Valuing Reductions in Risk of Death

Maureen L. Cropper

University of Maryland and Resources for the Future

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- Goal is to estimate what an individual is willing and *able* to pay for a ***small reduction*** in his risk of death
  - It does NOT measure the amount an individual would pay to avoid death with certainty
- Suppose a person is willing to pay ₹500 to reduce his risk of dying by 1 in 10,000 over the coming year:
  - If 10,000 people will each pay ₹500 for a 1 in 10,000 risk reduction, together they will pay ₹5,000,000 for risk reductions that sum to 1 statistical life saved
  - We say that ₹5,000,000 is the ***Value per Statistical Life (VSL)***.

How Should the VSL Vary with Income?

- The ratio of the VSL to income (Y) indicates the percent of income a person would spend on a 1 in 10,000 risk reduction
  - VSL/Y = 170 implies he would spend 1.7% of income
  - VSL/Y = 50 implies he would spend 0.5% of income
- USEPA's VSL implies a VSL/Y = 170
- High-quality studies and common sense suggest that this ratio should fall with per capita income
- In previous example if Y = ₹100,000 then VSL/Y = 50

Key Issues in Using the VSL

- How to estimate the VSL?
  - Several studies published for India, yielding diverse results
  - Can transfer values from other countries, but how should this be done?
- Should the VSL vary with age?
  - Should the same value be applied to persons of all ages, as is done by the World Bank, IMF and US government?
  - 61% of air pollution related deaths are persons 65+
- How to value risk reductions to children?

Approaches to Valuing Mortality Risk Reductions

- Revealed Preference Studies
  - Use compensating wage differentials to value risk of death (most common approach)
  - Use data on purchase of safer vehicles or safety equipment (e.g., bicycle helmets)
- Stated Preference Studies
  - Contingent valuation studies ask people whether they would pay a stated amount for a change in risk of death
  - Can ask of persons of all ages, but questions are hypothetical

Should the VSL Vary with Age?

- Does the amount people will pay to reduce their risk of dying decrease as they age?
  - This might occur because remaining life expectancy (LE) decreases
  - Empirical evidence that the VSL decreases with age is mixed
- The Value per Statistical Life Year (VSLY) approach assumes that the VSL is proportional to LE
  - VSLY = VSL/(Discounted remaining LE)
  - VSLY is assumed constant and YLLs are multiplied by the VSLY

Use a Constant VSL or a Constant VSLY?

- USEPA, the IMF and the World Bank value lives lost due to air pollution by a VSL that does not vary with age
  - The life lost of an 80-year-old counts the same as the life lost of a 40-year-old
- In Europe the VSLY is more widely used; it is also used to value DALYs and QALYs. But literature support is weak.
- Which approach is used makes a great deal of difference in valuing air pollution damages
  - Over 50% of lives lost due to air pollution in India are persons 70+ years old
  - Using the VSL (v. VSLY) more than doubles air pollution benefits from the US Clean Air Act

Estimates of the VSL for India

- Large range of VSL/Y values from Indian studies:
  - Madheswaran (2007) wage-risk study implies VSL/Y = 374
  - Bhattacharya et al. (2007) stated-preference study implies VSL/Y = 14.4
- Using benefits-transfer from OECD, World Bank and Lancet Commission on Pollution and Health find VSL/Y = 64 for India
- Benefits-transfer based on a recent Gates Foundation study suggests a VSL/Y = 53 for India

VSL Estimates of Air Pollution Mortality

- Applying a VSL/Y = 53 yields a value of reducing air pollution deaths to zero in India = 5% of GDP
  - Estimates also computed for each state
- These values are 10 times the value of lost output
  - Value of lost output reflects only returns to labor
  - Our estimates apply the same VSL to persons of all ages
  - 71% of deaths due to air pollution are age 60+; 61% of deaths are 65+
  - Value of these deaths are low using output approach given that worker-population ratio falls with age