**Suggested Answers**
**Economics 40565**

**Bill Evans**
**Fall 2007**

1. The graph is at the end of the handout. Fluoridated water strengthens teeth and reduces incidence of cavities. As a result, at all price levels, people are willing to consumer fewer dental visits. Therefore, the demand curve shifts in from D1 to D2.

2. Please see the graph at the end of the handout.

3. The graph is at the end of the handout. The demand curve without insurance is line (ab). With insurance and a zero dollar copayment, the costs of each prescription is \$0, so demand is a vertical line (bc). When the copayment is increased to \$9/prescription, then demand curve now shifts to line (bde). If P=\$15 and consumers did not have insurance, consumers would demand 15=45-5Q or 6 units. With a zero coinsurance rate (insurance pays for everything), demand would be 9 units since P=\$0. With a \$15 price and a \$9 copay, each prescription costs \$9, so they would demand 9=45-5Q, or 36=5Q and q=7.2.

4. The graph is at the end of the handout. Demand without insurance is $P_d$ =150-30Q and the graph is illustrated by line (ab). With a coinsurance rate of c, the price faced by consumers is $P_d = P_s c$ where $P_s$ is the price received by sellers. In this case, c=0.25 so the price paid to sellers is $P_d = P_s(0.25) = 150\text{-}30Q$ which means that the price transacted in the market is now P = (150/0.25) - (30/.25)Q = 600 - 120Q. This demand curve is line (ac). With a price of \$60/unit, consumers would demand 60=150-30Q or 90=30Q or Q=3 units. With a 25% coinsurance rate, if price is \$60, consumers only pay \$15/visit, so the demand is really \$60 = 600 - 120Q, or 540 = 120Q and Q=4.5. DWL is this case is area (def). Note that in order to sell 4.5 units to people without insurance, price would have to fall to P=150-30(4.5) = \$15. Therefore, the area of (def) is (½)(60-15)(4.5-3) = 33.75.

5. The graph is at the end of the handout. The demand curve without insurance is line (ab). With insurance and a zero dollar copayment, the costs of each prescription is \$0, so demand is a vertical line (bc). When the copayment is increased to \$9/prescription, then demand curve now shifts to line (bde). If P=\$15 and consumers did not have insurance, consumers would demand 15=45-5Q or 6 units. With a zero dollar copay, they would demand 9 units since P=\$0. With a \$15 price and a \$9 copay, each prescription costs \$9, so they would demand 9=45-5Q, or 36=5Q and q=7.2.

6. Purchase of these insurance policies are an anomaly and cannot be explained well with economic theory. Since a large fraction of elderly meet their deductible levels each year, there is little 'risk': although they experience a loss, the loss is fairly certain. Since policy prices are based on the actuarial risk and 'loading factors' such as administrative expenses, in many cases, people would be paying large administrative costs to cover a risk that almost surely will happen.

. The graph is at the end of the handout. Demand without insurance is $P_d$ =150-30Q and the graph is illustrated by line (ab). With a coinsurance rate of c, the price faced by consumers is $P_d = P_s c$ where $P_s$ is the price received by sellers. In this case, c=0.25 so the price paid to sellers is $P_d = P_s(0.25) = 150\text{-}30Q$ which means that the price transacted in the market is now P = (150/0.25) - (30/.25)Q = 600 - 120Q. This demand curve is line (ac). With a price of \$60/unit, consumers would demand 60=150-30Q or 90=30Q or Q=3 units. With a 25% coinsurance rate, if price is \$60, consumers only pay \$15/visit, so the demand is really \$60 = 600 - 120Q, or 540 = 120Q and Q=4.5. DWL is this case is area (def). Note that in order to sell 4.5 units to people without insurance, price would have to fall to P=150-30(4.5) = \$15. Therefore, the area of (def) is (½)(60-15)(4.5-3) = 33.75.

7. a. This is an acute condition that needs treatment now and there are few substitutes, so elasticity of demand should be low (in absolute value).
   b. Mammographies are typically preventative services. Use of this service can be delayed over time. Higher.
   c. Length of a hospital stay. The patient typically has little control over this decision. Lower
   d. These are typically non-acute (elective) procedures that are expensive. Higher.

