Health Insurance
Adverse Selection

Definitions

1. **Information asymmetry**: a situation in which agents in a potential economic transaction do not have the same information about the quality of the good being transacted.

   Asymmetric information is knowledge that is *private* to some agents, i.e., some agents have it and others don't.

   1.1 private knowledge of *type*, i.e., immutable characteristics, e.g., genetic predisposition to health conditions;
   1.2 private knowledge of *actions*, e.g., amount of regular physical exercise.

2. Asymmetric information *can* (but doesn't have to) lead to market failure (too much or too little of some economic activity):

   2.1 private action $\Rightarrow$ moral hazard.
   2.2 private type $\Rightarrow$ adverse selection;

Definitions

1. **Adverse Selection**: Over-supply of low-quality goods, products or contracts when there is asymmetric information.
2. Low-risk or "good"-type agents *select* themselves out of insurance with only high-risk or "bad"-type agents remaining, leading to too little insurance being provided.

Predictions:

1. **Positive Correlation** between risk-*type* and insurance coverage.
   1.1 Higher risk customers are most likely to buy insurance.
2. **Adverse selection death spiral**:
   2.1 Pooling different risk types will unravel the pool, *without an inducement* that keeps low-risk in the pool.

Positive correlation between risk-*type* and coverage

1. If insurance is offered at *actuarialy fair rates*, i.e., premium=loss×prob. of loss, *risk-averse* individuals are willing to buy it to eliminate risk.
   - 1.1 For a risk-averse individual, actuarialy fair insurance will strictly increase utility as it eliminates risk in exchange for a small sure payment.
   - 1.2 Insurance transfers risk away from risk-averse individuals by pooling independent risks (law of large numbers).

2. If insurers knew risk of all insurees i.e.,*perfect information*, they could offer actuarialy fair insurance (with a small profit margin) to all insurees, but they often don't and must offer same insurance to high- and low-risk insurees, with premium = average of high- and low-risk actuarialy fair premiums.

3. At average premium, low-risk individuals would be paying too much compared to their risk, they might not want to buy insurance, leaving only high-risk in the insurance pool, i.e., adverse selection. This is inefficient as all risk-averse individuals should buy insurance.

Note the difference between low-and high-risk *type* and risk *averse*.

Adverse Selection Death Spiral/1

Adverse selection death spiral: successive rounds of adverse selection that destroys an insurance market.

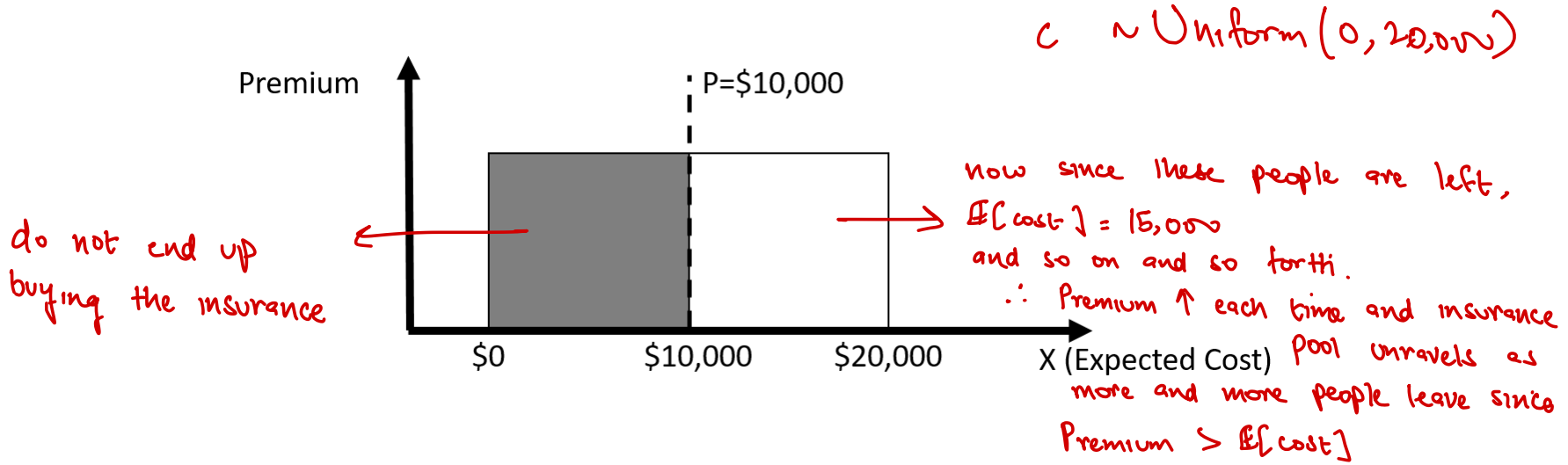
Basic Setup:

1. Heterogeneous risk types: Several customers and each customer has an expected health care cost for a given year.
2. Insurance company offers **single** insurance policy with annual premium P. It covers all costs.
3. Why single policy: Insurance company cannot distinguish between healthy and sick customers, nor can it offer different policies.
4. Insurance company cannot prevent sick people from buying.
5. Customer will buy insurance if and only if the premium is less than expected cost. (else can pay expected cost and not the premium)

asymetric information

$\mathbb{E}[\text{cost} \mid \text{high risk}] > \mathbb{E}[\text{cost} \mid \text{low risk}]$

Adverse Selection Death Spiral/2

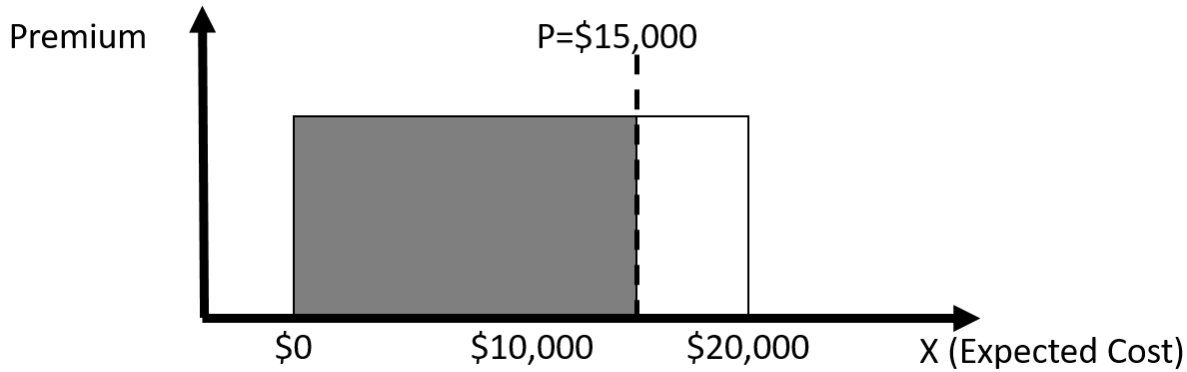


First Round:

- Premium = \$10,000. Half of customers do not buy because expected cost $<$ premium.
- Healthy customers do not buy health insurance. Leave the market.
- Insurance company collects \$10,000; but pays on average \$15,000. Loss of \$5,000.
- Insurance company increases premium to \$15,000.

Source: Bhattacharya, Hyde and Tu (2014). Health Economics

Adverse Selection Death Spiral/3



Second Round:

- Healthier individuals leave plan again. Sick people remain.
- Insurance company again makes loss. Again increases premium.
  $[n = 3...N^{th} - 1]$ Rounds:
- Healthier individual leave again. Sicker people remain...losses...increase in premium...
- Akerlofian market collapse: Insurance company collapses. No more insurance.

Source: Bhattacharya, Hyde and Tu (2014). Health Economics

Evidence for Adverse Selection

- Harvard University offers two kinds of plans in 1994
  - Cheaper HMO plan: Premium \$0 [Enrolment 82%]
  - Expensive PPO plan: Premium \$361. More generous. [Enrolment 18%]
- First round. PPO declined to 14% in 1995.
  - PPO leavers: More healthy on average. 31% under 40. 6% less spending.
  - PPO stayers: Less healthy on average. 18% over age 60 and 6% more spending
  - Premium increased to \$731.
- Second round. PPO declined to 9% in 1996.
  - PPO leavers: More healthy on average. 30% under 40. 9% less spending.
  - PPO stayers: Less healthy on average. 19% over age 60 and 9% more spending
  - Premium increased to \$1,414
- Third round.
  - No third round. PPO discontinued.

