r)^4$
- Decision rule does not change—adopt programs with a positive net benefit based on present value

- Rate on money lent now in exchange for payment at the end of a pre-specified period of time
 - Usually an annual rate in cost-effectiveness calculations
 - Panel recommended 3% (divide by 1.03) as it was thought to represent an average real rate of return for risk free investments in the United States

Arguments Regarding Discounting (1)

- Prevention is different
 - No reason to say they should be valued more or less but, if you feel a need to make an adjustment, change the value
- Inflation
 - Adjust for inflation and discount

Arguments Regarding Discounting (2)

- Adjust discounting for uncertainty
 - Use expected discount rate
- A paradox suggesting that without discounting, effects policy would always imply waiting to implement is irrelevant
 - Rarely have to spend money in limited time and would like to avoid complexities of non-discounting

Arguments Regarding Discounting (3)

- Proportional discounting ($b/(b+t)$)
 - Time preferences change as time advances
- Real value of health benefits may not be constant
 - Change threshold but leave discounting alone
- Real cost of producing health changes over time
 - Adjust cost stream
- Individual discount rates
 - Use market rate because CEA's purpose is prescriptive rather than descriptive

- Policy deferral
 - If same costs and results in a year, then invest smaller amount now if not discounted
- Affluence
 - Always wait for effects as will be more highly valued by those with more money in the future
- Technological change
 - Always makes sense to wait for it if not discounted

- Look at what people receive for differential mortality risk at work
 - Discounting at rates of 1-14.2 percent
 - This includes rate of return in financial markets
- One method
 - Observe people's choices of jobs
 - Know probability of mortality and wage
 - Assume functional form for utility
 - Solve for implicit discount rate
 - ▶ People don't necessarily think this way, but behavior is consistent

Timing Matters when Discounting

- Suppose we have a health program with \$1.2M in benefits and \$700,000 in costs each year
 - Suppose we spend and get benefits at the start of each year with a net benefit of \$500,000/year
 - ▶ Net benefit = \$1,456,735
- Suppose all benefits occur at end of year
 - $(- \$0.7 \text{ M}) + [\$0.5 \text{ M} / 1.03] + [\$0.5 \text{ M} / 1.03^2] + \$1.2\text{m} / 1.03^3$
 - ▶ Net benefit = \$1,354,905