

Health Insurance Moral Hazard

Plan

1. Need for Third Party Payment
2. Development/Features of Insurance
 - 2.1 Empirical evidence on insurance's benefits
3. Issues with Third-Party Payment
4. Moral Hazard
 - 4.1 Problem of moral hazard
 - 4.2 Solutions to moral hazard
 - 4.3 Empirical evidence on moral hazard.
5. Singapore Healthcare
 - 5.1 Solutions to moral hazard

From Health to Health-care

utility is a function of health

Want health because $\rightarrow U = U[H, Y(H)]$ i.e. Consumption & Investment.

Assume we want health but health is also a Capital good:

$$\rightarrow H_t = H[(1 - \gamma)H_{t-1}; T_H^t, M^t] \text{ Health is autoregressive}$$

1. H_{t-1} is stock accumulated from $t = 0$ till $t - 1$. Can't change it in t
2. T_H^t is dependent upon your labor-leisure choices. time spent on increasing H
3. M^t : Health-care

So assume we want health-care, then we are concerned with the following:

1. How to pay for M^t and M^{t+x} i.e. health-care in current time-period and in future?
2. Does payment method have problems?
3. How to resolve them?

From Health-care to Payment

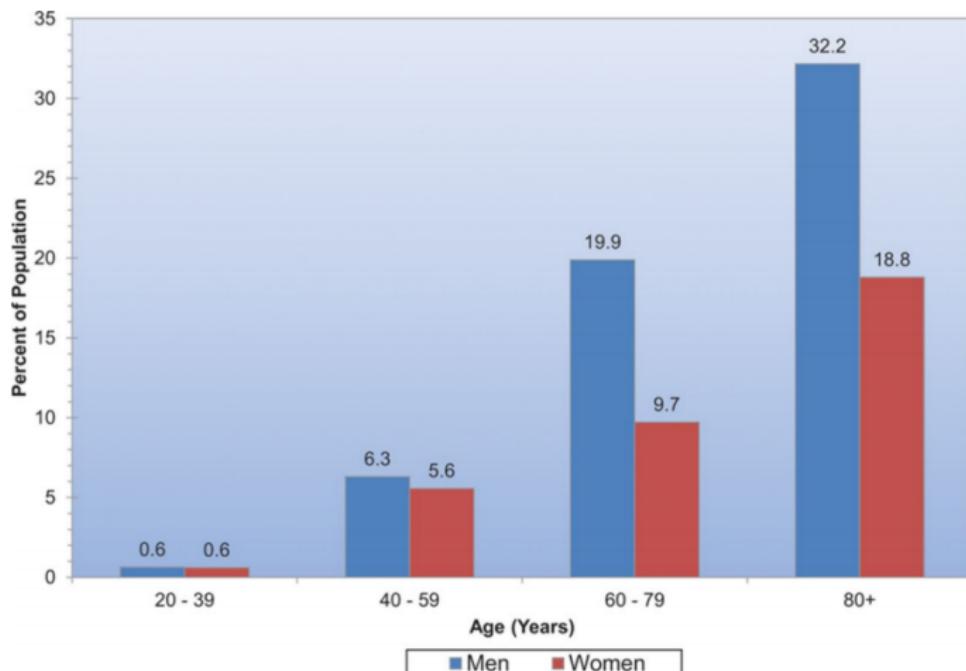


1. Borrowing: *personal loans*
 - 1.1 Inter-temporal: borrow when sick, repay when healthy.
 - 1.2 Time/effort cost to borrow (banks, friends, relatives);
 - 1.3 Difficult to borrow when sick, not enough time to repay.
2. Savings: *emergency funds*
 - 2.1 Inter-temporal: Earn income when healthy, pay costs when sick.
 - 2.2 Current costs paid from accumulated savings until now.
 - 2.3 Future costs paid from accumulated + future savings.
 - 2.4 Smoothing: Curtail consumption for unpredictable event:
for given Y_t , if expect costs to be high, then $S_t \uparrow \rightarrow C_t \downarrow$
spend less / save more for unpredictable event

Expected cost depends on (1) Probability of falling ill;
(2) Cost of falling ill. → both are uncertain and variable.

(1) Probability of falling ill

Prevalence of coronary heart disease by age and sex



(2) Cost of falling ill

Uncertainty: Health (medical) Spending is

1. **Unpredictable**

→ increases with age

1.1 Probability of falling ill, location, services.

2. **Highly variable**

2.1 Probability of falling ill, location, services.

Setting	Ward	P25	P50	P75
Private Hospitals/ Clinics	Inpatient	74,008	81,338	87,958
Public Hospitals (Unsubsidised)	Ward A	35,979	38,251	41,325
Public Hospitals (Unsubsidised)	Ward B1	31,338	34,204	39,668
Public Hospitals (Subsidised)	Ward B2	7,589	8,312	9,474
Public Hospitals (Subsidised)	Ward C	5,434	6,046	7,079

Table: Bill Amount for Heart, Coronary Disease, Coronary Artery Bypass Graft (Open) 2019

Risk-Pooling

If (1) probability of falling ill, and (2) cost of illness are uncertain and highly variable - can you rely on borrowing and savings? ? like

Risk-pooling

1. Pool of 100 students:
2. Uncertainty:
 - 2.1 Probability of sickness: One random student gets sick every year;
 - 2.2 Cost of illness: \$50,000. High for **any one** individual;
3. **Risk pool:** Insure each other and pay premium \$500 per annum [$\$500 \times 100 = \$50,000$ per annum];
4. Put this pooled money in bank, earn interest and pay when someone falls sick.
5. Individual has paid insurance premium to avoid the risk of uncertainty that will have to pay \$50,000.

