ECO 316 – Problem Set 6

Due date: Sunday October 13th, 11 PM EST

Funding a new hospital

An urban community that has experienced high population growth decides it needs a new public hospital. To simplify, let's assume that the capacity of the hospital corresponds to the number of bedrooms available. The community may build a hospital with either 300 or 400 rooms but must fund the hospital with the revenue that the hospital generates. Building and operating a 300 rooms hospital costs $60M a year, while building and operating a 400 room hospital costs $80M a year.

Given current population demographics, it is estimated that the hospital would be serving 500 patients a week (for simplicity assume that each patient stays a week), 52 weeks a year. Given the number of bedrooms available, 2 patients may sometime have to share a room. Because it allows for better rest, patients prefer being alone in their room. A patient's willingness to pay to be alone is denoted by v. There is heterogeneity in the value v that people are willing to pay for being alone.

Patients in this community have high health-insurance coverage rates, and one can in fact assume that all hospital patients have insurance. It is estimated that net of the cost of medical supplies, the hospital makes on average $2500 of profit per patient every week.

(a) Compute the hospital's expected yearly revenue. How big a hospital could be financed with this revenue? What is the probability with which a given patient

is placed in a single room? In a room with an other patient?

Note: Take your time for this one.

The hospital cannot charge the patient for basic medical services and cannot refuse patients. As a result the price for being in a double-occupancy room is necessarily 0. However the hospital is allowed to charge patients for services not covered by their insurance, in particular, for the privilege of being in a single-occupancy room.

The hospital CEO wants to explore whether the community could fund a 400 bed hospital using a price discrimination scheme. For this purpose she runs a survey of a random sample of 500 individuals representative of the local community in which the respondents are asked

> Imagine you were placed in a double occupancy room (i.e. currently with a roommate) but were given the option to upgrade to a single occupancy room at a price p (for the entire week). What is the price p (in multiples of $100) at which you would be indifferent between remaining in the double occupancy room and having a room of your own.

Let us denote by p_i^* the price p at which respondent i is indifferent between having a roommate and being alone.

(b) Show that $p_i^* = v_i$, where v_i is the respondent's value for being alone.

Values v_i from the survey are reported in the spreadsheet hospitalFunding.csv. For convenience, in the rest of this document, we assume values are indexed in decreasing order, i.e. $v_i \geq v_{i+1}$. You'll have to **sort values yourself** in the spreadsheet.

Imagine that a hospital with 400 beds is built. The CEO wants to evaluate the consequences of setting aside X rooms for single occupancy. These deluxe rooms come at price p. Each incoming patient is being offered whether to go for a deluxe room at price p or a standard room (i.e. possibly shared) for free. A patient choosing a standard room would be randomly assigned with a neighbor or not, depending on availability of rooms. Insurance payments from patients are still $2500 regardless of whether they are placed in standard or

deluxe rooms. Assume that the price p of deluxe rooms adjusts so that the market for deluxe rooms clears (i.e. it is the highest price such that demand for deluxe rooms is equal to X).

(c)   What are the indices i of the patients who will choose to get the X deluxe rooms?

(d)   Given that X deluxe-rooms are used by single patients, how many standard rooms are available? Given that X of the 500 weekly patients go for the deluxe room, how many patients apply for a standard room? What is the probability $q(X)$ with which a patient going for a standard room is alone?
Note: again, take your time for this one.

(e)   Consider a patient with value for being alone v. What is his expected payoff from choosing to be in a standard room? What is his expected payoff from being in a deluxe room? At what price $p(X)$ does the market for deluxe rooms clear?

(f)   Compute the market price of deluxe rooms, and the hospital's total yearly revenue for $X = 50$, $X = 75$, $X = 100$, $X = 125$, $X = 150$, $X = 175$. What value X^* allows the hospital to fund 400 beds?

A group of concerned citizens is uneasy with the use of discriminatory practices and intends to oppose the plan to build a 400 bed hospital funded with a discriminatory scheme with $X = 175$ believing that it benefits people with high vs (say the rich) at the expense of people with low vs (say the poor). The CEO wants argue her case by showing that the scheme is in fact a Pareto improvement which gives a significant share of surplus to patients that choose standard rooms.

(g)   Consider a patient $i > X$. What is his expected payoff under the 300 beds hospital, no-discrimination scheme? Show that whenever $X \leq 250$ he must get a higher payoff.

Given the value X^* you found in in question (f), what is the patient's expected payoff under the 400 beds, X^* deluxe rooms scheme? Using the survey data,

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what is the total (summing over patients) weekly increase in surplus accruing to patients who pick standard rooms?

(h) Similarly, compute the total yearly increase in payoffs for patients who pick deluxe rooms.

(i) Is the price discrimination scheme a Pareto improvement? What share of the created surplus goes to the rich? To the poor?