Evidence against Adverse Selection

1. Positive correlation between risk-*type* and insurance coverage (Cardon and Hendel 2001)
   - 1.1 Health-care costs and coverage were positively related (US workers)
   - 1.2 Correlation disappears when adjusted for age, race, gender.
   - 1.3 $\rightarrow$ Employees do not have information advantage over insurers.
   - 1.4 Adverse selection existed because cannot discriminate on demographic factors.

2. Negative correlation between risk-*type* and insurance coverage (Fang et al 2008)
   - 2.1 Healthier individuals buy more insurance than risky ones.
   - 2.2 Healthier individuals had lesser medical expenditure than sicker ones.
   - 2.3 "Advantageous selection" seniors with higher cognitive ability are both healthier and more likely to buy insurance.

Adverse Selection Solutions

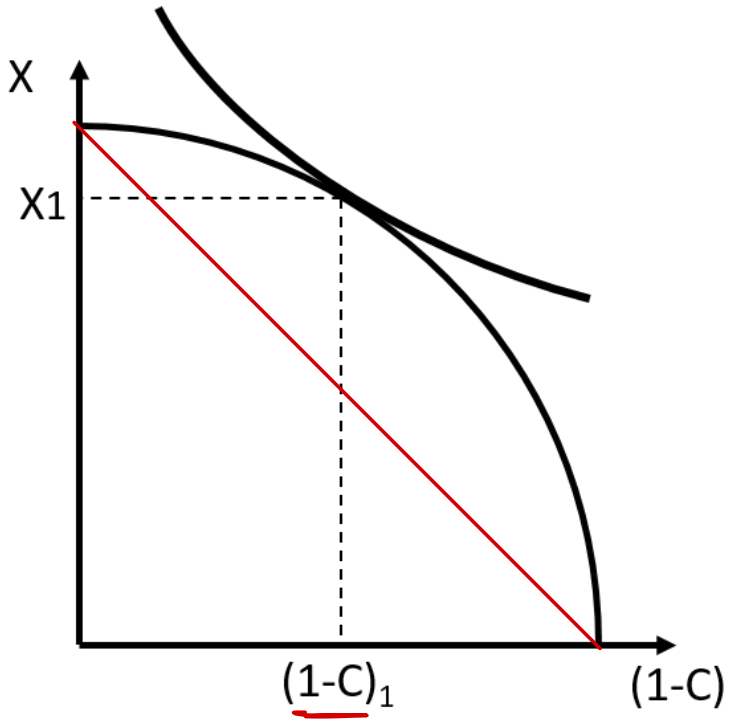
Adverse Selection Theoretical Model Premise

In current setup:

- **Insurance company is unable to identify healthy vs sickly**
- hence offers same premium to both
- This "same" premium is set at the average (expected) value of healthy and sickly's expected health-care costs.
- Since this expected value is higher than the healthy person's expected value, healthier people quit insurance i.e. adverse selection
- Adverse selection is associated with welfare loss due to un-certainty