Risk-Pooling and Insurance

1. Insurance: (Pool risk with others)

1.1 Inter-temporal: Transfer income from *Healthy state* to *Sick state* to equate marginal utility of income.

- ▶ Compare to inter-temporal over age for savings and inter-temporal over state for borrowing.
- ▶ Marginal utility of income low when healthy, *pay premium when healthy*, high when sick.

1.2 Smoothing: Curtail consumption only by the premium

- ▶ Compare to reduction of current consumption by expected costs divided by number of time-periods available to save.

1.3 Time/Effort cost (?)

- ▶ Search cost for agent/plan

Features of Insurance

Insurance must have a few features:

1. ✓ Relatively easy to define the **probability of loss**:

 1.1 Demographic, epidemiological, actuarial models of risk.

2. ✓ Relatively easy to **price the loss**

 2.1 Exactly state the loss amount, in what time frame, and for what event.

3. ✓ Risk-pool should be large enough:

 3.1 Helps to lower premium ($\$50,000/100 = \500 vs. $\$50,000/1,000 = \50)

 3.2 Their risk should be independent of each other; *claims should be independent*

4. ✓ Loss should be uncertain for any one individual:

 4.1 Does not work for non-accidental items.

*(otherwise opportunity for
Moral Hazard)*

Demand for Insurance

1. Probability of Loss (or falling ill):

1.1 Demographic, epidemiological factors such as age, gender...?

2. Price of loss (or falling ill):

2.1 Cost associated with falling (relative to income)

- ▶ E.g. Insurance for cancer vs insurance for flu

3. Type of Care (Preventive vs Curative):

3.1 Elasticity of demand (responsiveness);

- ▶ Insulin (relatively inelastic) vs Preventive (relatively elastic) screening.
high premiums *low premiums*

4. Insurance policy's price:

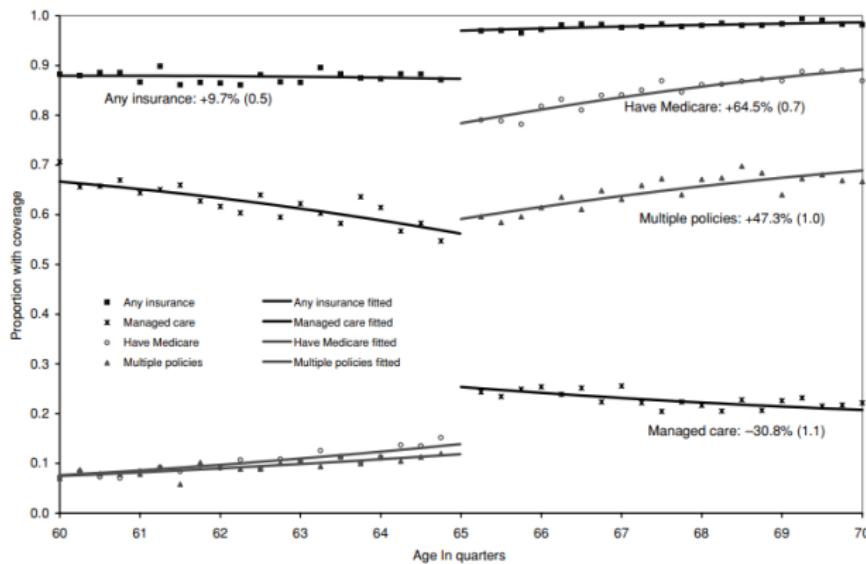
4.1 Premium: The annual amount paid by individuals to buy an insurance policy.

4.2 Loading fee: Administrative costs associated with insurance company's operations. Up to 40% in the US.

5. Degree of risk-aversion

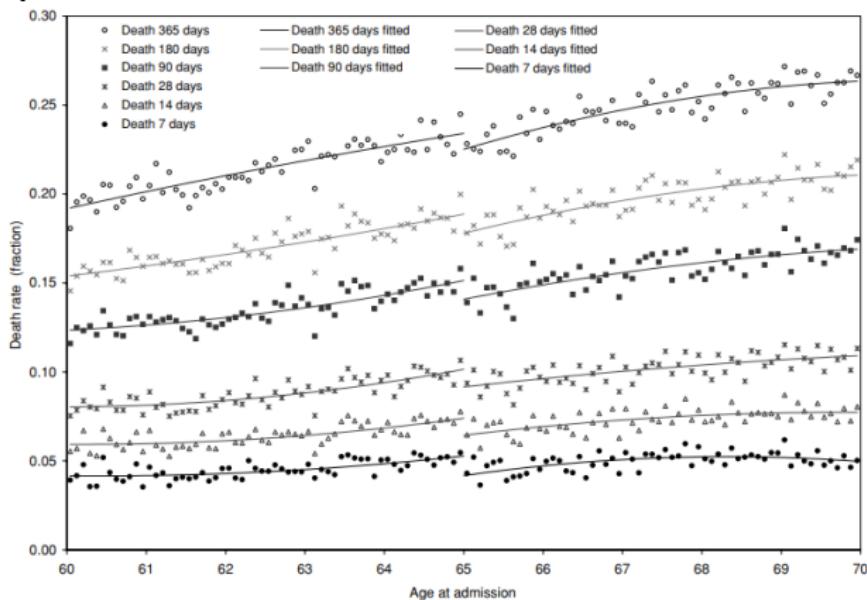
5.1 If risk-averse, then will buy insurance by paying premium.

