

Answer all questions in the space provided on the exam.

Total of 60 points (and worth 40% of final grade).

Read each question carefully, so that you answer the question.

Multiple Choice (1 points each question)

CIRCLE ONE –

PLEASE NO OTHER WRITING SO GRADESCOPE CAN READ ANSWERS

1. a b c d e

2. a b c d e

3. a b c d e

4. a b c d e

5. a b c d e

6. a b c d e

7. a b c d e

8. a b c d e

9. a b c d e

10. a b c d e

11. a b c d e

12. a b c d e

13. a b c d e

14. a b c d e

15. a b c d e

16. a b c d e

17. a b c d e

18. a b c d e

Short Answer (6 points each question)

1.(a) Consider moving from no health insurance to partial health insurance. On an appropriate diagram show

- (i)** The effect on total medical expenditures.
- (ii)** The welfare loss due to moral hazard.

(b) On an appropriate diagram show the benefit of health insurance to a risk-averse consumer. **Provide an explanation of your diagram, do not just draw it.**

(c)(i) A firm has 10,000 employees, each of whom have probability 0.2 of incurring annual health expenses of \$2,000 and probability 0.8 of incurring annual health expenses of \$7,000. Give the range of values that the average loss for the 10,000 employees falls in with 95% probability.

(ii) John obtains a major medical and hospital policy that covers all costs, aside from a \$5,000 annual deductible and a 30% coinsurance rate. If John actually incurs annual health charges of \$8,000, by how much will her health insurance company reimburse her?

2.(a)(i) Suppose an insurance company sells insurance to 100 people each of whom has independent and uncertain health expenses, with common mean \$20,000 and standard deviation \$10,000. What interval will the average claim per individual insured person lie in with probability 0.95?

(ii) Consider the market for used cars and let X = value of the car. Sellers know the value of the car they sell and their utility is $U(X) = X$. Buyers only know that car value is uniformly distributed on $(10,150)$ and their utility is $1.5 \times X$. Suppose the posted price for used cars is 90. Will consumers buy a car at this price? **Explain your answer.**

(b)(i) The Manning et al. paper on the Rand Health Insurance experiment in Table 2 found that adjusted total expenses were \$550 under the 95% plan (which has an effective coinsurance rate of 30 percent and were \$750 under the free plan. Calculate the arc price elasticity of health care demand.

(ii) What category of health service -- inpatient or outpatient -- was found to be most price responsive in the Rand health insurance experiment?

(c) Circle True or False to each of the following statements

- (i) True False** Life expectancy in 2023 is a forecast of average life expectancy for someone born in 2023 using 2023 death rates at each age.
- (ii) True False** For public health policy purposes a good measure of the value of a life saved is the present discounted value of future earnings.

3.(a) Suppose that a person with terminal cancer has the following options:

- Passive treatment: spend \$40,000, live five more years with each year worth 0.5 of a year in perfect health.
- Aggressive treatment: spend \$100,000, live ten more years with each year worth 0.7 of a year in perfect health.

Is it cost effective to go beyond passive treatment and consider aggressive treatment? For simplicity ignore any time discounting. Explain your answer.

(b) On an appropriate diagram show the impact on an individual's level of health and consumption of nonmedical goods of an increase in income. For your diagram state the effect on individual well-being and level of health.

(c)(i) Explain the difference between cost-benefit analysis and cost-effectiveness analysis.

(ii) The World Health Organization (WHO) is considering sending in teams of experts to deal with an outbreak of a disease in a distant country. Sending more teams will prevent more fatalities. It costs \$100,000 per team spent and they estimate the following effectiveness:

Number of teams	1	2	3	4	5	6	7
Total lives saved	200	400	500	510	512	513	513

Suppose saving a life is valued at \$20,000. What is the optimal number of teams? **Explain your answer.**

4.(a) On appropriate diagrams show why a profit-maximizing firm holding a patent for a drug that has constant marginal costs of production and delivery will nonetheless charge different prices for the drug in different countries.

(b) On an appropriate diagram show the profile of income over time from age 22 for

(i) a college graduate who gets no further training and immediately works fulltime.

(ii) a college graduate who immediately enters medical school and eventually works fulltime as a general practitioner.

(c)(i) Explain what a prospective payment system is.

(ii) Explain what the Herfindahl-Hirschman Index (HHI) is used for.

