Cost Benefit Analysis Steps

1) Identify costs and benefits
2) Calculate costs and benefits
3) Compare aggregate costs and aggregate benefits
WTP Measurement

- Revealed Preferences
  - Market Data
    - Direct Use
    - Indirect Use
    - Substitute Market
  - Experiments
- Stated Preferences
  - Surveys
Cost Benefit Analysis Steps

1) Identify costs and benefits
   • What counts?
   • Who counts?
   • Time period
2) Calculate costs and benefits
   • Methods of calculation
   • Discounting future benefits/costs
3) Compare aggregate costs and aggregate benefits
Calculating Present Value

Actual value/\((1 + \text{discount rate})^{\text{years}}\)

Example: $100 2 years from now; discount rate = 3%

Present value = $100/(1 + .03)^2
              = $94.26
Value of Risk Reduction

WTP ($)

$6.1 Million

$6.10

1/1,000,000

% Reduction

100%

% Reduction
Discounting Life/Health

Actual value/(1 + discount rate)^{#years}

Premature death avoided 20 years in the future
Value Statistical Life = $3 million

Example 1: Discount rate = 5%
Present value = $3,000,000/(1 + .05)^{20} = $1,130,668

Example 2: Discount rate = 1.5%
Present value = $3,000,000/(1 + .015)^{20} = $2,227,411
1/1 Million Risk of Death

• Air pollution from factory emissions
• Earthquake
• Job working with chemicals
• Downhill skiing
Cognitive and Other Factors Affecting Valuation of Risk

• Sudden painless death vs. drawn out death with much pain and suffering
• Voluntarily incurred risk vs. no consent
• Man-made risk vs. acts of God
• Unfamiliar, uncertain, catastrophic risks
• Fairness in risk distribution
• Complete elimination of risk
• Preventing new risks vs. eliminating existing risks
• High probability vs. low probability events
• Perceptions of control
QALYs – Calculating Utility of Intervention

• *Utility of intervention* = years gained in better health state \( \times \) increased utility
  
  – *Increased utility* = utility of health state post intervention – utility current health state

• Example:
  
  • Current health state: Relative utility value = .5
  • Post-intervention health state: Relative utility value = .8
  • Better health for 5 years
  • Gain = 5 years \( \times \) (.8-.5, or .3) = 1.5 QALY
Using QALYs in Cost-Benefit Analysis

- Estimate $$ for 1 QALY
  
  E.g.,
  
  • WTP to avoid chronic bronchitis = $260,000
  • Loss of QALY associated with disease = 2 QALYs
  • Value 1 QALY = $130,000 (2QALY/$260,000)

- Estimated value of change in health
  
  = change in QALY x value 1 QALY
  
  – E.g., change of 3 QALY = $390,000 (3 x $130,000)
QALYs – Calculating Cost-Effectiveness

• Calculate cost/utility ratio
  = cost intervention/expected increase in QALYs

• Example:
  – Intervention is expected to result in 1.5 QALY gain
  – Cost = $15,000
  – Cost-utility ratio = $15,000/1.5 QALY, or $10,000 for 1 QALY gain
How would you choose?

You have $20,000 which will fund one of the scenarios described – who would you spend the money on and why?

STEVE
18 year old Steve is a victim of a car accident. He has severe facial scarring and psychological problems as a result. Plastic surgery would correct the scarring.

JOANNE
Joanne is 42 years old and has no dependents. She has just been diagnosed as HIV positive as a result of her drug taking. She no longer takes drugs. Drug treatment is available which is 75% effective. This could extend her life expectancy and minimize symptoms. At present her symptoms are minor, but will increase over time.

ROSA
Rosa is 65 years old. She has had few health problems over her life, but now needs a hip replacement. Without the hip replacement, she will no longer be able to live alone. Her only son lives 200 miles away. The hip replacement would allow her to live independently.

DANIEL
11 year old Daniel has advanced cancer. With aggressive chemotherapy treatment he has a 20% chance of survival.