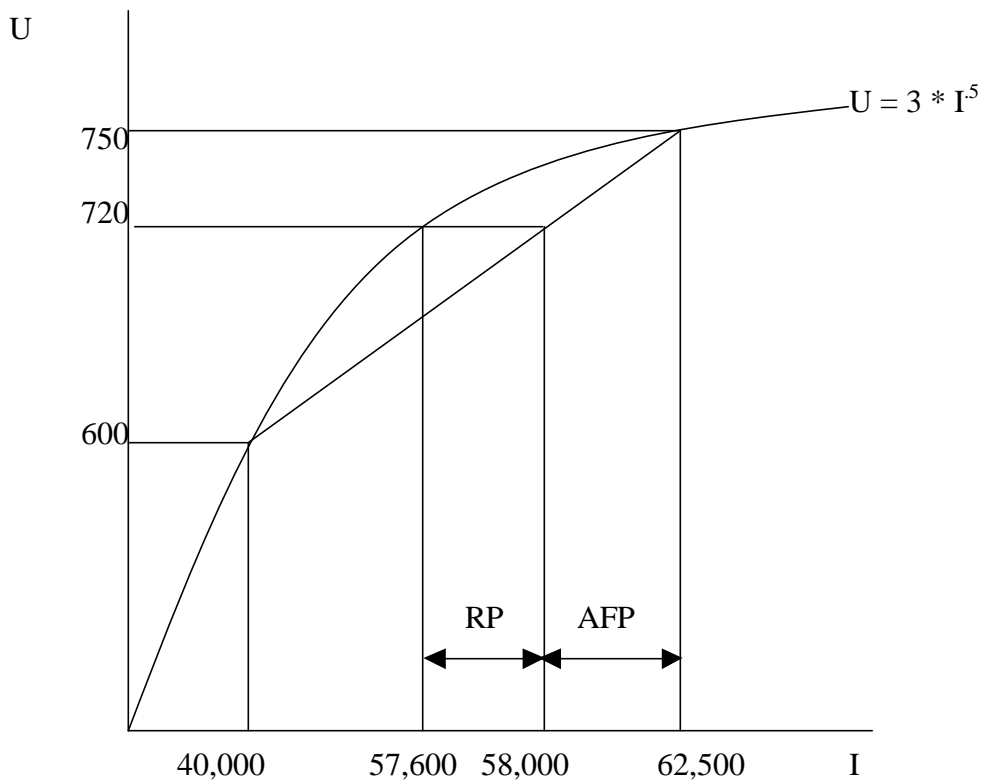


Answer the following questions (the value of each question is listed within parentheses):

1. Mr. Boddy is considering buying health insurance.
- His utility function is the following:  $U = 3 \cdot (I)^{1/2}$
  - His income is \$62,500
  - He faces a 20% probability of getting hit with a lead pipe in the library by Colonel Mustard.
  - His medical bills for being treated for a massive head injury would be \$22,500.

Graph his utility function and use it to help demonstrate your answers to the following questions (if you have trouble with the math, answer the questions by indicating answers on the graph for partial credit).



a. (2) What is his expected utility from his uninsured situation?

$$E(U) = \text{prob ill} * U(40,000) + \text{prob healthy} * U(62,500)$$

$$\text{Prob ill} = .2$$

$$\text{Prob healthy} = .8$$

$$U(40,000) = 600$$

$$U(62,500) = 750$$

$$E(U) = 720$$

b. (2) What is the certainty level of income that would leave him as well off as facing the risk.

$$\$57,600$$

c. (2) What is the actuarially fair premium and note it on the graph.

$$.2 * \$22,500 = \$4500$$

d. (2) What is his risk premium and note it on the graph.

$$\$400$$

e. (2) If the insurance company is willing to provide an insurance policy that will cover 100% of the medical bills for a premium that is equal to the expected loss plus a 15% load, what will the premium be?

$$\$5,175$$

f. (2) What is the highest premium Mr. Boddy is willing to pay for the insurance?

$$\$4,900$$

g. (8) Verbally explain the intuition behind why Mr. Boddy would be willing to pay a premium that is higher than his expected loss for insurance.

*Because he is risk averse, a certain amount of income with certainty generates more utility than an equal amount of expected utility from a risky situation. The maximum amount of income the person is willing to give up for a given level of expected utility to gain certainty is called the risk premium.*

h. (8) The model used above assumes the demand for medical care is perfectly inelastic (e.g., assume the price of medical care is \$225 and Mr. Boddy will consume 100 units no matter what insurance he has). How does your analysis of the situation change if you know that his demand for medical care is downward sloping? I am looking for an intuitive discussion of the important consequences of this change rather than a graphical/mathematical re-analysis of the question. Overall explain how this modification should affect his likelihood of buying insurance?

