

1.(a) Fee for service (FFS) is indemnity insurance where insured has great choice of health care though has to pay coinsurance/copayment and a deductible.

(b) A PPO also has a gatekeeper but care can be from a list of providers.

(c) Health maintenance organization (HMO) has a gatekeeper that decides on care and that care is to be provided within the HMO. An HMO is more restrictive than an PPO.

(d) High deductible health plan (HDHP) has much higher deductibles and copays than the preceding plans. This will discourage consumption.

2.(a) Let  $X$  denote health costs.  $X = \$10,000$  with prob 0.7 and  $X = \$20,000$  with prob 0.3.

$$\mu = E[X] = \Pr[X=\$10,000] \times 10,000 + \Pr[X=\$20,000] \times \$20,000$$

$$= 0.7 \times \$10,000 + 0.3 \times \$20,000 = \$13,000.$$

$$\sigma^2 = V[X] = \Pr[X=\$10,000] \times (\$10,000 - \$13,000)^2 + \Pr[X=\$20,000] \times (\$20,000 - \$13,000)^2$$
$$= 0.7 \times (-\$3,000)^2 + 0.3 \times (\$7,000)^2 = \$21,000,000.$$

$$\sigma = S.D.[X] = (V[X])^{1/2} = (21,000,000)^{1/2} = \$4,582.$$

(b) A person is **risk-averse** if they prefer a certain outcome to a gamble that has expected outcome of the same value.

(c) If Arnold is risk-neutral or risk-averse, he will definitely purchase insurance that costs less than the actuarial free premium of \$13,000, the expected loss. For higher premia than \$13,000, such as \$14,000 given here, purchase will depend on just how risk-averse Arnold is.

3.(a) The expected value of  $\bar{X}$  is  $E[\bar{X}] = \mu = \$13,000$ .

$$\text{Standard deviation of } \bar{X} \text{ is } S.D.[\bar{X}] = \sigma / n^{1/2} = \$4,580 / 2,500^{1/2} = \$4,580 / 50 = \$92.$$

(b) 95% sure that average claims will be within  $1.96 \times \$92 = \$180$  of \$13,000.

So 95% sure that claims are in the interval (\$12,820, \$13,180).

(c) No. Not much risk. The 95% interval is reasonably tight around the expected average claim.

4.(a) The actuarially fair premium for this policy is the expected loss of \$10,000.

(b) The loading factor is  $100 \times (\$11,500 - \$10,000) / \$10,000 \% = 15\%$ .

(c) No. The loading factor also covers expenses other than reimbursements, such as administrative costs.

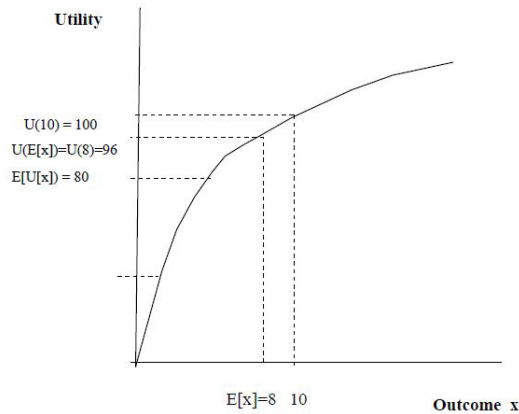
## Econ 132 – Ass 2 Solutions

5.(a) Expected utility  $E[U(x)] = 0.2 \times U(0) + 0.8 \times U(10) = 0.2 \times 0 + 0.8 \times 100 = 80$ .

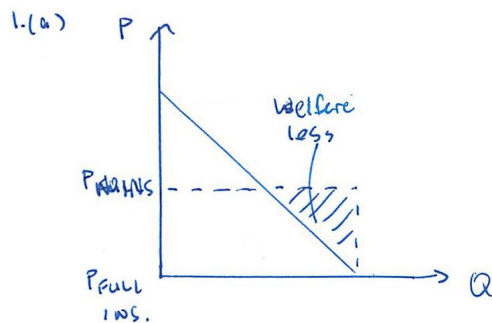
(b) See below for plot of Martin's utility as a function of income.

(c) The insurer's expected payout =  $0.8 \times 0$  (no payout) +  $0.2 \times 10$  (payout) = 2.

(d) Definitely buy the insurance as  $U(7) = 91$  exceeds  $E[U(x)] = 80$ .



6.



(b) No. Society need not be worse off

- There is welfare benefit of reduced exposure to risk
- Low income may now be able to see doctor
- Uninformed consumer may have seen doctors too little when paying full amount

$$7. \text{ Elasticity} = - \frac{(2400-3000) / [(2400 + 3000)/2]}{(25 - 0) / [(25+0)/2]} = \frac{600/2700}{25/12.5} = \frac{0.222}{2} = 0.111$$

8. See next page

Conclude that there is **no statistically significant** (at 5%) difference between outpatient spending across the plans.