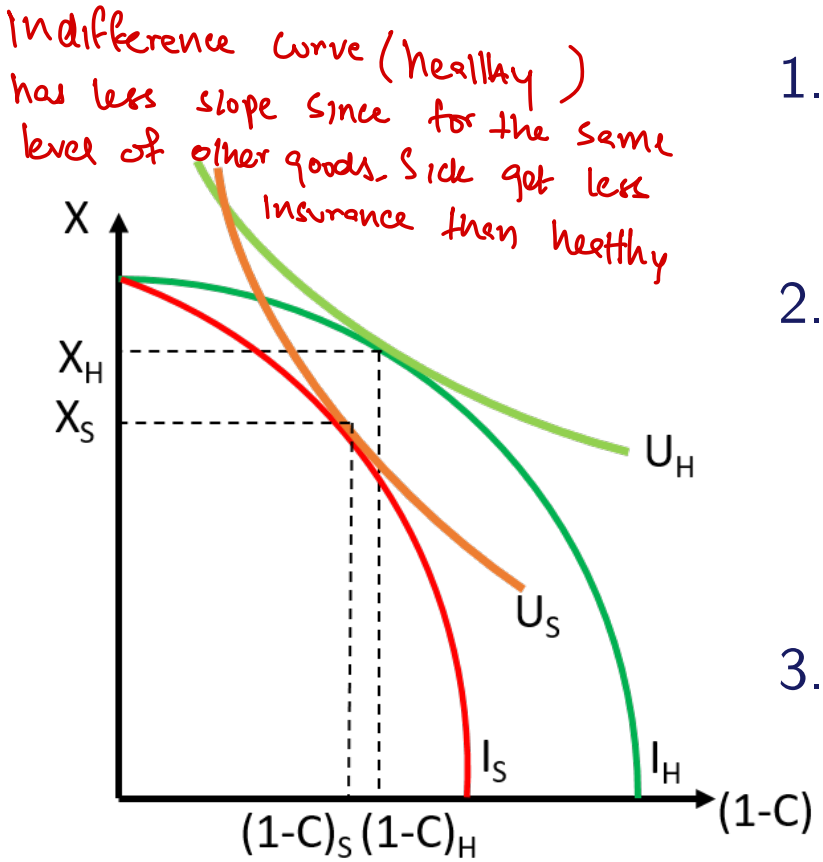
Insurance company **wants people to self-identify their type** (high, low risk) through selecting insurance $\rightarrow$ avoid adverse selection.

Adverse Selection Theoretical Model: Setup 1/5



1. Two goods: Insurance coverage (1-C) and other goods (X)
   - 1.1 C: co-insurance (consumer pays C%)
   - 1.2 (1-C): Insurance pays 1-C%
2. Budget line: **curved** ↳ co-insurance
   - 2.1 As coverage increases, C↓, insurance premium increases more than proportionately.
   - 2.2 (A) Insurance is picking up more of the health bill as coverage ↑ → risk of Moral Hazard increases
   - 2.3 (B) Total bill increases in size due to effects of insurance on demand for care.
3. Expanding coverage (1-C), decreases ability to buy X at an increasing rate. ↳ due to increasing premiums
4. Optimal: $(1-C)_1; (X_1)$

Adverse Selection Theoretical Model 2/5

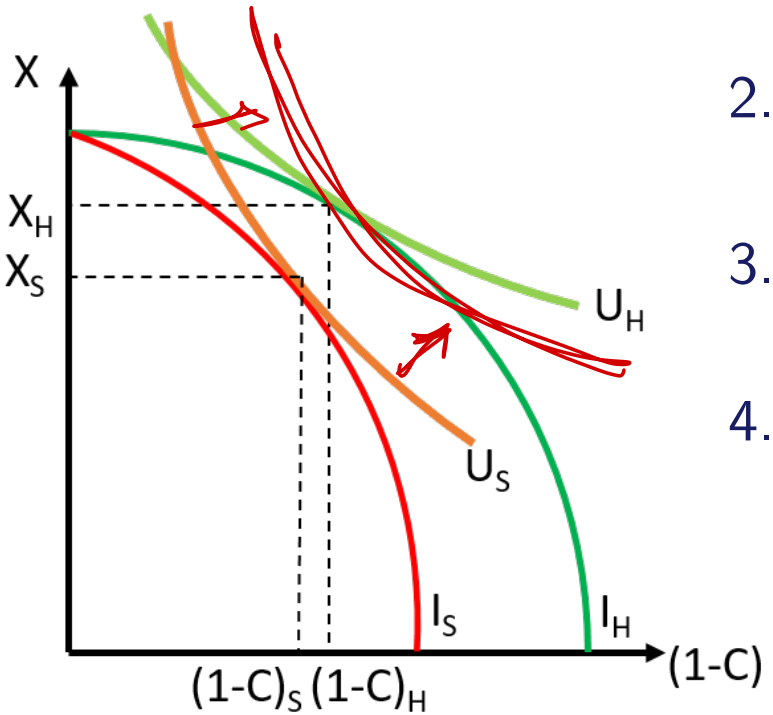


$\frac{\partial \text{Premium}}{\partial \text{coverage}}(\text{sick}) > \frac{\partial \text{Premium}}{\partial \text{Coverage}}(\text{healthy})$

[Budget lines]