If insurance reduces income risk, do people get it?



1. Card, Dobkin, and Maestas (2009, QJE): Effect of Medicare.
2. 8% increase in any coverage.
3. 65% Increase in Medicare coverage at age 65,

If insurance reduces income risk and people get it, does it improve health?



1. Regression Discontinuity: $y_i = f(a_i, a) + \beta Post65_i + \epsilon$
2. Mortality decreases by 1 percentage points.
3. Short-time period: 14–20% reduction in 7-day mortality.

Empirical Evidence

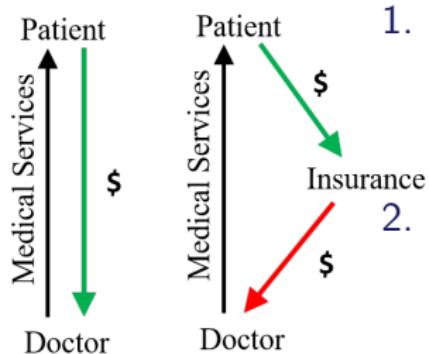
Impact of Health insurance on healthcare utilization:

Several complications:

1. Selection: People who value insurance more (risk averse, likely to fall sick), are more likely to take-up insurance.
2. Selection: Generosity of insurance (items it covers, deductibles, co-insurance) determines its uptake. More generous - more uptake.
3. Heterogeneity: The effect of insurance may vary across different groups.

Moral Hazard

What is the problem with Insurance?



1. In insurance, three parties to transaction:
 - 1.1 **Patients** pays premium to insurance firm;
 - 1.2 **Insurance company** pays fees to doctor;
 - 1.3 **Doctor** provides services to patient.
2. Issues of
 - 2.1 **Asymmetric Information**
 - 2.2 **Separation of Actions and Incentives**

	Patient	Doctor	Insurance
Information	<i>Lower information than doctor</i>		Lower Information than Patient/Doctor
Action	Purchasing care, paid by insurance.	Providing care, paid by insurance.	Limited Control
Incentive	No incentive to control cost	Incentive to increase cost	Incentive to control cost

⇒ **Moral hazard by (A) patients and (B) doctors.**

How does Moral Hazard happen? Example

Moral Hazard is the tendency for insurance coverage (against loss) to reduce incentive to prevent or minimize the cost of loss. by the patient

1. You have baseline risk of bad event (lung cancer).
Your actions (smoking) increase or decrease this risk.
2. You buy insurance that will **pay some or all costs** for bad event if it occurs. Price for event is now lower -
Price-distortion - you do not face full price for your consequences.
3. Due to price-distortion, you **change your behaviour** (either **increase the risk** of event, OR **increase the cost** of recovering from event).
4. Insurance company can't observe behaviour change due to **information asymmetry**.
5. There is social loss due to behaviour change.

Asymmetric Information, Moral Hazard, DEFINITION *

Definition: Moral Hazard is the tendency for insurance coverage (against loss) to reduce incentive to prevent or minimize the cost of loss.

Three necessary conditions:

insurance is paying your cost ↗ for patient

1. **Price Distortion:** Cost of risky or wasteful action is reduced due to insurance because "purchases are partly or fully paid for by others".
2. **Asymmetric Information:** When two parties to a transaction do not have the same level of information (Arrow 1962)
 - 2.1 Patient ↔ Insurance firm. Firm cannot always monitor you.
 - 2.2 Patient ↔ Doctor. Doctor has more information.
3. **Behaviour change:** Alter behaviour in response to price-distortion.
You may become reckless knowing you have insurance

Kinds of Hidden “Actions” / Moral Hazard *

A. Demand Side (Patient and Insurer)

- ▶ ex-ante: Behaviour change *before insured event, makes event more likely*:
 - ✓ Because insurance will cover you in future, you take worse care of yourself now (Ehrlich and Becker 1972)
 - ✓ Not engage in preventive behaviour;
 - ✓ Engage in risky behaviour.

Action is hidden from insurance company - Asymmetric Information

- ▶ ex-post: Behaviour change *after insured event, makes recovery from event more expensive*:
 - ✓ Because insurance covers you now, you use **more** medical **care** (than necessary). Marginal cost is lower.
 - ✓ Use **higher quality** medical care once sick (than necessary).
 - ✓ Lower incentive to search for low cost providers/medicines, monitor them.

Motivation is hidden from insurance company - Asymmetric Information

Kinds of Hidden “Actions” / Moral Hazard *

B. Supplier Side (Physician and Patient)

Supplier Induced Demand:

- ▶ Physicians / Hospitals **over-prescribe** healthcare.
- ▶ Physicians / Hospitals **cherry-pick** patients.