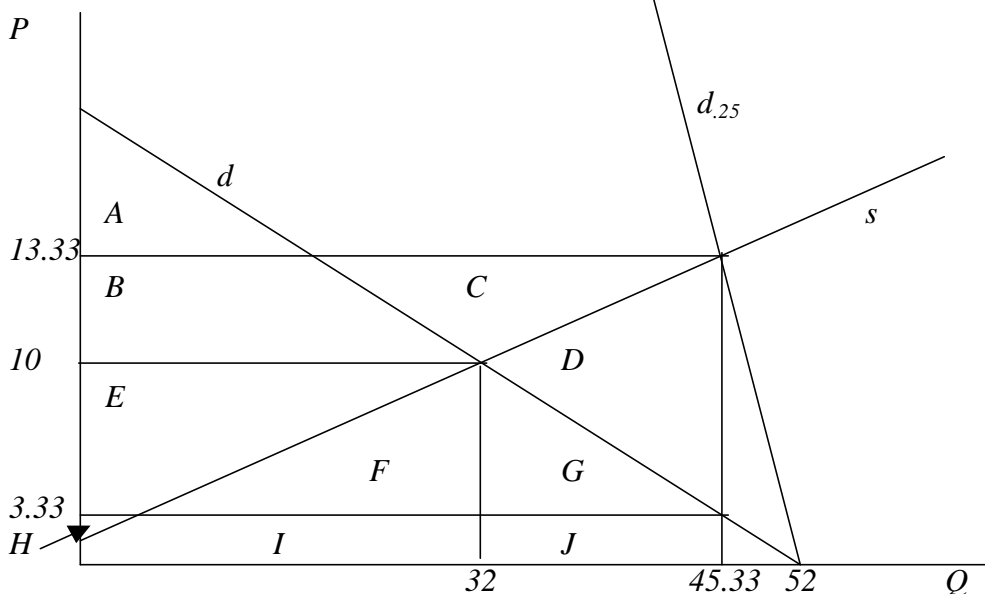
*If demand is downward sloping, then when Mr. Boddy no longer has to pay the full cost, he will consume more care. So if his medical costs will be \$22,500 without insurance, they may be \$24,750 if his care were paid for by the insurance company (if he they buys 110 units of care). The insurance company will therefore charge him a higher premium. As the last 10 units of care would provide less than \$2250 of benefit, he may not perceive that the higher premium is worth it.*

2. The small country of Mcphersonia has the following market demand and supply for bottles of antacids:

$$\begin{aligned} D: & P = 26 - .5Q \\ S: & P = 2 + .25Q \end{aligned}$$

After much protesting, President Tieslau signed legislation for a new National Insurance to Cover the Purchase of Antacids (NICPA). The new plan, funded by a tax increase, will cover 75% of all antacid purchases (that is, the coinsurance rate will be 25%).

- a. (8) Verbally and graphically demonstrate the effect of NICPA on the market for antacids bought in Mcphersonia (please indicate deadweight loss on the graph).



Before the plan is instituted,  $P = 10$  and  $Q = 32$ . Total expenditure on antacids is  $E+F+H+I$ , consumer surplus is  $A+B$  and producer surplus is  $E+H$ .

The insurance plan causes demand to rotate so that the new equilibrium  $P$  and  $Q$  is  $\$13.33$  and  $45.33$ , respectively. In this new situation, the following is true:

The price pharmaceutical companies receive is  $\$13.33$  and their revenue is  $B+C+D+E+F+G+H+I+J$ .

Pharmaceutical company surplus is  $B+C+E+H$ .

Beneficiaries (who are also taxpayers) pay  $H+I+J$  out of pocket for the antacids (paying only  $\$3.33$  for them).

Consumer surplus looks like it might be  $A+B+E+F+G$  but do not forget that taxes have risen by  $B+C+D+E+F+G$ , leaving taxpayers with a surplus of  $A-C-D$ .

- b. (8) Discuss/explain why this plan creates deadweight loss. How much deadweight loss will the plan generate?

*B+C represents value transferred from consumers/taxpayers to producers (not a deadweight loss). However, area D is a cost of producing the antacids that does not have a corresponding benefit. Therefore, D is deadweight loss.*

- c. (5) Assuming zero administrative costs, how much will NICPA cost taxpayers? Under what circumstances is this cost (and deadweight loss) worth it?

