



AFRICAN ECONOMIC RESEARCH CONSORTIUM

Collaborative PhD Programme in Economics for Sub-Saharan Africa

COMPREHENSIVE EXAMINATIONS IN CORE AND ELECTIVE FIELDS

FEBRUARY 13 – MARCH 3, 2017

HEALTH ECONOMICS

Time: 08:00 – 11:00 GMT

Date: Tuesday, February 21, 2017

INSTRUCTIONS:

Answer a total of FOUR questions: ONE question from Section A, ONE question from Section B, and TWO questions from Section C (which must be either Question 5 or 6 AND Question 7 or 8).

The sections are weighted as indicated on the paper.

Section A (15%): 27 Minutes

Answer only ONE Question from this Section

Question 1

- (a) What are the consequences of early and unwanted pregnancy amongst adolescents? **[5 Marks]**
- (b) What are the consequences of unattended adolescence health needs? **[5 Marks]**
- (c) In what ways can government intervention address the consequence of adverse lifestyle on population health? Explain explicitly. **[5 Marks]**

Question 2

The global burden of disease (GBD) is a comprehensive regional and global assessment of mortality and disability from different diseases and injuries.

- (a) Disability Adjusted Life Years (DALYs) has been widely accepted and commonly used as a measure of the Burden of Disease, though it is admitted to be characterized by some limitations. Give a brief exposition of your understanding of the concept of DALYs, highlighting its components, benefits and limitations. **[10 Marks]**



- (b) Consider a person who gets some disability at the age of 10, lives with the condition for 35 years, and suffers premature death at the age of 45. If the life expectancy is 60 years, and the health related quality of life weight associated with the condition is 0.75, what will be the (undiscounted) lifetime Quality of Life Years (QALYs) of this person? What will be the expected QALY loss? **[5 Marks]**

Section B (25%): 45 Minutes

Answer only ONE Question from this Section

Questions 3

For a market to function efficiently, it is required that there be no externality to the actions of the parties in the market. However, the healthcare market is characterized by substantial externalities.

- (a) How do the negative and positive externalities impact on healthcare markets? Support your discussion with appropriate diagram(s). **[8 Marks]**
- (b) With an appropriate diagram and clear explanation, demonstrate the economic impact of positive and negative externalities. **[7 Marks]**
- (c) Identify and discuss the alternative methods of dealing with externalities. **[10 Marks]**

Question 4

Apart from educational status of an individual, health status plays a significant role in the labour force participation of the individual. Given specific data set, you are presented with an estimable equation that expresses labour force participation (L) as a function of a vector of health status indicators (H), and other explanatory variables (X):

$$L = \alpha + \beta H + \lambda X + \mu$$

which assumes exogeneity of the right hand side variables. However, existence of endogeneity in which the health variables are non-independent of L is supported by reality.

- (a) Give a brief interpretation of the parameters in the equation **[5 Marks]**
- (b) Show that in the presence simultaneity (bidirectional) relationship, the health variable (H) is correlated with the error term (μ) **[12 Marks]**
- (c) How would you handle the problem of endogeneity arising from the presence of unobserved heterogeneity? **[8 Marks]**



Section C (60%): 108 Minutes

Answer TWO Questions from this Section;

Which Must be Either Question 5 or 6 AND Question 7 or 8

Question 5

- (a) Using an appropriate diagram, separately demonstrate the effect of variations in the following variables on the optimal quantity of health stock in the Grossman model:
 - (i) Age [4 Marks]
 - (ii) Wage [4 Marks]
 - (iii) Education [4 Marks]
- (b) Present and explain in detail, the geometric diagram of the Integrated Grossman Model around the 4 quadrants. [10 Marks]
- (c) How would you show the effect of the following on the diagram in (b) above?
 - (i) Change in the individual's preference between labour and leisure [4 Marks]
 - (ii) Change in wage or income. [4 Marks]

Question 6

On the one extreme of health insurance contracts is the provision of full coverage insurance, in which the insurer reimburses the full cost of medical care to the insured, with an effective price of zero to the insured persons, and by implication, the existence of an incentive to extend their demand to the point where their marginal utility is zero ('satiation quantity').

- (a) Identify and discuss extensively the various forms by which health insurance contracts can deviate from full coverage. [8 Marks]
- (b) With reference to the financial consequences of illness, develop a general framework for determining the optimal insurance protection in the absence of moral hazard. [15 Marks]
- (c) Develop a similar framework with two health states (healthy and unhealthy) to determine the optimal insurance protection (again in the absence of moral hazard), showing the three possible first order conditions. [7 Marks]



Question 7

Assume the following hypothetical cross-country relationship was estimated for 2015 using African data:

$$\text{Log (Health expenditures/population)} = -2.43 + 1.31 \log (\text{income/population}) + 0.08 (\text{North Africa})$$

$$\text{Adjusted } R^2 = 0.17.$$

where, *North Africa* refers to a dummy variable which equals 1 if the observation was Egypt, Algeria or Tunisia.

- (a) Interpret the results of the regression. [6 Marks]
- (b) What other variables would be expected to improve the fit of the model? Explain. [6 Marks]
- (c) Discuss the disadvantages of using cross-sectional data for this kind of analysis. [6 Marks]
- (d) Discuss the methodological challenges inherent in international comparisons of health expenditures. [6 Marks]
- (e) Discuss at least five reasons why international comparisons of health expenditures are useful? [6 Marks]

Question 8

Imagine that you have been asked to advise local decision makers on the cost-effectiveness of ante-natal HIV testing (that is pregnant women for the HIV virus). You undertake a literature search to identify published economic evaluations – but find nothing to help you in your analysis. You quickly realize that you will have to undertake a decision analysis of your own using data from available sources.

The Data

From the literature search, you identify publications that provide you with the following information:

- (i) If a woman has HIV and her infection is not known during pregnancy, the probability that she will transmit the infection to her child is 26%.
- (ii) If a woman's infection is known during pregnancy, however, it is possible to use risk-reduction interventions such as caesarean section, antiretroviral therapy and bottle feeding. These interventions cost \$800 more than a normal delivery and reduce the



probability of vertical transmission to 70%, but only 95% of infected women accept them.

- (iii) Discussion with midwifery staff indicates that offering the test to women could be achieved at negligible additional cost, but your pathology laboratories suggest that each blood test will cost \$10; they also indicate that the tests are 100% accurate (that is, there are no false negatives or false positives).
- (iv) A published paper suggests that the prevalence of previously undetected HIV in the ante-natal population in your area is 5%.

Assumptions

Discussions with professional staff indicate the following assumptions can be justified:

- (i) No woman will select to terminate on discovering she has HIV infection.
- (ii) All women who are tested positive will be offered risk-reduction interventions.

Required:

- (a) Structure a decision tree characterizing the decision regarding whether or not to offer ante-natal HIV testing. **[12 Marks]**
- (b) Calculate the expected cost per true positive case detected. **[10 Marks]**
- (c) What are likely to be the key sensitivity analyses to undertake? **[4 marks]**
- (d) What are the weaknesses of the analysis? **[4 Marks]**