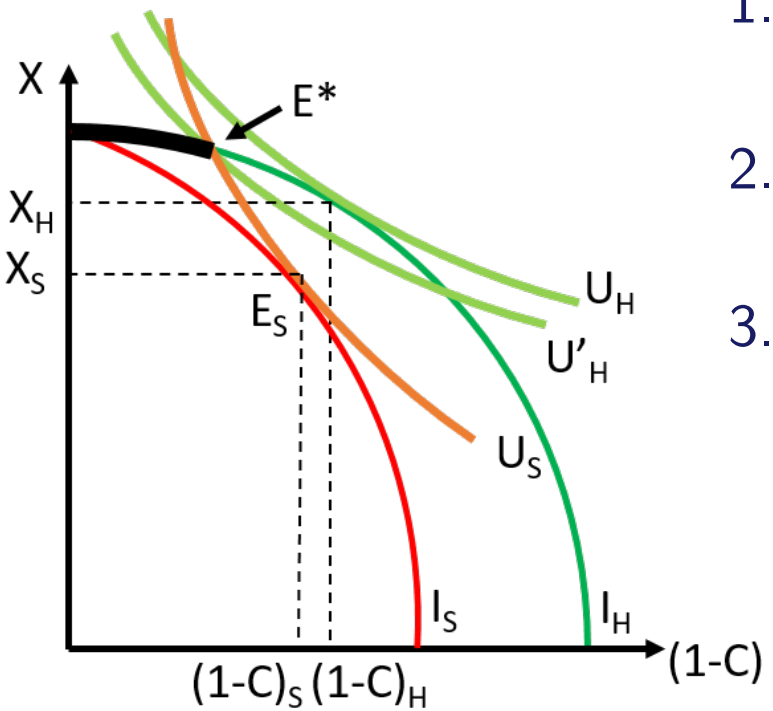
1. Two patient-*types*: Sickly and Healthy (risk-types)
   - 1.1 **Expected cost** higher for sickly
2. If insurance company **can identify risk-types**, offer high premium to sickly:
   - 2.1 **Budget line** I_S lower than $I_H \rightarrow$ if for same coverage, healthy charged lower premium, then can buy more X.
3. **Indifference curve** tipped towards insurance for sickly (flatter for healthy) $\rightarrow U_S, U_H$ curves intersect!
4. Healthy person consumes more of everything (higher effective income)
   - 4.1 $X_h > X_s$ and $(1-C)_h > (1-C)_s$

Adverse Selection Theoretical Model 3/5



1. If insurance company **cannot identify risk-types**
2. Sickly will buy insurance meant for the healthy.
3. IF they switch to budget line I_H, then they can be on a higher indifference curve.
4. IF sickly switch to I_H, then they pay lower premium (meant for healthy) but consume more of health-care than healthy.
   - 4.1 Because they are sicker than healthy
   - 4.2 Because of moral hazard induced by cheaper insurance (recall the price distortion is higher now)
5. Insurance company collects lower premium but pays out higher in insurance claims for these sickly patients. Makes loss and quits the market.

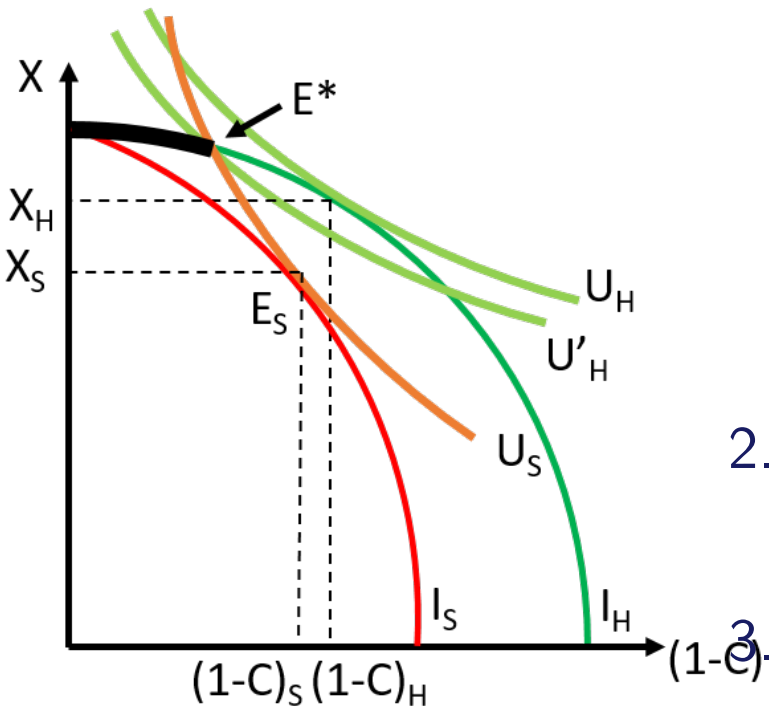
Adverse Selection Separating Equilibrium 4/5



