Valuing Reductions in Risk of Death

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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