

Health Insurance Theory

University of Alabama

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Last Class

- ▶ Natural Experiments
- ▶ Selection bias and randomization
- ▶ Four commonly used identification strategies in health
 - ▶ Fixed Effects Estimation
 - ▶ Difference-in-Differences
 - ▶ Instrumental Variables
 - ▶ Regression Discontinuity Design

What is Health Insurance?

Health Insurance is a type of insurance coverage that covers the cost of an insured individual's medical expenses.

When we refer to health insurance, we need to make the distinction between HI and Social Insurance.

- ▶ Health Insurance is a form of risk-pooling, whereas Social Insurance refers to government programs such as Social Security, Medicare, and Medicaid.
- ▶ Health Insurance is provided through markets in which buyers protect themselves against adverse health outcomes, while social insurance uses the government as insurer.
- ▶ Two features that distinguish social insurance from health insurance are that in the former:
 1. Premiums are heavily or sometimes completely subsidized
 2. Participation is constrained according to government-set eligibility rules.

Health Insurance Example

- ▶ In a very simple example, consider a club of 100 members. Members are about the same age, and they have the same interests and lifestyles.
- ▶ About once per year, one of the 100 members gets sick and incurs health care costs of \$5,000. The incidence of illness seems to be random, not necessarily striking men, women, the old, or the young in any systematic fashion.
- ▶ Club members, worried about potential financial losses due to illness, decide to collect \$50 from each member and put the \$5,000 in the bank for safekeeping and to earn a little interest.
- ▶ The “insurer” collects the money, tries to increase its value through investment, and pays claims when asked.
- ▶ Here, all 100 members have pooled the risk of bad health outcomes.

Desirable Qualities of Insurance

An insurance arrangement has several desirable qualities:

1. The number of insured people is large (Law of Large Numbers), and people are independently exposed to potential losses.
2. The losses covered should be definite in time, place, and amount.
3. The probability of incurring a bad outcome or a loss should be measurable.
4. From the viewpoint of the insured individual, the loss should be an accident.

Example of Loss Aversion

People typically are more inclined to avoid drastic losses.

Would you rather:

a. Flip a coin: \$8 if heads, \$-2 if tails.

b. Get \$1 for sure.

a. Flip a coin: \$8,000 if heads, \$-2,000 if tails.

b. Get \$1,000 for sure.

a. Flip a coin: \$8,000,000 if heads, \$-2,000,000 if tails.

b. Get \$1,000,000 for sure.

Exciting Insurance Terminology

There is a specific set of terms used in insurance to describe pricing:

- ▶ Premium- The price that people pay for insurance of a certain coverage amount
- ▶ Coinsurance or Copayment- Many times health insurance will require that the insured share in the loss when bad states occur. The percentage paid by the insured is the coinsurance rate, while copayment is the literal amount paid by the insured as a result of this sharing.
- ▶ Deductible- In many cases, the insurance company will require that the insured pay a certain amount before the insurance “kicks-in” and begins to payout. This amount is the deductible. A deductible amount is usually a set amount per year.
- ▶ In many cases, coinsurance and deductibles are used together.

Exciting Insurance Terminology

- ▶ Coinsurance makes consumers more alert to differences in the true costs of the treatment they are purchasing, while deductibles discourage frivolous claims or visits. Each may serve to avoid claims and to reduce costs.
- ▶ Exclusions- Services or conditions not covered by the insurance policy, such as cosmetic or experimental treatments.
- ▶ Limitations- Maximum coverages provided by insurance policies. For example, a policy may provide a maximum of \$3 million lifetime coverage.
- ▶ Pre-existing Conditions- Medical problems not covered if the problems existed prior to issuance of the insurance policy.

Exciting Insurance Terminology

- ▶ Pure Premiums- The actuarial losses associated with the events being insured.
- ▶ Loading fees- General costs associated with the insurance company doing business, such as sales, advertising, or profit.
- ▶ Actuarial Fair- The equality of expected payouts and premiums. Although insurance companies must also cover additional administrative costs to break even, the definition of actuarial fair provides a benchmark in talking about insurance.

Health Insurance Example

Suppose an individual makes \$40,000 per year, however does not have health insurance. Further assume that this individual has utility of the form: $U(M) = M^{0.5}$. With a 50% probability, the individual will suffer a serious health issue within the year costing them \$30,000 in hospital fees.