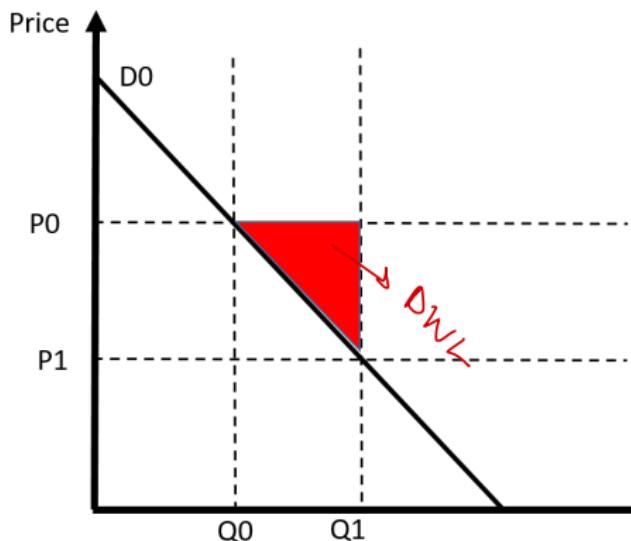
Moral Hazard: Welfare Loss Illustration

Without Health Insurance:

- ▶ Original Demand: D_0
- ▶ Original Price: P_0
- ▶ Original Quantity of Healthcare: Q_0

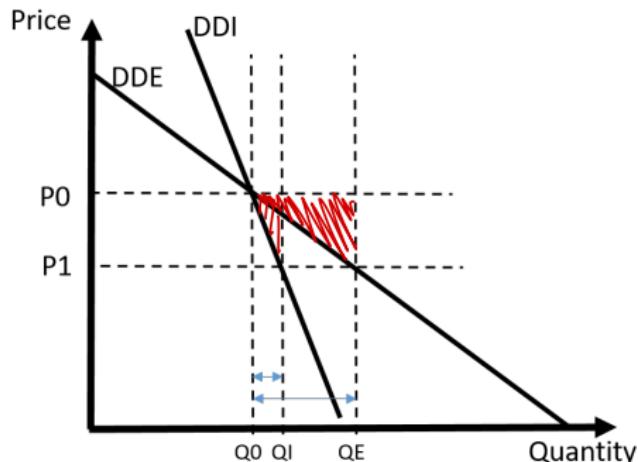
With Health Insurance

- ▶ New Price: P_1 (with insurance)
 - ▶ Price Distortion: $P_0 - P_1$
 - ▶ Cost of health-care has *not* changed. Price faced/paid by consumer has reduced due to insurance.
- ▶ New Quantity demanded: Q_1
- ▶ Social Loss: (Red Area)
 - ▶ Private optimal (Q_1) \neq social optimal (Q_0)



Moral Hazard - Elasticity of Demand

- ▶ Degree of moral hazard depends on elasticity of demand curve.
- ▶ Elasticity: Degree of price responsive. %age change in quantity demanded due to %age change in price.
- ▶ Insurance reduces price from P_0 to P_1 .
- ▶ DD_E : Relatively price-elastic demand. E.g. mental health services.
 $\Delta \text{Qty} = (Q_E - Q_0)$
- ▶ DD_I : Relatively price-inelastic demand. E.g. Insulin for diabetics.
 $\Delta \text{Qty} = (Q_I - Q_0)$
- ▶ $(Q_E - Q_0) > (Q_I - Q_0)$:
Higher potential moral hazard with relatively elastic demand
Higher quantity distortion and higher social loss.



Solutions to Moral Hazard *

1. Change price sensitivity of demand (elasticity).
 - 1.1 Problem was: Relatively elastic demand has higher moral hazard.
 - 1.2 Solution: No solution as unable to change elasticity of demand.
2. ✓ **Cost-sharing:** Make consumers face price to a certain degree
 - 2.1 Problem was: Price distortion (consumers were not facing full price of health-care)
 - 2.2 Solution: Cost-sharing by design of insurance contracts using Deductibles, Co-insurance, Co-Pay.
3. ✓ **Incentives to stay healthy:**
 - 3.1 Problem was: Insurance lowers incentive for preventive care (ex-ante moral hazard)]2 Solution: Lower premium (Dis-incentives for unhealthy activities: Higher premium for smokers, adventure sports).
4. ✓ **Gate-keeping:** Only give enough healthcare as is required and conduct assessments
 - 4.1 Problem was: Insurance increases healthcare utilization (ex-post moral hazard)
 - 4.2 Solution: Limit demand through eligibility assessment to seek formal care (e.g. AIC)

Solutions to Moral Hazard - Cost-sharing

1. **Co-insurance:** Enrollee pays *percentage* of cost for each episode. Insurer covers rest.
 - 1.1 0% coinsurance: Pay 0% i.e., full insurance. 25%: pay 25%, 100%: no-insurance.
 - 1.2 E.g. \$100 bill with 25% co-insurance. You pay \$25.
2. **Co-payment:** Enrollee pays *fixed amount* for each episode. Insurer covers above copay.
 - 2.1 E.g. \$100 bill with \$25 co-pay. You pay \$25.
3. **Deductibles:** Set minimal level of expenses below which insurer does not pay.
 - 3.1 E.g. Deductible of \$1000. If final bill, is \$50,000, you pay only the first \$1000. If final bill is \$800, you pay full \$800.
 - 3.2 Could be annual deductible (for entire year) or for each episode.