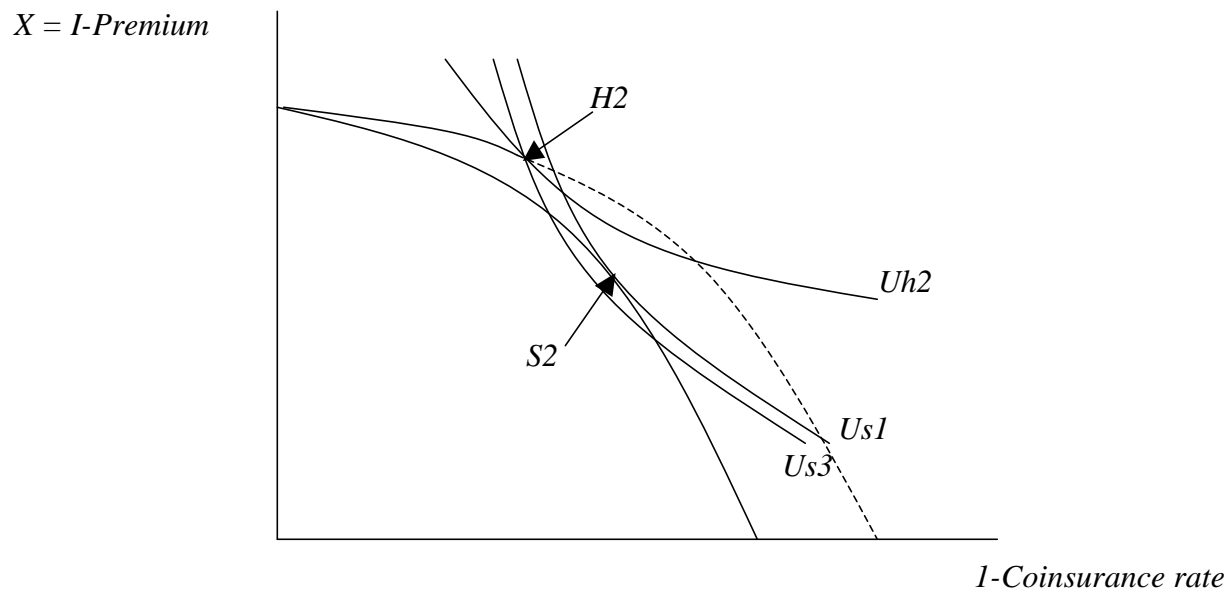
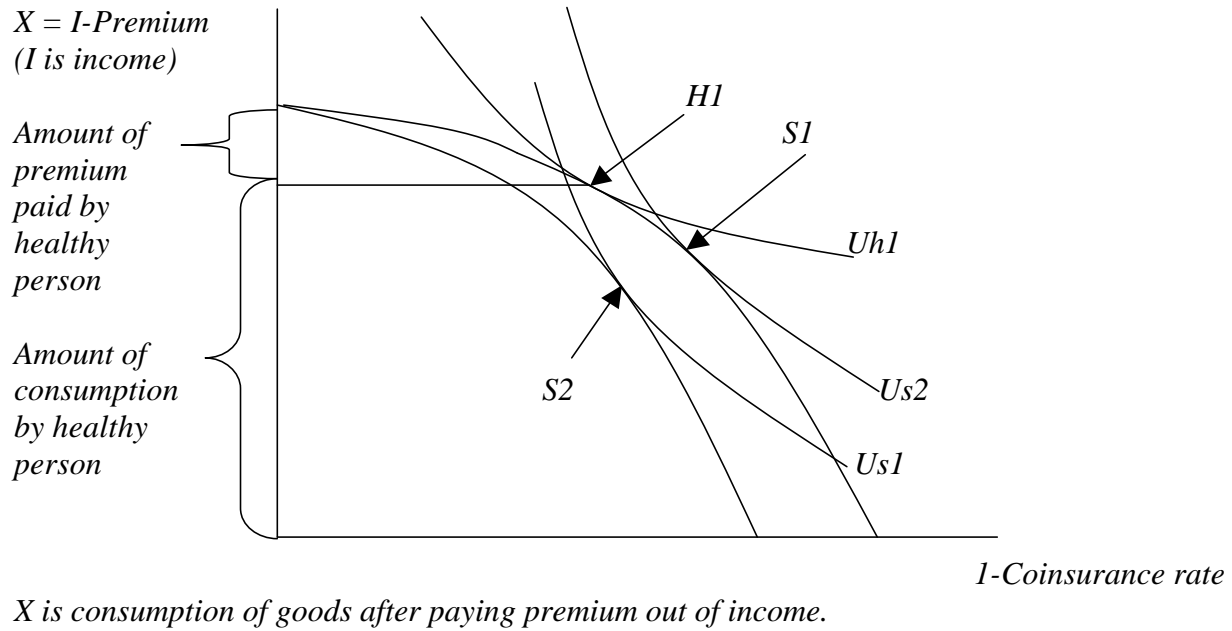
*Cost to taxpayers is \$454.33. Now, they were paying E+F before and G is a cost to them that has an offsetting benefit. However, taxpayers are now losing B+C+D. This is worth it if the risk reduction they face has a risk premium that exceeds B+C+D.*