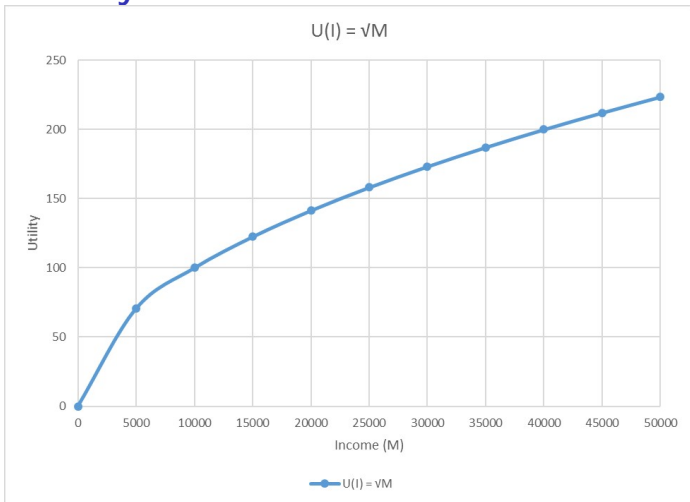
What is this individual's expected income and expected utility?

Expected income/utility is equal to income/utility in the good state times the probability of the good state plus income/utility in the bad state times probability of the bad state.

$$E[M] = (40,000 - 30,000) * 0.5 + 40,000 * 0.5 = 5,000 + 20,000 = 25,000$$

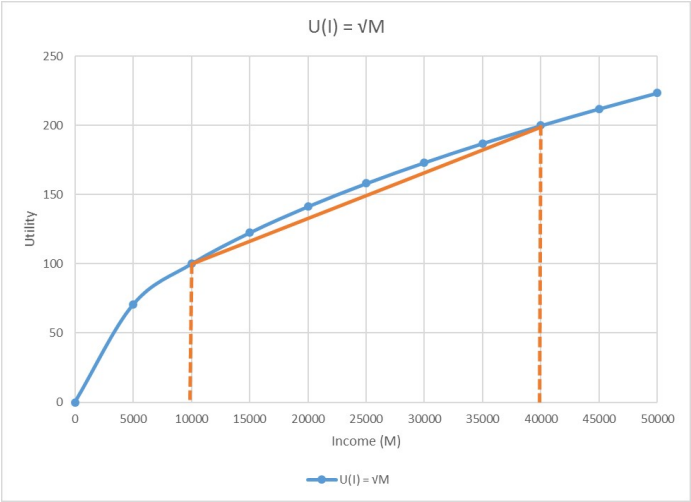
$$E[U] = (10,000)^{0.5} * 0.5 + (40,000)^{0.5} * 0.5 = 50 + 100 = 150$$

Certain Utility from Income



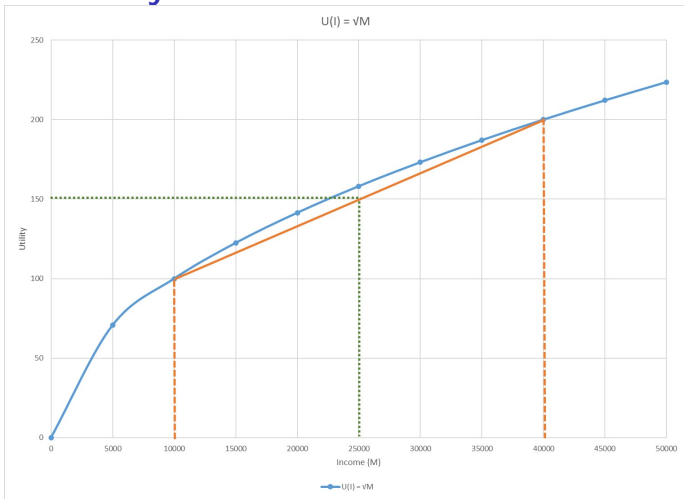
Here, note that the utility function is concave, indicating that this individual is risk-averse. What might a risk-loving or a risk-neutral utility function look like?