8. The arc elasticity of demand is defined as $e_d[(Q_2-Q_1)/(Q_2+Q_1)]/[(P_2-P_1)/(P_2+P_1)]$. In each case, the denominator in the elasticity is the same. For free care, $P_1$ =0 and with a 50% coinsurance rate, $P_2$ =.50 so $[(P_2-P_1)/(P_2+P_1)] = 1$.

| | Doctor Visits | $ Hospital Care | $ all care |
|---|---|---|---|
| Q1 | 4.55 | 769 | 1410 |
| Q2 | 3.03 | 846 | 1078 |
| (Q2-Q2)/(Q1+Q2). | -0.201 | 0.047 | -0.133 |
| $[(P_2-P_1)/(P_2+P_1)]$ | 1 | 1 | 1 |
| Arc elasticity | -0.201 | 0.047 | -0.133 |

9. A) Those that had insurance prior to the law will not experience a change in the copayment rate so their demand will not change. Those without insurance before January 1 will experience a drop in copayments of from 100 to 25 percent, a price drop of (0.25 - 1)/1 = -0.75 or a 75% drop in price. Given an elasticity of -0.4, this will increase demand by -0.4(-0.75) = 0.3 or 30%. The new level of demand for these people will then be $29*(1.3)= $37.7 billion.

   B) Everyone without insurance will now be covered and therefore, the government will end up paying 75% of $37.7 billion. Everyone with coverage from another source will now receive coverage from the federal government so the government will end up paying 75% of $73 billion, for a grand total of (0.75)($73+37.7)= $83.025 billion.

   C) Outlays for the program will be $83 - $22 = $61 billion.

   D) An estimate from the CBO can be found at http://www.cbo.gov/showdoc.cfm?index=6139&sequence=0 and these numbers suggest that the outlays should be roughly $55 billion a year. Not bad for back of the envelope!!!

10. There are two potential answers. One can say the expenditures are high for those with insurance because of moral hazard. However, it is hard to explain a three-fold difference in spending due to moral hazard – elasticities of demand are typically not that large. A more likely explanation is adverse selection -- those with insurance are those most likely to need insurance so it is no surprise that this groups spends more on prescription drugs than those without insurance.

11. a) In the real world, people with and without insurance are very different. Those with insurance tend to be from higher income families, have more years of education and have otherwise better health. In some situations however, the purchase of insurance is due to adverse selection: people who need the insurance the most are most likely to purchase. Therefore, is one were to compare health spending across groups of people, some with and without insurance, it is impossible to tell whether the observed differences in use are due to insurance or due to some of these other unobserved factors. By randomly assigning insurance to children, we do not have to worry about the underlying reasons they have insurance since the

b) The authors identified the impact of insurance on demand by looking at the difference in insurance use before and after the students had insurance. They attribute all of the increase in use over time to insurance. However, this could be a biased estimate. Suppose for example that medical care use is naturally increasing over time, either because of market effects (maybe prices are going up) or because as children age they consume more medical care. In either of these cases, we would have expected use to increase over time anyway so the author's are overstating the impact of insurance on demand. The authors could eliminate this problem by adding a 'control' group where they collect data on a group of children who were not offered insurance. Their change in use over time would represent what would have happened to use in the absence of the treatment program.

12. If a person receives income I, is taxed at a rate of t, the after tax income available to them is I(1-t). To purchase a policy worth $4200 in after tax dollars, the person would need to receive I(1-t)=$4200, which is 4200/(1-t) = 4200/(1-0.36) = $6562.50 in before tax income..

13. The original budget constraint is line (ab). The most X that can be purchased is $I/P_x$= $1000/$4 = 250 and the most y than can be purchased is $I/P_y$= $1000/$2=500. The original utility maximizing bundle is $(x_1, y_1)$ along indifference curve U1. As the price of Y fall to $1/unit, the budget constraint rotates about point a and the new budget constraint is line (ac). The new utility maximizing bundle is $(x_1,y_2)$ along indifference curve U2. Given the price drop for y, the substitution effect suggests y should fall and x should increase. But because of the price drop, purchasing power has increased, and, assuming y and x are both normal goods, the income effects suggests x and y will both increase. To isolate the substitution effect, draw a line parallel to the new budget constraint but tangent to old indifference curve.

| | |
|---|---|
| Substitution effect: | $x_1$ to $x_3$ (-), $y_1$ to $y_3$ (+) |
| Income effect: | $x_3$ to $x_1$(+), $y_3$ to $y_2$ (+) |

In this case, y unambiguously increases. Because we are given that the consumption of x does not change after the price drop for y, it must be the case that the negative substitution for x is just equal to the positive income effect.