Components of Insurance

1. Annual Premium: E.g. \$500/year
2. Co-Pay/Co-Insurance
3. Annual Deductible (minimum amount below which insurer will not pay)
4. Policy Limit (max limit for insurance amount)
5. Out-of-pocket (OOP) Payment

	Cost	Co-Ins (10%)	Co-Pay (\$10)	Insurance Pays	OOP
Visit 1	100	\$10		\$90	\$10
Visit 2	200	\$20		\$180	\$20
TOTAL	300	\$30		\$270	\$30
Visit 1	100		\$10	\$90	\$10
Visit 2	200		\$10	\$190	\$10
TOTAL	300		\$20	\$280	\$20

Components of Insurance

1. Annual Premium: E.g. \$500/year
2. Co-Pay/Co-Insurance
3. Annual Deductible E.g. **\$300/year**
4. Policy Limit
5. Out-of-pocket (OOP) Payment

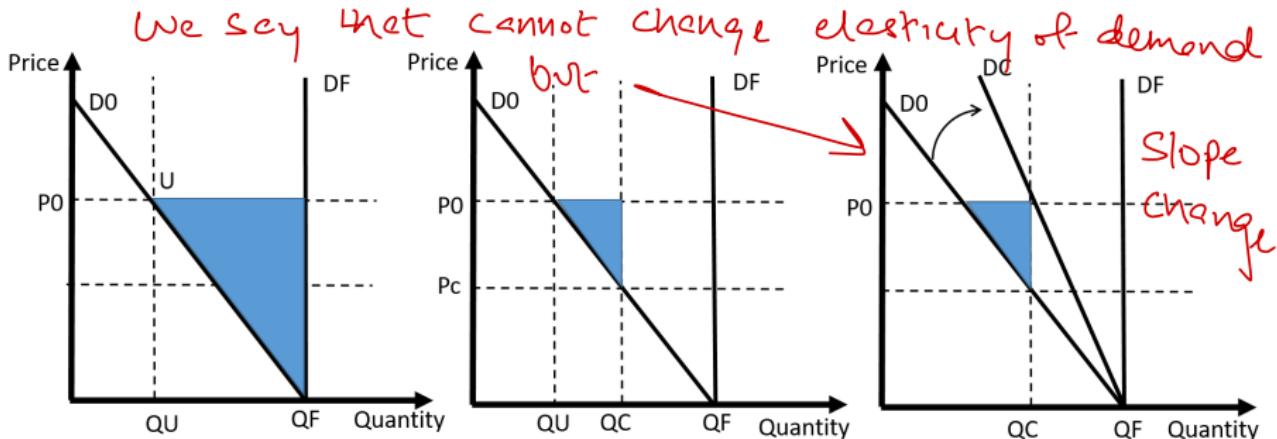
	Cost	Cumulative	Co-Ins (10%)	Co-Pay (\$10)	Insurance Pays	OOP
Visit 1	100	100				\$100
Visit 2	200	300				\$200
Visit 3	100	400	\$10		\$90	\$10
Visit 4	200	600	\$20		\$180	\$20
TOTAL	600		\$30		\$270	\$330

Components of Insurance

1. Annual Premium: E.g. \$500/year
2. Co-Pay/Co-Insurance
3. Annual Deductible
4. Policy Limit - E.g. **\$400/year**
5. Out-of-pocket (OOP) Payment

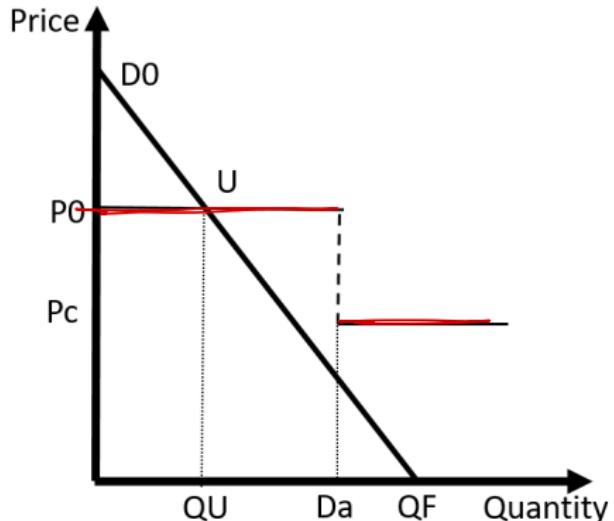
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Visit 1	100	100	\$10		\$90	\$10
Visit 2	200	300	\$20		\$180	\$20
Visit 3	100	400	\$10		\$90	\$10
Visit 4	200	600	\$20	???	\$0	\$200
TOTAL	600		\$60		\$360 + \$240	$\div 600$

