

Evaluation of Public Policies and Social Programs

Session 10: Valuing Health, Education & Human Capital — VSL, QALYs, and Long-Run Returns

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Today

1. The value of a statistical life (VSL) and quality-adjusted life-years (QALYs), briefly
2. Core exercise: Perry Preschool — a template for Astoreca
3. Discussion: why the discount rate matters so much here
4. What we learned
5. Paper presentation (closes today's session)

Welcome back from the First Presentation.

Learning Objectives

By the end of today's session, you will be able to:

- State what the value of a statistical life (VSL) is (and is not), and derive it from the same hedonic logic as Session 6
- Compute a quality-adjusted life-year (QALY)-based cost-effectiveness ratio and compare it to a threshold
- Know when to reach for cost-benefit analysis (CBA) or cost-effectiveness analysis (CEA)
- Apply the Perry Preschool calculation structure directly to the Astoreca school's long-run earnings benefit

Valuing Health and Mortality Risk

Recall: the same hedonic logic, a different market

Session 6: housing prices capitalize school quality. Today: wages
capitalize mortality risk.

Same tool (Rosen's hedonic framework), same equilibrium logic, different attribute.

Why do we need a value for health?

A policy can reduce mortality risk, but it also uses scarce resources.

- A regulation, a safer road, or a cleaner fuel may prevent deaths without identifying whose life will be saved
- The decision still requires a comparison: how much should society spend for a small reduction in risk?
- Today we ask how economists recover a money value for that risk reduction from choices people actually make

Discussion: what is a small risk reduction worth?

Thought experiment

Suppose a job raises annual death risk from 1 in 10,000 to 2 in 10,000. How large would the annual wage premium have to be for you to accept the risk?

- What information would you need before answering?
- Would the answer be the same for everyone? For every risk level?
- If 10,000 workers each accepted a wage premium of \$600 for this extra risk, what aggregate tradeoff would that reveal?

From the thought experiment to the VSL

Viscusi, W.K. & Aldy, J.E. (2003), “The Value of a Statistical Life,” JEP

The **value of a statistical life (VSL)** is *not* the value of a specific identified life. It is the aggregate willingness to pay (WTP) for a small mortality-risk reduction: if 100,000 people each pay \$100 to reduce their death risk by 1/100,000, VSL
 $= \$100 \times 100,000 = \$10\text{M}.$

US regulatory values: EPA \$7.4M, DOT \$11.6M, FDA \$10.3M (2020 dollars). These are policy inputs, not prices of identifiable people.

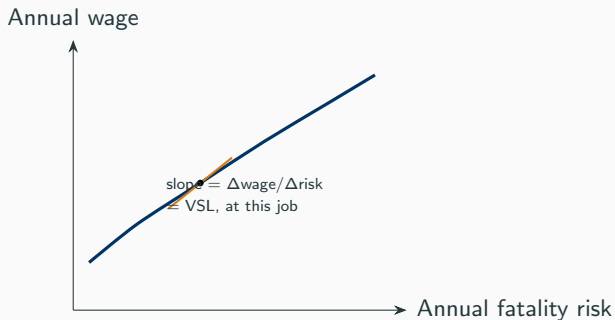
Where could we observe this tradeoff?

Workers choose among jobs that bundle wages with different risks.

- If two jobs are otherwise similar, a riskier job must offer a **compensating wage differential**: extra pay that makes workers willing to accept the additional risk
- Comparing the wage premium with the change in fatality risk gives a revealed-preference measure of WTP for safety
- This is the labor-market version of Session 6's hedonic price gradient: the attribute is mortality risk, and the implicit price is embedded in wages

Early applications include Thaler & Rosen (1976) and Viscusi (1978); Viscusi & Aldy (2003) review the literature.

The hedonic wage-risk locus



Riskier jobs pay compensating wage differentials. The *local slope* of the market locus is the VSL revealed by workers at that risk level — not a universal constant. Rosen (1974); Thaler & Rosen (1976); Viscusi (1978); review and evidence in Viscusi & Aldy (2003).

How is the risk valued in practice?

Stylized measurement example

Suppose an estimated wage equation implies that an increase in annual fatality risk of 1/10,000 is associated with a \$600 annual wage premium.

$$\widehat{\text{VSL}} = \frac{\text{wage premium}}{\text{risk increase}} = \frac{\$600}{1/10,000} = \$6,000,000$$

- The calculation is simple; the hard work is establishing that the wage difference reflects risk rather than skill, unpleasant conditions, location, or worker selection
- That is why empirical papers measure risk carefully and control for job and worker characteristics, while the review literature reports a range rather than one universal number

A different question: how much health does treatment buy?

Not every health intervention changes mortality. Some improve the quality of the years people live.

- A cancer treatment may extend life; a surgery may reduce pain; a mental-health program may improve functioning
- We need one outcome that combines length and quality of life without putting a dollar value on life itself
- That motivates the quality-adjusted life-year, or QALY

What does “quality of life” mean?

Health-state measurement

Quality of life is not observed as a single natural unit. Researchers describe a person's health state across dimensions such as mobility, self-care, usual activities, pain or discomfort, and anxiety or depression.