14. If I is before tax income, t is the tax rate, and health insurance is not a tax-preferred fringe benefit, consumers purchase health insurance with after-tax dollars. Let X be all other goods and H be expenditures on health insurance. In this instance, the budget constraint is I(1-t) = X+H.

In this case, the consumer has $600 in income and faces a 30% marginal tax rate so the most that can be spent in either all other goods (x) or on health care is $600(1-0.3) = $420. The original budget constraint is line (ab).

When health insurance is tax preferred, the budget constraint changes. The firm is willing to pay the worker $I in total compensation and the worker can take this in before tax salary (S) or health insurance (H). After tax salary can is S(1-t) can be spent on X, so X/(1-t) = S. Therefore, the new budget constraint is I = H + X/(1-t) (substitute X/(1-t) for S in I=S+H). The most that can be spent on all other goods is still $420, but the person could receive a health plan valued at $600 since they would not have to pay taxes on that amount, so the budget constraint rotates about point and the new constraint is line (ac).

15. Moving from budget (ab) to (ac), we assume the consumption of both X and H increase. Label the two utility maximizing bundles as $(x_1,H_1)$ and $(x_2,H_2)$ respectively. The movement to tax-referred health insurance has reduced the relative price of health insurance, which, according to the substitution effect, should increase H. Because of the price drop, income now goes further than before so the income effect also suggests that the consumption of H should increase. To isolate the income and substitution effects, draw a line parallel to the new budget constraint until it is just tangent to the old indifference curve (line dd). The movement from Y1 to Y3 is along the same indifference curve and represents solely a change in price so this is the substitution effect. The movement from Y3 to Y2 is due solely to a change in income: relative prices are the same. Therefore, Y3 to Y2 represents the income effect. Given the way I've drawn

the indifference curves, there is not much of an income effect in this example.

16. Line (ac) is the budget constraint with a 30% marginal tax rate. As marginal rates fall to 15%, the amount the worker can take in health insurance does not change so the budget constraint will rotate about point C. However, if they spend no money on health insurance, the most they can spend on all other goods is now much higher at $600(1-0.15) = $510 so the new budget constraint is line (ce).

In this case, the relative price of health insurance has increased. Before, in order to spend an extra dollar in health care, workers gave up $1 in before tax income which would be turned into $0.7 in after tax spending. Now, giving up $1 in before tax income to spend on H requires that they sacrifice $0.85 in $X. The cost of H has increased relative to the cost of x. Therefore, the substitution effect suggests the consumer should move away from H and towards X. However, because tax rates declined, real purchasing power increased and therefore, the income effect suggests that the consumption of both X and H should increase.

Indifference curve $U_2$ is the original situation with quantities $X_2$ and $H_2$. The new situation is descried by $U_3$ with consumption values $X_3$ and $H_3$. To isolate the income and substitution effects, move a line parallel to the new budget constraint (line ae) until it is tangent to the old indifference curve ($U_2$).

| | |
|---|---|
| Substitution effect: | $x_2$ to $x_4$ (+), $H_2$ to $H_h$ (-) |
| Income effect: | $x_4$ to $x_3$(+), $H_4$ to $H_3$ (+) |

17. If the company offered workers this deal, the people most likely to think like Joe are people who value health care the least, e.g., people who expect to have the lowest medical expenses over the next year. Therefore, the people remaining with insurance would be the ones with the highest expected use. Subsequently, the premiums for the remaining people would increase. This could potentially lead to an insurance death spiral where the low cost uses turn down insurance, leaving only high cost workers left in the insurance pool. The firm needs low health care users in the insurance pool so as to subsidize the costs of high-expenditure workers.

18. Adverse selection is caused by asymmetric information. In the automobile market, high-quality information about insurance risk is readily available to help circumvent the problem of asymmetric information. For example, an insurance company can easily obtain previous claims with other insurance companies and a history of moving violations. Also, auto insurance is required for all drivers so there is no concern that good risks exit the market.