Solutions to Moral Hazard - Co-insurance /Copay

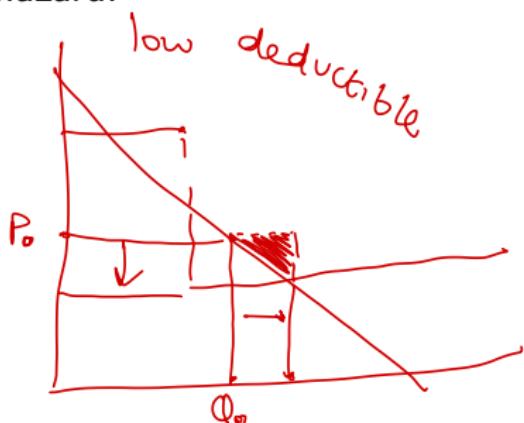


- ▶ D0: Original demand; P0: Original price.
- ▶ QU: Qty w/o insurance.
- ▶ DF: Dd with Full Insurance (inelastic demand).
- ▶ QF: Qty Full Insurance.
- ▶ Shaded area: Social loss.
- ▶ P_c: Copayment. Effective price.
- ▶ QC: Quantity with copay.
- ▶ Relatively smaller social loss
- ▶ DC: Demand. Pivots at X-axis.
- ▶ 0%: Full-insurance:DF
- ▶ 100%: No insurance: D0
- ▶ QC: Qty with coinsurance.

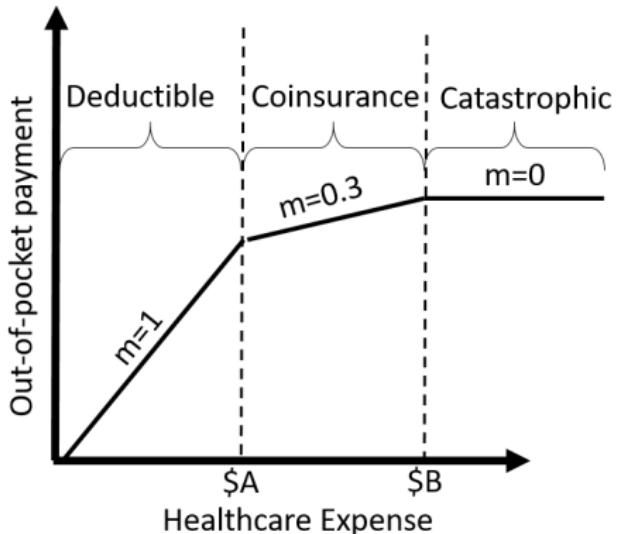
Solutions to Moral Hazard - Deductible



- ▶ No coverage for $Q < Da$
- ▶ QU: D_d too low to reach high deductible.
- ▶ No price distortion. No moral hazard.



Solutions to Moral Hazard - Deductible



- ▶ Deductible: \$A
- ▶ Coinsurance: 33%
- ▶ Full coverage (catastrophic) above \$B
- ▶ Out-of-pocket expense share

Limits to solutions for Moral Hazard

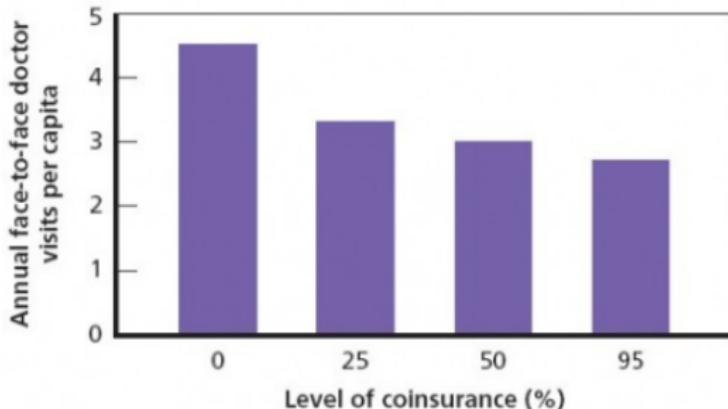
1. Price distortion (consumers were not facing full price of health-care) →
Cost-sharing:
 - ✓1.1 Preventive care, mental health, inter-temporal effects.
2. **Incentives to stay healthy:**
 - ✓2.1 \$2 provided if walked 7000 steps each day, vs given full-account and \$ taken away if didn't walk. Latter group performed better.
 - ✓2.2 Financial incentives work better if tied to group success than individual success.
3. **Gate-keeping** (limit demand)
 - 3.1 Associated with lower utilization of health services (up to -78%) and lower expenditures (up to -80%)
4. Fee Guidelines: Limited information and time.

Empirical Evidence on Moral Hazard

RAND Health Insurance Experiment (HIE)

1. Objective: Does free medical care lead to better health than insurance payments with co-payments
 - 1.1 Use of health-services?
 - 1.2 Appropriateness and quality of care received?
 - 1.3 Consequences for health?
2. Timeline: 1971-1982
3. Setup: Randomised 7,700 individuals (age less than 65) from six cities
4. Intervention: Four types of cost-sharing plans with 0%, 25%, 50%, 90% co-insurance rate.
 - 4.1 0% plan: Patients pay nothing (max moral hazard?)
 - 4.2 100% plan: Patients pay everything (least moral hazard?)

