University of Victoria
Department of Economics

Economics 318
Health Economics

Instructor: Chris Auld

Midterm Examination II
March 21, 2013

ANSWER KEY

Instructions. Answer all questions. For multiple choice questions, choose the single, best answer. For short answer questions, respond concisely, using equations or a diagram if necessary, noting that undefended answers are worth zero marks. Neither calculators nor any other electronic device, including but not limited to cell phones, are needed and you may not use any such device during the exam. Each multiple choice question is worth 2 points, for a total of 30 points. Each short answer question is worth 15 marks, for a total of 30 marks. Good luck!

NAME: _____

STUDENT #: _____

1 Multiple choice questions (30 marks).

Instructions. Choose the best answer for each question. **Record your answers clearly on this page.** Each question is worth 2 marks.

MULTIPLE CHOICE ANSWERS

1.	(A.)	B.	C.	D.					
2.	A.	(B.)	C.	D.	9.	A.	B.	(C.)	D.
3.	A.	B.	(C.)	D.	10.	A.	B.	C.	(D.)
4.	A.	B.	(C.)	D.	11.	A.	(B.)	C.	D.
5.	A.	(B.)	C.	D.	12.	A.	(B.)	C.	D.
6.	A.	B.	(C.)	D.	13.	(A.)	B.	C.	D.
7.	A.	B.	(C.)	D.	14.	(A.)	B.	C.	D.
8.	A.	(B.)	C.	D.	15.	(A.)	B.	C.	D.

1. In the context of health insurance, moral hazard refers to

   (a) increased use of health care resulting from decreased effective prices.

   (b) increased use of health care resulting from sexually transmitted diseases, alcoholism, and drug abuse.

   (c) increased use of health care resulting from increased risk aversion.

   (d) increased use of health care resulting from non-convexities in production technologies.

2. A public health intervention has immediate costs of \$14M. The intervention yields immediate benefits of \$10M, and another \$5M of benefits in one year. The intervention is worthwhile if the annual interest rate used to discount future costs and benefits is:

   (a) greater than 1/4.

   (b) less than 1/4.

   (c) greater than 5/14.

   (d) less than 5/14.

3. You have utility function for wealth $U(W) = 20W$. You are offered actuarially fair insurance against some risk. You

   (a) fully insure.

   (b) buy no insurance.

   (c) are indifferent to how much insurance you purchase.

   (d) there is not enough information to decide if (a), (b), or (c) is correct.

4. Fishermen and miners have similar education and other characteristics, and fishing and mining are considered similar jobs except that fishing is riskier. Fishermen face a risk of on-the-job death of 3/10,000 per year, whereas 2/10,000 miners per year are killed in workplace accidents. Fishermen earn \$50,000 per year and miners earn \$49,000 per year. We infer that the value of a statistical life for this population is

   (a) \$5,000,000.

   (b) \$6,000,000.

   (c) \$10,000,000.

   (d) \$100,000,000.

5. *Adverse selection* in health insurance markets

   (a) refers to the tendency of insured people to take fewer preventive actions.

   (b) refers to the tendency of low risk people to opt out of insurance.

   (c) refers to firms refusing to insure people with pre-existing conditions.

   (d) refers to efforts by consumers to select the lowest priced insurance on the market, leading to pervasive disequilibrium.

6. In the model of physician behavior we discussed in class, we assumed that

   (a) physicians maximize their incomes.

   (b) physicians make a labor-leisure tradeoff and are indifferent to patient health.

   (c) physicians make a labor-leisure tradeoff and must be sufficiently compensated to harm patient health.

   (d) physicians make a labor-leisure tradeoff but always seek to maximize patient health.

7. QALYs are a metric which allows analysts to

   (a) disentangle correlation and causation in epidemiological studies.

   (b) accurately assess life expectancy.

   (c) make tradeoffs between quantity and quality of life.

   (d) monetize health outcomes for cost-benefit analyses.

8. The supply and demand model for physician services is inconsistent with the existence of Supplier Induced Demand in the sense that supply and demand

   (a) assumes consumers are fully informed.

   (b) assumes firms perceive they can sell as much as they wish at the prevailing price.

   (c) assumes markets clear.

   (d) assumes away public goods such as physician services.

9. A new pharmaceutical is developed which allows patients to live for one year in health state $q = 0.5$. With probability 0.5, the patient lives for one more year in health state $q = 0.4$, otherwise the patient dies. If the interest rate used to discount future outcomes is $r = 0.2$, then a patient on the pharmaceutical has expected present value QALYs equal to:

   (a) 2/6.