5.(a) Consider funding of NIH research. If Q research studies are funded, then a typical household places value $\$(1 - 0.001Q)$ on the Q -th study. There are 100 million households in the country. If each study costs \$5 million, what is the optimal amount of money the NIH should spend on supporting research studies?

Draw an appropriate diagram and compute the answer.

(b) Consider vaccination against a contagious disease. If a person is vaccinated there is a direct benefit to the person (they are less likely to get the disease), as well as an indirect benefit to others (someone vaccinated is less likely to pass the disease on to others). Vaccination costs \$20. Show on an appropriate diagram that a competitive market will lead to too few people having vaccinations. **On the same diagram show the welfare loss to society.**

(c)(i) Resistance to antibiotics such as penicillin is an example of a negative externality

Circle **True** or **False**

(ii) In health care it is not possible to privatize a public good.

Circle **True** or **False**

6.(a)(i) What did we learn from the paper Cutler, D.M and M. McClellan (2001), "Is Technological Change in Medicine Worth It?", *Health Affairs*?

(ii) A study finds that the coefficient of variation for c-sections for baby delivery varies greatly by region, even after control for supply factors and socioeconomic variables. Is this cause for concern? **Explain your answer.**

(b) Provide a plot of life expectancy (across countries) against country income per capita, paying attention to both the slope and curvature of the plot.

On the same diagram show where the U.S. lies in relation to this curve.

(c)(i) Briefly contrast public provision of health care in the United States with that in the major western European countries.

(ii) Briefly contrast amount of health services received in the United States with that in the major western European countries.

7. The output for question 7 is given on the last page of the exam, which you might find helpful to tear out.

Key variables: lyg = Life-years gained
 $price$ = Drug price at launch per treatment-episode 2012 \$1000's
 $plyg$ = Price per life-year gained 2012 \$1000's
 $time$ = Approval date since 1995 in years"
 $year$ = Approval date (year)
 $orphan$ = 1 if orphan drug status (for drugs used to treat rare conditions)
 $lncomp$ = number of drugs previously approved for the tumor site

For each of the following if there is not enough information to answer the question then state this.

- (i) By how much does drug price at launch increase with one more life year gained?
- (ii) What is the elasticity of drug price at launch with respect to life years gained? **Explain.**
- (iii) What is the annual percentage change increase in drug price at launch? **Explain.**
- (iv) Is there a statistically significant relationship between drug price at launch and drug effectiveness at significance level 0.05? **Explain.**
- (v) What economics lesson do we learn from the last set of regression output? **Explain.**
- (vi) What **regression command** would allow us to obtain the sample average of drug price at launch?

Multiple Choice (1 points each) Note: You should spend 30% of time on these!

1. Adverse selection in insurance means:
 - a. the choice by consumers of an insurance plan that is insufficient to meet their needs
 - b. the choice by insurance plans not to cover medical conditions that exist at the time a person begins coverage with the insurance plan
 - c. the systematic choice of a particular insurance plan by persons with higher than average risks
 - d. the choice by insurance plans to require certain persons to have their premiums determined on an individual basis.
 - e. all of the above.

2. Medicare parts A and B cover
 - a. hospital
 - b. hospital, physicians
 - c. hospital, physicians, pharmaceutical drugs
 - d. hospital, physicians, pharmaceutical drugs, nursing homes

3. Health expenditures as a percentage of GDP in the U.S. are
 - a. more than 20%
 - b. between 10% and 20%
 - c. between 5% and 10%
 - d. less than 5%

4. A limitation of the Rand study is that
 - a. all health insurance policies had the same coinsurance rate
 - b. health insurance was selected by the individual rather than randomly assigned
 - c. both a. and b.
 - d. neither a. nor b.

5. A risk-averse consumer needs to choose between:
 - 1: Insurance costs \$110. It pays out \$0 with probability 0.5 and \$200 with probability 0.5.
 - 2: Insurance costs \$110. It pays out \$50 with probability 0.5 and \$150 with probability 0.5.
 - a. insurance choice 2 is preferred
 - b. insurance choice 1 is preferred
 - c. there is not enough information to answer this question.

6. A lesson from Akerlof's market for lemons is that market failure can occur
 - a. when there is certainty and information is symmetric
 - b. when there is uncertainty and information is asymmetric
 - c. when there is uncertainty and information is symmetric
 - d. none of the above.