RAND HIE - Healthcare Usage



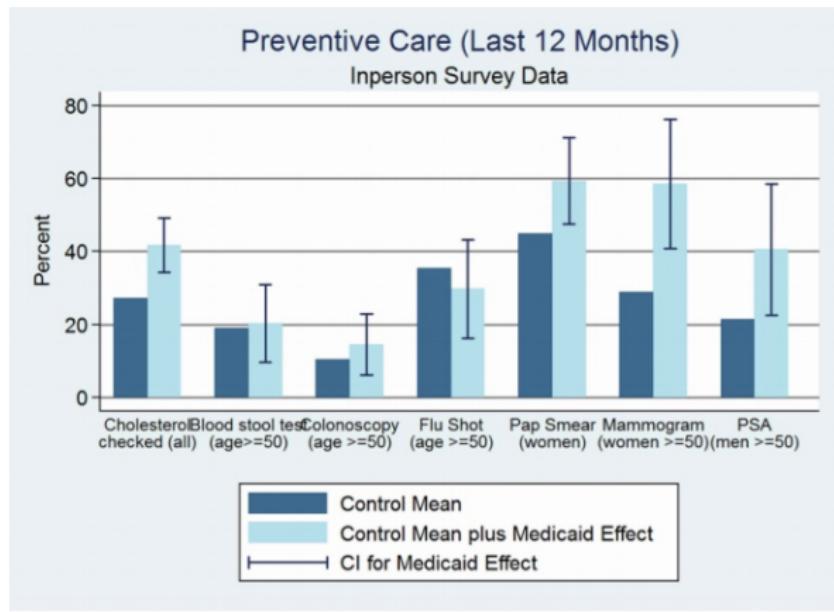
- ▶ Highest usage in 0% co-insurance plan
- ▶ All differences between the zero co-insurance plan and other plans are statistically significant.
- ▶ On average, cost sharing reduces doctor visits by 1-2 per year.
- ▶ Declines were similar for other services (e.g. dental visits, prescriptions, mental health)

- ▶ *ex-post*
 - ▶ Improved control of hypertension. Higher reduction in hypertension for free care. 10% reduction in mortality.
 - ▶ Improved vision.
 - ▶ Improved satisfaction, lower number of sick-days
- ▶ *ex-ante*
 - ▶ Improved dental care.
 - ▶ Risky-behaviour- smoking and obesity - did not change.

Oregon Medicaid Health Experiment (MHE)

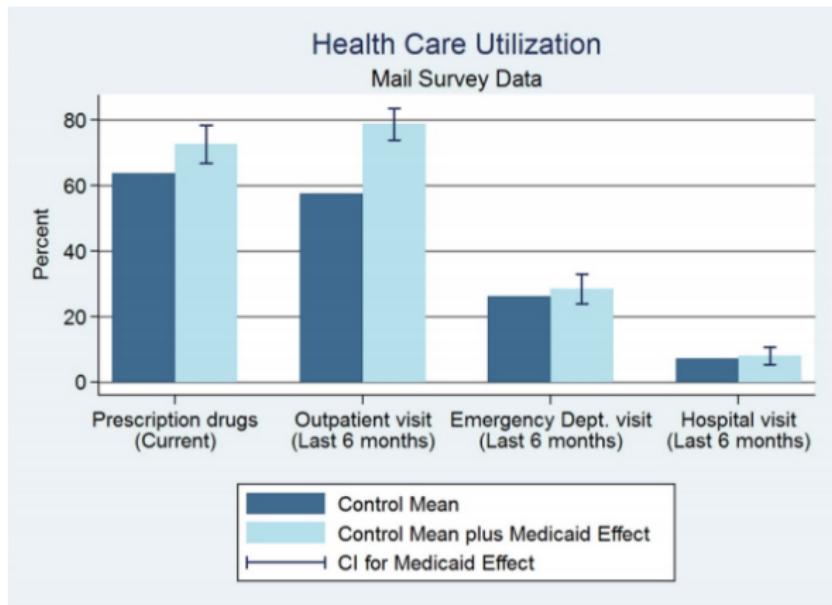
- ▶ Objective: Effect of Medicaid on usage, health.
- ▶ Timeline: 2008
- ▶ Setup: Randomised 29,835 individuals in Oregon to participate in Medicaid
- ▶ Intervention: Medicaid vs No Medicaid
- ▶ Led by: Katherine Baicker and Amy Finkelstein

Oregon MHE - Preventive Care



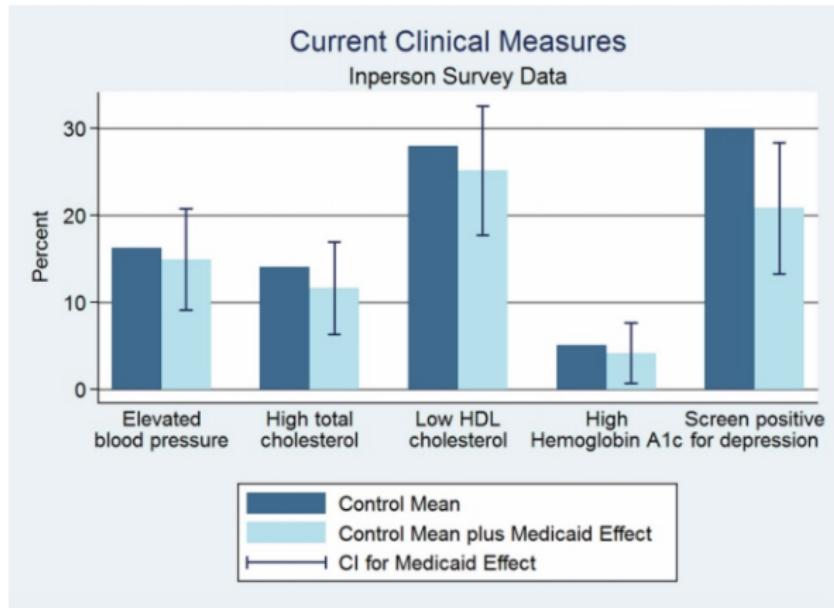
- ▶ Preventive care increased in Medicaid group.

