# Public Health 126: Introduction to Health Economics and Public Policy Problem Set 1

Due: February 14, 2008 by 2pm

February 6, 2008

Please answer the following questions in a clear and concise manner.

## 1 Calculating marginal benefits

You, like the rest of Berkeley, have caught the cold. You have decided that you want to take medication to help end your ailment. Of course, each dosage that you take will give you varying benefit (i.e., "treatment"). The total benefits of the doses in dollars are given in Table 1. The market for cold medicine is perfectly competitive; that is, all suppliers produce a dosage for $2 each.

Table 1: The benefits of doses of cold medicine

| Dose | Total benefit | Marginal benefit | Average benefit |
|---|---|---|---|
| 1 | 10 | | |
| 2 | 20 | | |
| 3 | 27 | | |
| 4 | 32 | | |
| 5 | 36 | | |
| 6 | 39 | | |
| 7 | 41 | | |
| 8 | 42 | | |
| 9 | 42 | | |

a. Complete Table 1.

b. How many doses should you consume? Why?

c. Calculate the elasticities of demand when you consume

   i. 5 doses

   ii. 8 doses

## 2 The supply and demand for physician services

The total supply of physician services is given by $P_S = 76 + 3H_S$, where $P_S$ is the price that physicians receive and $H_S$ is the total number of hours that physicians work per day in millions. Demand for physicians services is given by $P_D = 108 - H_D$, where $P_D$ and $H_D$ are the price that consumers pay and the number of hours of service consumed respectively.

a. What is the law of demand? Does it hold here?

b. Show graphically and calculate algebraically the equilibrium in this market. In *Health Policy Issues*, it is reported that there are about 800,000 physicians in America. How many hours does the average physician work per day?

It is important to understand the difference between *movements along* a curve and *shifts* of a curve. For each of the following cases, state whether there is movement along or a shift of the curve for both demand and supply.

c. Americans put down their Big Macs and start going to the gym—they become healthier.

d. There is significant growth in incomes for all Americans.

e. Doctors prefer to spend more time with their families.

f. It becomes easier to enter medical school and become a certified physician.

g. The cost of being treated in the emergency room increases.

h. The wage of nurses, who assist physicians, increases.

## 3 Externalities and subsidies

There is a market for influenza vaccines. Demand is given by $P_D = 40 - 2V_D$, where $P_D$ is the price of the vaccine paid by consumers and $V_D$ is the number of vaccines consumed divided by ten million. The supply of vaccines is given by $P_S = 8.75 + \frac{V_S}{2}$, with $P_S$ and $V_S$ being the price received by suppliers and the number of vaccines supplied divided by ten million.

a. Draw a supply-and-demand diagram depicting the equilibrium. Find the equilibrium algebraically.

b. What is the elasticity of demand at the equilibrium? Of supply? Are producers or consumers more responsive to price at the equilibrium?

c. Define the term *externality* and discuss why the government may want to subsidize vaccinations.

d. Assume that the government gives producers a subsidy for each vaccine that they produce. What happens to the demand curve? To the supply curve? Does the equilibrium quantity go up or down? Does the price that consumers pay go up or down? By more or less than the amount of the subsidy?

e. Now assume that the government gives a subsidy to each consumer that gets vaccinated. What happens to the demand curve? To the supply curve? Does the equilibrium quantity go up or down? Does the *net* price that consumers pay go up or down? By more or less than the amount of the subsidy?

f. Instead suppose that the government wants producers to make more vaccines and implements a *price floor*: consumers must pay at least \$20 for the vaccine. Is there an equilibrium in this market? How many vaccines are produced? How many are consumed?

g. Lastly, the government wants more people to become vaccinated, so it implements a *price ceiling*: consumers will pay at most \$10 for the vaccine. Is there an equilibrium in this market? How many vaccines are produced? How many are consumed? Who will get vaccinated?

## 4 The production of health

In a simplified model, there are three inputs for producing health ($H$): nutrition ($N$), environmental factors ($E$), and medical care ($M$). Production is given by the Cobb-Douglas form:

$$H = N^{\frac{1}{2}} E^{\frac{1}{4}} M^{\frac{1}{4}}$$

a. Draw a sketch of the relationship between health and medical care, holding nutrition and environmental factors constant.

b. Find the equation for the marginal productivity curve of each input.

c. Draw a sketch of the marginal productivity curve for medical care.

d. If you want to maximize health, should you focus on just one of these factors? Why?

## 5 The demand for health insurance

Each individual has a utility curve over total wealth given by $U = \sqrt{W}$, where $W$ is wealth. Suppose that each individual has a 90% chance of being healthy and a 10% chance of being sick. If he is healthy, he gets all his wealth—\$90,000. If he becomes sick, he only has \$10,000 remaining after medical expenditures.

a. Does marginal utility increase or decrease as wealth goes up? Why?

b. What is his utility if he is healthy? If he is sick?

c. What is his *expected utility*?

d. How much wealth would he need to be indifferent between receiving this amount for sure and accepting the risk of varying wealth depending on whether he is healthy or sick (i.e., what wealth achieves the same level of utility as the expected utility over the states of sick and healthy)?

Now he has the option of buying health insurance.

e. What is the most that he would be willing to pay for insurance?

f. What is the *actuarially fair* price of insurance in this problem?

g. Should we expect actuarially fair insurance prices? Why?

## 6 Short response

The answers to the following three questions **in total** may not exceed two handwritten or (preferably) two, double-spaced typed pages.

a. What factors have driven the increase in health care costs over the last three decades? What can be done?

b. Why are hospitals in the United States largely non-profit, while physicians are for-profit?

c. Are we spending too much on health care? Explain.