Separating Equilibria

1. Insurance company offers two different contracts and lets people select them:
2. Company offers a full-coverage policy for sickly people on I_S.
3. Company offers a "limited" policy for healthy to dark-shaded line on I_H (left from E^*)
   - 3.1 Offer low-coverage (high C) plans at rates based on "healthy" (low-risk) spending.
   - 3.2 Not offer to right of E^* as it will increase utility of sickly.

Adverse Selection Separating Equilibrium 3/3



1. **Sickly** will buy at U_S tangent to I_S at E_S. No change for them.
   - 1.1 Utility at E_S is greater than any point on dark-shaded region.
   - 1.2 **High-risk** have **self-identified** and paid **experience-rated** insurance premium appropriate to them.
2. **Healthy** will buy at E^* at utility U'_H
   - 2.1 Lower utility for healthy.
3. "Separating equilibrium" - offer insurance contracts which lets high and low risk type separate out.
   - 3.1 Outcome for competitive market, because insurance company cannot do anything except limit the plans for "low-risk" types (Rothschild and Stiglitz, 1976)

Solutions 01 - Compulsory Insurance

Mandate that everyone must buy health insurance s.t. that people of different risk level form a single insurance pool

1. Compulsory insurance with choice: USA: PPACA or "Obamacare" everyone must buy insurance, but choice of providers on Health exchange.
2. Compulsory insurance without choice of insurance provider.
   - 2.1 Japan: Every Japanese citizen assigned an insurance fund based on his/her employment status, age, and location. If unemployed or retired, then safety-net general insurance program - Kokuho.
3. Choice of insurance provider but restrict product differentiation:
   - 3.1 If insurance companies are not different, then little adverse selection from customers.
   - 3.2 Germany: Insurance funds are limited in their differentiation.
   - 3.3 Germany: All funds must meet a generous minimum standard $\rightarrow$ prevents adverse selection death spiral.

Results in **discount insurance for the frail/sick** and **actuarially unfair insurance for the healthy**.

Solutions 02 - Lifetime Insurance

Lifetime insurance contract

1. Commit to lifetime insurance **before** health differences emerge.
2. Information asymmetry between insurance and customer develops over time $\rightarrow$ Pool together before healthy realize they are healthy.
3. Pay a premium that **increases** with age but does not depend on subsequent health development.

Issues:

4. Antagonistic relationships once risk differences are apparent:
   - 4.1 After certain time-period, once risks are different, premiums are same but payouts are different for individuals.
   - 4.2 Insurance company would like to drop the sicker individual.
   - 4.3 Healthier individual would like to drop the insurance.
   - 4.4 Only kept together by legal nature of contract.
   - 4.5 Inhibit competition as no other insurance company can compete for these two customers.

Solutions 03 - Guaranteed Renewable Contract

Guaranteed Renewable Contract

1. Commit to lifetime insurance **before** health differences emerge.
2. Information asymmetry between insurance and customer develops over time $\rightarrow$ Pool together before healthy realize they are healthy.
3. Pay a premium that **decreases** with age but does not depend on subsequent health development.
   - 3.1 Decreasing premiums due to front-loading of premium $\rightarrow$ Pay majority of premium in younger years before risks differ.
4. After certain time-period, once risks are different, premiums are same for both but are **also very low**.
   - 4.1 None of the customers wants to leave.
   - 4.2 No legal binding commitment required.
5. Inter-temporal subsidization: Younger ones (both) subsidise the sicker older one.
   - 5.1 At young age, do not know later risk - more willing to pay high premium
   - 5.2 At older age, the high upfront premiums lock the individual

Solutions - Natural Solutions?