7. According to a Kaiser Health News column, picked up by Paul Krugman in his New York Times column of March 11 2011, at AcademyHealth's yearly policy conference a participant stated that there was no reason the government should pay for "so-called comparative effectiveness research." The explanation for this viewpoint is
- comparative effectiveness research should be done privately because the benefits are private
 - it is very expensive to do comparative effectiveness research and would cost more than the benefit
 - ignorance.
8. The study by Neuhauser and Lewicki (1975), "What Do We Gain from the Sixth Stool Guaiac?" discussed in class and presented in the coursepack
- the first Guaiac test is cost-effective but the sixth test is not cost-effective
 - the first Guaiac test is not cost-effective
 - it would be better to do no Guaiac tests than to do all six tests.
9. Hospitals in the U.S.
- are mostly for profit
 - are mostly not-for-profit but act quite differently from for-profit hospitals
 - are mostly not-for-profit and act similarly to for-profit hospitals
10. A pharmaceutical drug that passes phase III drug trials and is approved by the FDA
- is safe and effective
 - is better than alternative drugs available at the time of approval
 - neither a. nor b.
 - both a. and b.
11. Physician-induced demand leads to
- higher prices for health care and higher quantity of health care
 - higher prices for health care and lower quantity of health care
 - lower prices for health care and higher quantity of health care
 - lower prices for health care and lower quantity of health care
12. The internal rate of return on training is that rate of return at which
- the present discounted value (PDV) of costs is equated across training and no training
 - the PDV of benefits is equated across training and no training
 - the PDV of costs and benefits is equated across training and no training
 - none of the above.

13. The main reason for the dramatic increase in the real cost of a hospital patient bed day over the past fifty years is
- increased real price of medical equipment
 - increased quantity of medical equipment
 - increased real wages and salaries
 - increased use of labor
14. Very high prices of drugs in the U.S. are
- limited to generic drugs off patent
 - limited to brand name drugs on patent
 - occur for both brand name drugs on patent and generic drugs off patent
 - none of the above
15. Covered California is California's website is used for
- Medicaid
 - Medicare
 - American Affordable Care Act (Obamacare) insurance policies
 - none of the above
16. Recent federal government studies place the value of a human life at
- between \$5 million and \$10 million
 - between \$1 million and \$5 million
 - less than \$1 million
 - federal government studies are prohibited from place a dollar value on human life.
17. The biggest gains to life expectancy are for countries
- moving from very poor to moderately poor
 - moving from moderately poor to middle income
 - moving from middle income to rich
 - the gains are fairly uniform at all levels of country income.
18. The incremental cost-effectiveness ratio for treatment A versus treatment B equals
- difference in costs divided by difference in outcome
 - difference in outcome divided by difference in costs
 - difference across treatments in the costs-to-outcome ratio
 - difference across treatments in the outcome-to-costs ratio

7. Data for Question 7

Consider the assignment 5 data example

Key variables: lyg = Life-years gained
 price = Drug price at launch per treatment-episode 2012 \$1000's
 plyg = Price per life-year gained 2012 \$1000's
 time = Approval date since 1995 in years"
 year = Approval date (year)
 orphan = 1 if orphan drug status (for drugs used to treat rare conditions)
 lncomp = number of drugs previously approved for the tumor site

You are given the following information

```
. regress price lyg, vce(robust)
      |               Robust
price |               Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
lyg   |    157.6652    8.610761    18.31   0.000    140.4017   174.9287
_cons |    -6.853084   4.834336     -1.42   0.162   -16.54534   2.839177
-----+-----

. regress lnprice lnlyg, vce(robust)
      |               Robust
lnprice |               Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
lnlyg  |     1.035771   .1713206     6.05   0.000    .6922938   1.379248
_cons  |     4.635659   .1912241    24.24   0.000    4.252278   5.01904
-----+-----

. regress lnplyg year, vce(robust)
      |               Robust
lnplyg |               Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
year   |     .1013861   .0271092     3.74   0.000    .0470354   .1557369
_cons  |    -198.8301   54.4688     -3.65   0.001   -308.0335  -89.62676
-----+-----

. regress lnplyg year lncomp, vce(robust)
      |               Robust
lnplyg |               Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
year   |     .0989639   .0239431     4.13   0.000    .0509401   .1469878
lncomp |    -.6237524   .1751127     -3.56   0.001   -.974984   -.2725208
_cons  |    -192.582    48.02531     -4.01   0.000   -288.9085  -96.25539
-----+-----
```