3. (12) Explain the adverse selection problem (an example may help). Be sure to explain the primary cause of the problem and who is hurt by the problem.

*Adverse selection results from insurance companies knowing less about the expected risk of the people they insure than the people do. When the insurance company sets a common premium for all their customers based on the entire group's expected expenditure on healthcare, some of the healthiest will find that their risk + actuarially fair premium is smaller than the premium charged by the insurance company. This leads them to discontinue coverage. With some of the healthiest people leaving the mix, the expected average expenditure will rise, causing more to drop out. In the end, only the least healthy will buy insurance; they are the ones most hurt by adverse selection. If insurance companies were to know each person's expected expenditure, they could charge each person a different premium. If the healthier were to face lower premiums, they would be much less likely to drop out.*

**3c. For 5180 students only (15)**

The standard adverse selection model concludes that only the sickly and/or very risk averse will buy insurance. Phelps presents a model whereby the secretly sickly and the healthy each buy health insurance and the secretly sickly buy insurance that costs more. Graphically and verbally explain this model. Make sure you explain how the insurance companies limit policy options so that each type of insured chooses the plan that covers their expected expenditure.



*If insurance companies knew whether each person were healthy or sickly, they would provide different priced premiums for each group. A range of premiums would be charged depending on the coinsurance rate. As expenditure increases at an increasing rate with lower coinsurance rates (the % of a medical bill the insured pays), the budget constraints bow outward.*

*We also assume the sickly will demand more care and will more highly value a lower C than the healthy. This is why the healthy and sickly have indifference curves sets which reflect different preferences (they cross).*

*Since the insurance companies cannot tell whether someone is healthy or sickly, if they only offer premiums based on health person expenditure, both the healthy and sickly get the same range of options and the healthy choose H1 and the sickly choose S1.*

*This drives some of the healthy to drop out and premiums rise until only the sickly are left and they choose bundle S2.*

*If however the insurance company only makes available the solid portion of the budget constraints in the second graph (the dotted portion is not available), then the sickly will willingly choose S2 and the healthy will choose H2.*

*For the healthy, H2 is not as good as H1, but it is better than S2.*

**4. Answer either 4a or 4b, (NOT BOTH) (Yes, 4a does have two parts, sorry)**

**4a. Answer the two following questions on Medicare**

- (6) Explain the combination of demographic changes that have led to the financial trouble that Medicare faces.

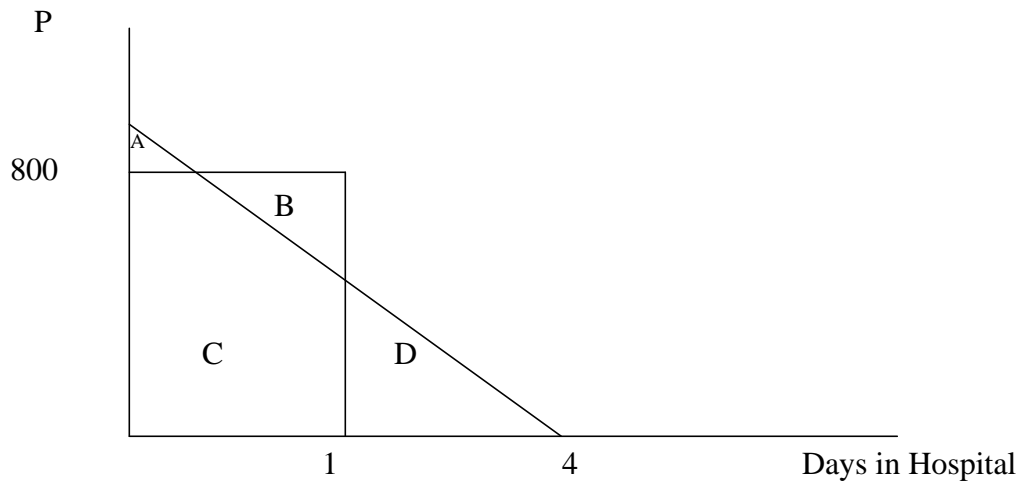
*Birth rates in the US are falling and people are living longer. This combination means there will be fewer workers paying for the medical care of those over age 65. To make matters worse, medical expenditure tends to rise with age, so longer life means even higher health expenditure.*

- (6) The new Medicare prescription drug benefit contains a “doughnut hole.” Explain what the doughnut hole is.

