

Problem Set 1
Economics 40565, Health Economics
(Due: At the start of class, Tuesday, September 25, 2007)

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1. Suppose we are graphing the health production (H) as a function of medical spending (M). Fogel and McKeown argue that the rise of agricultural output increased the size of humans and therefore, allowed them to better fight off infectious diseases. Suppose this hypothesis is correct. Graphically illustrate how the rise of agriculture may have altered the health production function. Is this a shift along or a shift in the production function?
2. Data from the National Longitudinal Mortality Survey indicates that among adult males, when income doubles, five-year mortality rates fall by 25 percent. Five-year mortality rates among those with \$10,000 in income is about three percent. Given the information above, what are mortality rates among those with \$20,000 in income? \$80,000 in income?
3. Looking at the footnotes to Figure 2.2 in Fogel's article, define what a relative risk of 1 equals. Looking at Figure 2.3 in Fogel's article, what is the (approximate) relative risk of mortality for modern Norwegian males with BMI's of 19 and 31?
4. Using data on five-year mortality rates for US females aged 35 to 85 (M), an author estimates the Gompertz equation that relates log one-year mortality rates to age (A) and finds that in this population, the equation is estimated to be $\ln(M) = -9.944 + 0.0852A$. By how much does the one-year mortality rate increase as a person ages one year? 15 years? What is the predicted mortality rate at age 50? At age 65?
5. In a oft-cited paper, an economist demonstrated that in a sample of people with at least a high 3school education, education at age 30 was as good a predictor of smoking status at age 30 as it was smoking status at age 16: those more with years of education at age 30 had lower smoking rates at both age 30 and age 16. What does this result suggest about whether the poorer health habits of lower educated adults are 'caused' by education?
6. A growing body of research suggests that conditions people experience in utero have long term consequences on health. In a series of famous studies, British epidemiologist DJP Barker demonstrates that children born with low birth weight tend to have much higher rates of cardiovascular and lung disease at ages 50 and above. Although this evidence is suggestive, why might one be suspicion about whether this represents a causal relationship?
7. In the mid 1970s, Social Security (SS) payments were increase much faster than revenue growth and as a result, the SS system was predicted to go bankrupt in the not to distant future. To deal with these problems, in 1977, the Federal government for the first time reduced SS payments. Under the new law, those born after January 1, 1917 were to receive sharply lower monthly payments. Therefore, two people, one born in late December 1916 and the other born in January 1916, with the same earnings histories would receive very different SS payments. On the final page of this handout is a graph that shows the monthly SS payments received for males by quarterly birth cohorts (e.g., those born in the 1st quarter of 1916, the 2nd quarter of 1916, etc.). How can you use this fact to test for the casual impact of income on mortality for an elderly population?

8. Consumer and Producer's Surplus Review: The domestic supply and demand for a new alloy can be described by the curves:

$$\begin{array}{ll}\text{Inverse supply:} & P=40+4Q \\ \text{Inverse demand:} & P=400-8Q\end{array}$$

What is market-clearing price and quantity in this market? What are the values of consumer's and producer's surplus?

9. Suppose that in problem 8) the EPA determines that the manufacturing process used to produce the product generates toxic waste that the producers discharge into local waterways. The toxic release has been linked to a higher-incidence of cancer deaths. A Federal agency has estimated that the social marginal cost of the toxic waste is \$12 per unit produced, so the SMC curve is $SMC=52+4Q$. What would be the socially optimal level of output and price for the product? What is the dead-weight-loss associated with overproduction of the product?
10. Suppose the demand for alcohol can be described by the inverse function $P=80-Q$ and the inverse supply curve is given as $P=8+2Q$. What is the market equilibrium price and quantity in this market? Suppose that alcohol use generates consumption externalities such that the marginal social benefit is given by the equation $MSB=80-2Q$. What are the market clearing values of Price and Quantity? At these values, what is the dead weight loss of over consumption of alcohol? Suppose the government were to levy an excise tax on alcohol consumption to try to internalize the external costs of alcohol. On your graph, indicate the tax level that would effectively internalize costs. Calculate this value.
11. Most people receive health insurance through employers. One way to internalize some of the costs associated with the lack of exercise, smoking or excessive alcohol consumption is to charge employees with poor health habits higher insurance premiums. Why do insurance companies or firms typically not use this method to internalize costs?
12. In a nationally-representative survey, adults indicated they were willing to pay on average an extra \$76 in annual transportation costs if car manufacturers could produce a car that reduced annual motor vehicle death rates by 25%. Assume the annual chance of death by motor vehicle accident is 0.0001. What is the 'value of statistical life' implied by these survey responses?
13. Most 'value of a statistical life' estimates come from labor market studies which find that those with higher on-the-job risks receive higher wages. What assumptions about the labor market must the authors of these studies make such that these numbers can be transformed into accurately estimates of the value of a statistical life.
14. Review of demand elasticities: During the mid to late 1990s, all states filed civil law suits against tobacco manufacturers seeking to recover the increased costs of operating Medicaid programs that can be attributed to smoking. In December of 1998, cigarette manufacturers and the states agreed to an out-of-court settlement that ended these suits. As a result of a agreement, cigarette manufacturers increased cigarette prices by 55 cents/pack. Before the agreement, the average retail price of cigarettes was \$1.90 and 21 million packs of cigarettes were sold per year. If the elasticity of demand for cigarettes is -0.40, how much will smoking fall as a result of the settlement?

Monthly SS Earnings by Birth Cohort, 1991