   (b) 3/6.

   (c) 4/6.

   (d) 5/6.

10. The government currently spends \$10B on highway maintenance and \$1B on asbestos removal per year. Saving another statistical life through highway maintenance programs is estimated to cost \$10M, whereas saving another life through asbestos removal programs is estimated to cost \$15M. Assume the only effect either program has is on lives saved. Then the government should

   (a) reallocate funding from highway maintenance to asbestos removal until expenditures are equalized across programs.

   (b) reallocate funding from highway maintenance to asbestos removal until cost to save another life is equalized across programs.

   (c) reallocate funding from asbestos removal to highway maintenance until expenditures are equalized across programs.

   (d) reallocate funding from asbestos removal to highway maintenance until cost to save another life is equalized across programs.

11. One theoretical problem with the Standard Gamble is it

   (a) can only address mortality, but health interventions generally also affect morbidity.

   (b) confounds risk preferences and preferences over health states.

   (c) assumes away adverse selection.

   (d) is not robust to the assumption that markets are perfectly competitive.

12. A regulation requiring asbestos removal generates costs of $10,000,000,000 and is estimated to save 50 lives. The regulation has no other effects. The regulation

    (a) is good policy, because it saved the lives of 50 people.

    (b) would not pass a CBA, because the cost per life saved is much higher than the conventional value placed on life.

    (c) would probably pass a CBA, because the cost per life saved is roughly equal to the conventional value placed on life.

    (d) easily passes a CBA, because the cost per life saved is much lower than the conventional value placed on life.

13. Cost-effectiveness analysis differs from cost-benefit analysis in that

    (a) no attempt is made to monetize benefits.

    (b) geometric discounting is not imposed.

    (c) costs and benefits in the distant future are not ignored.

    (d) contingent valuation can be used as a method of measuring outcomes.

14. Health insurance in Canada is largely provided by the government, not private firms. Therefore,

    (a) moral hazard may be a problem.

    (b) moral hazard cannot be a problem.

    (c) moral hazard occurs on the intensive but not the extensive margin.

    (d) moral hazard is canceled by adverse selection.

15. Suppose physicians behave according to the model we discussed in lectures. Suppose further that a particular physician's preferences are such that she responds to an increase in fees by decreasing inducement. Then this physician would respond to a lump sum increase in income by:

    (a) decreasing inducement.

    (b) increasing inducement.

    (c) not changing the level of inducement.

    (d) there is not enough information to answer.

2 Short-answer questions (30 marks).

Instructions. Answer both questions clearly and concisely. No marks will be awarded to undefended answers. Ensure all axes and objects in graphs are clearly labeled.

1. (15 marks) Vaccinations against a communicable disease are provided by a competitive industry. Supply is given by

$$Q^S = P,$$

and demand by

$$Q^D = 12 - 2P.$$

(a) Sketch the supply and demand schedules on a graph. Find the equilibrium price and quantity. Label the equilibrium quantity Q_1.

(b) Now suppose that vaccinations are covered by a government insurance policy. The policy pays 50% of expenditures. Find the equilibrium price and quantity in the presence of this insurance program. Label the new equilibrium quantity Q_2.

(c) Sketch the deadweight loss induced by the insurance program, assuming the market outcome in the absence of insurance is efficient.

(d) Relax the assumption the market equilibrium is efficient. Suppose that vaccinations generate positive externalities. On a new graph, illustrate a case in which MSB are such that the outcome in the presence of insurance you derived in part (b) still involves too *few* vaccinations relative to the socially optimal quantity. Label the socially optimal quantity Q_3.

(e) Sketch the deadweight loss on the graph you drew for part (d).

Solution.

(a) A clearly labeled supply and demand graph should be sketched (see next page). The arithmetic: Substitute the supply relation into demand to find:

$$\begin{aligned} Q &= 12 - 2Q \\ 3Q &= 12 \\ Q &= 4 \end{aligned}$$

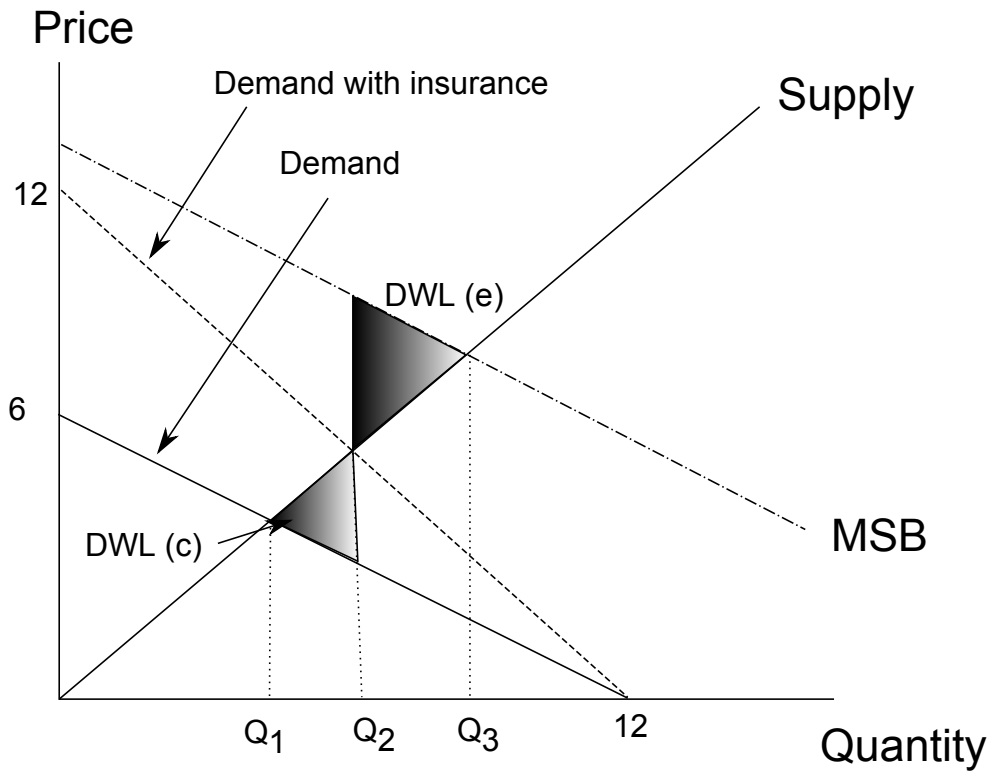
From the supply function, it follows that $P = 4$. $Q_1 = 4$ should be displayed on the graph.

(b) The effective price faced by consumers is $0.5P$, where P is the market price. Demand in the presence of insurance is then $Q^D = 12 - 2(0.5P) = 12 - P$. Repeating the arithmetic above yields $Q_2 = 6, P = 6$. $Q_2 = 6$ should be on the graph.

(c) The DWL is the triangle between Q_1 and Q_2 above the demand curve (without insurance) and below the supply curve, as shown as "DWL(c)" on the diagram.

(d) A new graph should be displayed showing a MSB curve which strikes the supply curve at any point to the right of Q_2. The MSB shown need not be linear nor have any particular slope, as this information is not given in the question.

(e) The DWL is now the area below the MSB curve but above the supply curve between Q_2 and Q_3, as shown as "DWL (e)" in the diagram.


Price
Demand with insurance
Supply
Demand
12
DWL (e)
6
DWL (c)
MSB
Q1
Q2
Q3
12
Quantity

2. (15 marks) A consumer has wealth $W = \$100$ and faces a 50% probability that he will require a surgical procedure which costs \$64. He behaves as if he maximizes his expected utility and his utility function is $U(W) = \sqrt{W}$.

   (a) Sketch a graph showing the utility function, the consumer's wealth when he does and does not need surgery, and expected utility as the probability of needing surgery varies between zero and one.

   (b) What is the expected loss the consumer faces? Calculate, and indicate on your graph.

   (c) What is the maximum price he would pay for full insurance? Calculate, and indicate on your graph.

   (d) A competitive (hence, zero profit), zero cost insurance industry provides only full insurance contracts. What is the equilibrium price for full insurance?

   (e) Are consumers better off due to the existence of insurance? Briefly explain.

   Bonus question: 3 bonus marks.

   (f) Society consists of large, equal numbers of identical male and identical female consumers. Male consumers are as described above, female consumers differ only in that they face a 25% probability of needing the surgery, but are otherwise identical to male consumers.

      i. Continue to suppose firms can only offer full insurance contracts, and can offer different contracts to men and women. Do markets form, and if so, at what price or prices?

      ii. Now suppose the government creates a law barring insurers from offering different contracts to men and women. Does a market form, and if so, at what price or prices, and for which consumers?

Solution.

(a) See graph on next page (which is not to scale, and students' answers need not either). The graph should show a concave function. The axes should be labeled wealth and utility, or equivalent terms. The points 36 and 100 (wealth if the loss does and does not occur) should be marked, and a line connecting the points (36, 6) and (100, 10) should be displayed and marked "expected utility" or equivalent.