*After enrollees reach a \$250 deductible, Medicare will pay for 75% of drug purchases until the person spends \$2250 of spending. Then the government will pay 0% until total expenditure reaches \$5100, after which point the government will pay 95% of drug expenses. The gap in coverage between \$2250 and \$5100 is called the doughnut hole.*

**OR**

4b. (12) Using the economic theory of demand for medical care with insurance involving a deductible, verbally and graphically explain how Medigap insurance increases the cost of the Medicare program?



*While a person with Medicare spends \$800 for the first day in the hospital, they pay zero after that.*

*A person not going to the hospital costs Medicare nothing, while it costs Medicare an amount determined by the DRG if they do spend time in the hospital.*

*Without Medigap, the person needs to decide whether area A (reflecting cost that is not worth it) is larger than D (benefit to the patient that does not cost the patient). If  $B > D$ , they will not go to the hospital. However, with Medigap, the price for the first day is also zero and the patient will decide to go to the hospital if  $A + C + D > 0$  (which is always). If they do go to the hospital, Medicare still pays the hospital the DRG amount for the stay.*

*Since Medigap causes more people to check-in to the hospital, it ends up costing Medicare more money.*

5. Answer TWO of the following:

- 5a. (10) People tend to think about health production as if doctors are engineers with clearly defined optimal treatment strategies for each set of symptoms. However, the coefficient of variation (COV) measure seems to show that this is not always the case.

Describe the COV and explain why studies comparing treatment in small and geographically close regions (counties in North Texas) and studies in big regions (Eastern US vs. Western US) tend to find smaller COVs for the same procedure than studies in mid-size and geographically distinct regions (Dallas vs Los Angeles vs. Boston)?

*The coefficient of variation standardizes the variance of a random variable (like the rate of knee surgery at various hospitals) by dividing it by the mean for all hospitals. A  $COV = 0$  would mean each hospital has exactly the same rate of knee surgery.*

*If you compare hospitals or contiguous counties, you generally get small COV because the doctors probably have similar training, hospitals face similar prices for inputs, and the population treated is probably pretty similar for the different hospitals or counties. If you split up the country into the East and the West, you also get small COV because any differences within the area that may exist are all averaged out. LA and Dallas may be very different and NY and Atlanta may be very different, but if we combine LA and Dallas and combine NY and Atlanta, the difference between the LA/Dallas group and the NY/Atlanta group may wash out.*

- 5b. (10) According to the McGuire model, how is it that physicians induce demand and not lose patients to other doctors? Describe the McGuire Model both verbally and graphically.

*Phelps does a really good job explaining this model in the text.*

- 5c. (10) It is common to find people with more insurance (e.g. having insurance with more complete coverage – lower copayments and coinsurance rate) also consume more medical care. Explain why it is that it is hard to determine what part of this relationship is caused by moral hazard and what part is caused by adverse selection?

*If you see two groups, those with low coinsurance rates buying a lot of care and those with higher coinsurance rates buying less care, it is impossible to tell whether it is the coinsurance rate driving the different usage or the fact that sicker people bought policies with lower coinsurance rates because they knew they had a higher demand for health care.*

6. (12) Bob's employer has just made him an offer. He will provide Bob's with health insurance benefits to completely cover the eye exams Bob gets every year (price is \$140). To do this, he is going to cut Bob's annual salary by \$160. Bob currently makes \$50,000 per year and he is in the 25% marginal tax bracket (which we can assume extends from incomes of \$40,000-\$60,000 – and assume that for income below \$40,000, the marginal tax rate is 10%). Given your knowledge of taxation of health benefits, explain why Bob will or will not accept the eye exam coverage. (Hint, figure out what the new policy will really cost Bob).

*The coverage will cut the taxes Bob pays by \$40 (since his salary will be lower by \$160 and he is in the 25% tax bracket) and then provide him with an eye exam which costs \$140. In exchange, Bob will lose \$160 in salary. He will be better off by \$20 and will therefore accept the offer. The employer is \$20 better off and Bob is \$20 better off. The government is \$40 worse off. In a very real way, the government is subsidizing Bob's health care.*