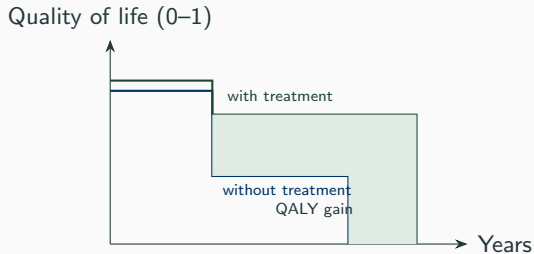
- A questionnaire such as the EQ-5D records the health state; a preference survey then assigns it a utility weight between 0 (dead) and 1 (full health)
- Common elicitation methods ask respondents to make tradeoffs: how many years of life would they give up for better health (time trade-off), or what risk of immediate death would they accept for better health (standard gamble)?
- The resulting weights are preference-based social values, not purely clinical measurements. Different populations and methods can produce different weights.

EuroQol Group (1990); Torrance (1986).

Quality-adjusted life-years and cost-effectiveness

- A **quality-adjusted life-year (QALY)** = (quality weight, 0–1) $\times$ (years of life)
- The **incremental cost-effectiveness ratio (ICER)** = $\Delta\text{Cost}/\Delta\text{QALYs}$
- Threshold values: NICE (UK) £20–30k; US informal \$100–150k
- Cost-effectiveness analysis (CEA) avoids monetizing life, but cannot compare health spending against non-health programs (like a school)

QALYs, visually



The shaded area — extra years *and* extra quality — is the QALY gain from treatment.

When to use which framework

- **VSL / cost-benefit analysis (CBA):** mortality-risk regulations, environmental policy
- **QALY / cost-effectiveness analysis (CEA):** clinical guidelines, drug approval, health technology assessment
- Neither VSL nor QALY is usually the headline metric for a school evaluation — but this style of thinking matters if your project touches health/safety margins (school meals, safety)

Core Exercise: Perry Preschool

Heckman, J. et al. (2010), “Rate of Return to the HighScope Perry Preschool Program,” J. Public Econ

A randomized early-childhood program for disadvantaged 3–4 year-olds, followed for decades — one of the best-documented long-run returns to an education intervention anywhere in the literature.

Simplified parameters

- Program cost: \$18,000/child
- Earnings gain: \$2,500/yr for 35 yrs (ages 25–60)
- Crime-reduction savings: \$4,000/yr for 15 yrs (ages 18–33)
- Discount rate: 3%

Task (groups, 25 minutes)

1. Calculate the PV of earnings and crime benefits separately
2. Calculate the benefit-cost ratio
3. Who bears the cost, and who receives each type of benefit?
4. **Directly transferable:** this is the calculation structure your team should use for the Astoreca school's long-run earnings benefit — what data would you need for the achievement-to-earnings link?

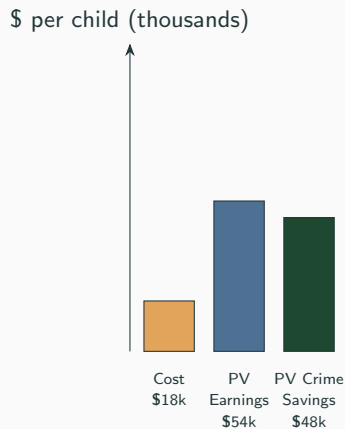
Solution: present values

$$\text{Present value (PV; earnings)} = 2,500 \times \frac{1 - (1.03)^{-35}}{0.03} = 2,500 \times 21.49 \approx \$53,725$$

$$\text{PV(crime savings)} = 4,000 \times \frac{1 - (1.03)^{-15}}{0.03} = 4,000 \times 11.94 \approx \$47,760$$

$$\text{Total PV benefits} \approx \$101,485, \quad \text{benefit-cost ratio (BCR)} = 101,485/18,000 \approx 5.6$$

Solution, visually



Benefits arrive decades after the cost — which is exactly why the discount rate is about to matter enormously.

Perry Preschool measured earnings directly, decades later. You don't have decades.

- Your team needs to convert an *achievement* effect (test scores, graduation rates) into an *earnings* effect, using external estimates from the literature (e.g., returns to a standard-deviation increase in test scores, or to an additional year of schooling)
- Every link in that chain — achievement → educational attainment → earnings — is a place where your estimate could be too optimistic or too conservative. Flag it in your sensitivity analysis (Session 13)

Why the Discount Rate Matters So Much Here

A preview of Session 12

Early-childhood and education programs have costs *today* and benefits *decades away*.

- The Perry Preschool benefits above were discounted only from the *start* of each benefit stream (age 25 or age 18) — not all the way back to the program itself (age 3–4)
- Discounting an extra 14–21 years at even a modest rate shrinks these numbers substantially
- The discount rate choice (Session 12) will be one of the most consequential decisions in your entire Astoreca evaluation

What We Learned Today

- VSL is aggregate WTP for small risk reductions, derived from the same hedonic logic as Session 6 — not the value of an identified life
- QALYs combine preference-weighted health states with years of life, allowing health interventions to be compared without monetizing life
- The Perry Preschool calculation — cost now, earnings and crime benefits for decades — is the direct template for the Astoreca school's core benefit calculation
- Long-horizon programs like this one are exactly where discount rate choice can make or break a recommendation

- Problem Set 3 (self-study checkpoint: by Session 15)

Paper Presentation (75–90 min)

Emilia Welkner, Javiera Hasbun & Paolo Vivanco

Finkelstein, A., Hendren, N. & Shepard, M. (2019), “Subsidizing Health Insurance for Low-Income Adults: Evidence from Massachusetts,” *AER*