Oregon MHE - Healthcare Usage



- ▶ Healthcare usage is statistically significantly higher in Medicaid group (for relatively elastic services)

Oregon MHE - Health Indicators



- ▶ No statistically significant difference across health outcomes

Singapore Policy Making

Moral Hazard

Recall in Moral Hazard:

- ▶ Use more medical care when sick (than necessary).
- ▶ Use higher quality medical care once sick (than necessary).
- ▶ Lower incentive to search for low cost providers/medicines.
- ▶ Lower incentive to monitor providers.

in Singapore:

- ▶ Since 2005, Riders on top of Integrated Plans
- ▶ Riders allowed users to pay close to zero for services.
 - ▶ Use more medical care when sick (than necessary).
 - ▶ Rider purchasers more claims: 9% vs 7% for non-rider.
 - ▶ Rider purchasers higher claims: 60% higher claims.
- ▶ March 2018, Ministry of Health introduced **mandatory co-payments** for IPs.
 - ▶ Co-payment of atleast 5% subject to annual cap.
 - ▶ Health Minister Gan Kim Yong: copayments are "the personal responsibility to choose appropriate and necessary care".

Moral Hazard

Recall in Moral Hazard:

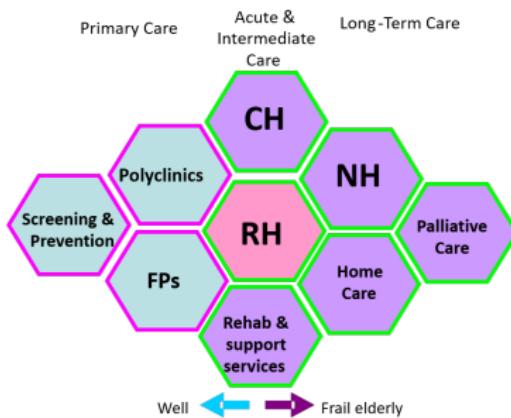
- ▶ *ex-ante*: current actions determine future state (risk pooling across time):
- ▶ Take worse care of yourself in future now that you are insured
 - ▶ Engage in risky behaviour
 - ▶ Not engage in preventive behaviour

in Singapore:

Subsidised health screening:



Moral Hazard



1. Moral Hazard:

- ▶ RH: Restructured Hospital: Supplier induced demand: [Limit beds?]
- ▶ RH: Ex-post: No monitoring of fee, additional services [Fee guidelines]
- ▶ Primary Care: Ex-ante: Low prevention [Screening at GPs]
- ▶ Ex-post: Not take care [Incentive for clinical outcomes]

Any benefits to Moral Hazard?

1. ✓ *ex-post* moral hazard: if people had under-estimated the care they need OR previously could not afford the care they value highly, then over-consumption is good.
2. ✓ *extra preventive care*: in both RAND and Oregon Medicaid Experiment, insured consume more preventive care.
3. *Income effect*: Beneficial income effect in addition to risk reduction benefit
 - 3.1 E.g. Wealth of \$20,000. Cancer treatment is \$300,000. Provides \$1,000,000 worth of benefits. Without insurance, will not get chemotherapy.
 - 3.2 With insurance, OOP of \$3,000, get chemotherapy, reap the \$1m benefit.

Optimal co-insurance for Moral Hazard?

1. Level of cost-sharing balances the risks and rewards.
2. If increase co-insurance, reduce wastage, but will also reduce the benefits of risk-sharing.
3. In 1973, the average co-insurance rate was 33% i.e., individuals paid 33% of their costs.
4. Welfare gains = change in benefits - change in costs
5. Hypothetically increase coinsurance rate to 67%.
 - 5.1 Costs fall much more than benefits. Total welfare gain of USD28billion per annum. In 1991, estimate of USD33billion-109billion (9-30% of all health expenditure)
 - 5.2 Chandra, Flack and Obermeyer 2021: 11.0 percentage points (p.p.) change in coinsurance causes a 22.6% drop in total drug consumption, and a 32.7% increase in monthly mortality
6. What level of co-insurance balances the marginal gain from increased protection and marginal loss from increased moral hazard? [0.45]

Summary - Insurance, Moral Hazard

1. Uncertainty and variability of medical spending - insurance.
2. Insurance → Moral Hazard:
 - 2.1 Insurance → price-distortion
 - 2.2 Insurance → information asymmetry
 - 2.3 Price-distortion → behaviour change
3. Moral Hazard:
 - 3.1 Consume more when someone else pays the cost (ex-post).
 - 3.2 Engage in risky behaviour, less prevention (ex-ante).
 - 3.3 Supplier induced demand.
4. Solution
 - 4.1 Cost-sharing: Co-pay, co-insurance, deductible
 - 4.2 Monitoring and gate-keeping
5. Some upsides: Preventive care, income effect.
6. Optimal insurance: balance the costs and benefits. Coinsurance = 45%