1. Customers mis-perceive their risk
2. Customers do not act on private information
3. Insurers can accurately observe customer risks
4. Selection on other factors overcomes adverse selection

Solutions 04 - Risk Misperception

1. **Extent of AS depends on degree of information asymmetry** between customer and insurance company.
2. Customers may not have risk information - i.e. no asymmetry
3. Novice drivers do not know their risk.
   - 3.1 88% of student drivers believed they were safer than median driver.
   - 3.2 Did not demand higher insurance.
4. Elderly males do not know risk of death
   - 4.1 31% of elderly (85-89) males believe reaching age of 100. Only 3.4% actually do.
5. Younger females do not know risk of death
   - 5.1 51% of 70-74 year females believe reaching age of 85. 57% actually do.

Solutions 05 - Failure to Act

Customers do not act on their private information.

1. Bounded Rationality: Even if customers know the real risk, they have **limited knowledge of differences in insurance premium** due to risk
   1.1 Number of miles driven (is real risk of accident) but not a predictor of insurance coverage purchase (Cohen and Siegelman 2010)

2. Decision fatigue: Even if customers know the real risk and the differences in premium, **they have limited willingness to act** on it.
   2.1 Too busy with other things than small bargains on insurance. (Pauly 2003)

Solutions 06 - Insurers can predict risk

Insurers can predict risk.

1. Insurers are better than middle-aged customers at predicting whether they will need nursing-home care (Finkelstein and Garry 2006)
2. Insurers can predict risk as long as customers are healthy and not yet diagnosed with chronic disease (Hendren 2012)
3. If insurers can predict risk, then they can adjust risk premiums accordingly.
4. **Risk-selection**: Insurers also take pre-emptive measures to remove high-risk customers and enrol healthy, low-risk customers to reduce expected expenditure of the pool.
   - 4.1 Insurance advertisements show physically active seniors doing outdoor activities, no wheelchair bound seniors.
   - 4.2 No offices or agents in high-cost regions; ignoring inquiries.
   - 4.3 Insurance seminars held in buildings without wheelchair access

Solutions 06 - Insurers can predict risk

Eliminating Risk Selection

1. **ex-post cost-based compensation**: Establish a national fund to re-insure sickness funds.
   - 1.1 Sickness funds that have more sicker customers are reimbursed with transfers from healthier funds (Swartz 2003)
   - 1.2 If sickness funds are compensated 100% for their higher-than-average costs, then completely eliminates risk-selection.
   - 1.3 However, **reduces incentives to operate efficiently** (Newhouse 1996)

2. **ex-ante risk-adjustment**: Compensating sickness funds with high-risk customers using payments from funds with low-risk customers.
   - 2.1 Transfers are based on *ex-ante* risk assessment and not actual costs outcomes - Sickness funds reimbursed on expected expenses
   - 2.2 Reduces incentives for risk-selection.
   - 2.3 Maintains **incentives for efficient operation**.
   - 2.4 Centralized fund to manage transfers between sickness funds.
   - 2.5 Complete vs in-complete risk-adjustment

Solutions 07 - Advantageous Selection

Advantageous selection: **less risky** people are **more likely** to buy insurance than more-risky people. Less risky people maybe more risk-averse, wealthier, or better able to understand benefits of insurance.

1. Cognitive ability positively correlated with insurance coverage and negatively correlated with health expenditure
   - 1.1 Better understand benefits of insurance, can find better deals on insurance
   - 1.2 Negative correlation between risk and insurance coverage (Fang 2008)

2. **Preference based selection**:
   - 2.1 Until now: assumed that individuals had **heterogeneous risk types** but **homogenous risk-preferences**. They all want to protect themselves equally.
   - 2.2 But if **homogenous risk types** but **heterogeneous risk-preference** $\rightarrow$ more risk-averse buy more insurance and gain more utility.
   - 2.3 Reality: heterogenous on both risk-type and risk-preference $\rightarrow$ adverse selection and preference-based selection occur simultaneously
   - 2.4 High-risk and very risk-averse may pool together and cross-subsidize.