(b) The loss is 64 and occurs with probability 0.5, so the expected loss is 0.5(64)=32. To be displayed as shown in the graph.

(c) Expected utility without insurance is

$$EU = 0.5\sqrt{36} + 0.5\sqrt{100} = 8.$$

If the price of full insurance is F, the consumer is indifferent to purchasing if

$$\begin{aligned}\sqrt{100-F} &= 8\\ 100-F &= 8^2\\ F &= 36,\end{aligned}$$

so the maximum he is willing to pay for full insurance is 36. To be displayed as shown on the graph.

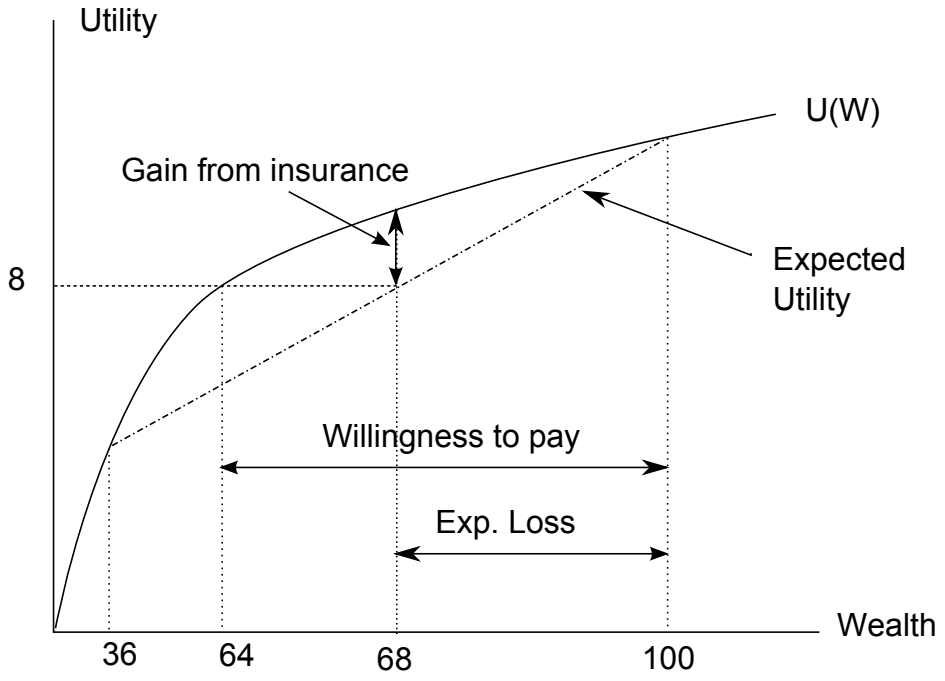
(d) Since the insurance industry has zero costs, its profits per person are equal to the price of full insurance minus the expected loss per person. Since profits are zero, the price of full insurance must be equal to the expected loss, 32.

(e) Consumers are better off because they are willing to pay \$36 for full insurance but only have to pay \$32. This could optionally be shown on the graph: without the insurance industry, consumers get $EU = 8$, with, they get $U = \sqrt{68} > \sqrt{64} = 8$.

(f) For women, we have an expected loss of $0.25(64) = 16$. Without insurance women get $EU = 0.25\sqrt{36} + 0.75\sqrt{100} = 1.5 + 7.5 = 9$, so the maximum women are willing to pay for full insurance, F_W, satisfies $\sqrt{100 - F_W} = 9$, or $F_W = 100 - 81 = 19$. Then:

i. When firms can offer different contracts to men and women, two markets will form. Men will pay \$32 for for insurance and women will pay \$16.

ii. (When firms cannot discriminate, it is exactly as if there is asymmetric information: consumers know whether they're men or women, but firms cannot tell.) Suppose that firms offer insurance which all consumers purchase. For profits to equal zero, the price of this insurance must be expected loss in the population, which is $(0.5)16 + (0.5)32 = 24$. But at a price of 24 women will not buy insurance, since they are only willing to pay up to 19. So firms would lose money if they offer this insurance contract, and there does not exist a price at which all consumers purchase and firms make zero profits. There cannot be two different prices for full insurance, as no consumers would select the higher priced contract. Therefore, a market will form offering full insurance for a price of \$32, which all men and no women will choose to purchase.


Utility
U(W)
Gain from insurance
Expected
Utility
8
Willingness to pay
Exp. Loss
Wealth
36
64
68
100