Expected Utility from Income



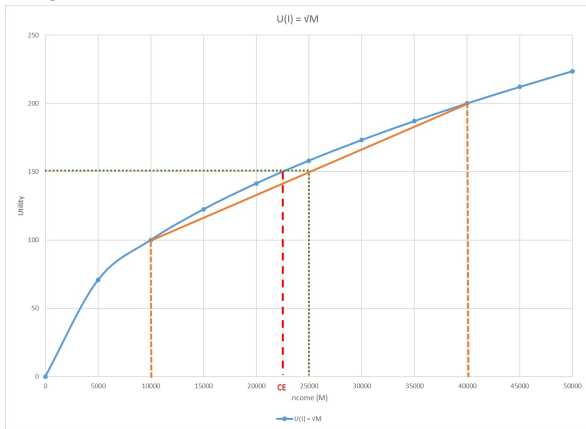
We can represent expected utility from income with a linear combination of the two possible outcomes.

Expected Utility from Income



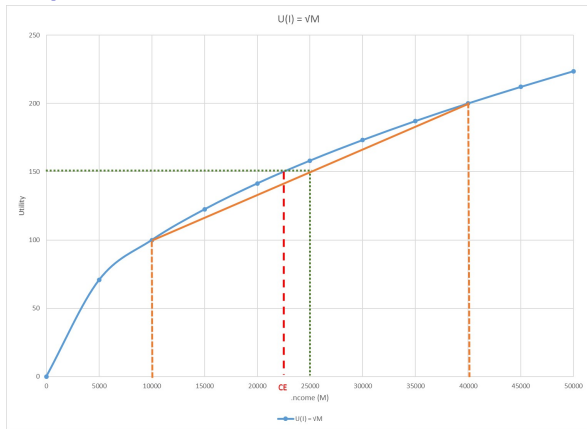
Recall from our calculation, expected income is \$25,000 and expected utility from that level of income is 150 utils. This is represented by the horizontal mapping from the expected income line to the y-axis.

Certainty Equivalent



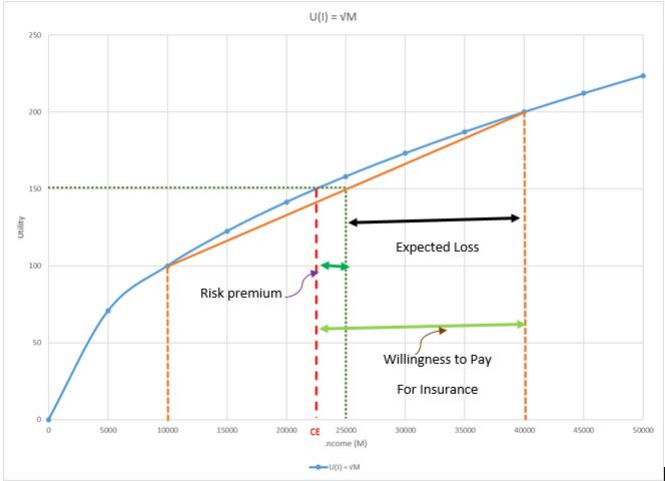
The certainty equivalent is the guaranteed amount of money that an individual would view as equally desirable as a risky asset. To calculate this dollar amount, we can back it out using the functional form of the utility function.

Certainty Equivalent



Recall, $U(M) = M^{0.5}$, and we know we get 150 utils at this level of income, so $150 = M^{0.5} \implies 150^2 = M \implies M = \$22,500 = CE$
This risk-averse individual is indifferent between receiving \$22,500 guaranteed vs taking a gamble with an expected value of \$25,000

Expected Loss, Risk Premium, WTP for Insurance



$$\text{WTP} = \text{Expected Loss} + \text{Risk Premium}$$

Things to Note

1. Insurance can be sold only in circumstances where there is diminishing marginal utility of wealth, i.e. the utility function is concave and the individual is risk-averse.
2. Expected utility is an average measure of how happy the individual can expect to be given that there is risk of negative events. Expected utility is nothing more than a computation of the mean outcome.
3. Even if insurance companies charge more than the actuarial fair premium, individuals that are risk-averse still may buy insurance. This purchase is due to the increased well-being due to the elimination of risk.
4. The willingness to pay for insurance is related to the distance between the utility curve and the expected utility line. If an individual is very unlikely to become ill, then the expected utility will be almost identical to certain utility.

Next Class

- ▶ Demand and Supply of Insurance, Moral Hazard, and Adverse Selection