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Reading Notes of Paying on the Margin for Medical Care

The current health insurance plan in America covers the full cost of both mastectomy and lumpectomy for breast cancer patients. The two treatments yield similar survival rate but lumpectomy is more expensive. Under the current plan, patients have no incentive to choose the cheaper treatment which result in welfare loss. The author proposed an alternative plan which covers the full cost of mastectomy but only fraction of lumpectomy. If a patient chooses lumpectomy, the new plan will cover up to the amount equal to the cost of mastectomy, the remaining costs are covered by the patients. In this paper, researchers examined how patients will react to the new policy. In particular, what percentage of the patients will switch from lumpectomy to mastectomy as a result of the new insurance policy and what is the welfare gain for the society? This reading notes is organized as follows: the second paragraph introduces the strategy that the author used to find a demand curve for lumpectomy, the third paragraph gives an overview of the datasets, the fourth paragraph introduces the empirical strategy and result of how the probability of choosing lumpectomy will change with different price, the fifth paragraph introduces the estimated result of how the patients will react to the new policy, the final paragraph shows the limitation of this study.

Mastectomy remove the whole cancerous breast, whereas lumpectomy removes only the tumor and keep the breast. Mastectomy is a one-time surgery, but lumpectomy includes one surgery and 25 radiation therapy spread over five weeks. The cost of initial surgery is similar between the two treatments, it is the following radiation therapy for lumpectomy that makes this treatment much more expensive. The insurance will cover the cost of mastectomy. If a patient chooses lumpectomy, the insurance will only cover the initial surgery cost, the following radiation cost will be paid by the patient. The primary motivation of this research is that the author wants to study how patients will respond to this policy change. They are trying to derive a possible demand curve for lumpectomy. However, both treatments are covered by the insurance under current plan, how should the researchers find the variation of cost between the two treatments? Researchers found that the distance between a patient's home to the nearest radiation center will affect a patient's cost of travel to receive radiation therapy. For patients who chose lumpectomy, they must go to the radiation center 25 times to receive the therapy. If a patient lives far away from the nearest radiation center, that will significantly increase her cost of travel and in turn, increase the total cost of treatment. In other word, for patients who choose lumpectomy, the cost of treatment will vary with the distance of her home to the nearest radiation center. Intuitively speaking, if a patient lives far away from the radiation center, we expect the probability of this patient chooses lumpectomy decreases. The author studied how the distance between patients' home to the nearest radiation center affect their probability of getting lumpectomy. Then, the author uses distance from a patients' home to the nearest radiation center as a proxy for the cost of lumpectomy and derive the demand curve for lumpectomy. Lastly, using the demand curve, the author explored how the patients will respond to the policy change. In particular, how many patients will give up lumpectomy and choose mastectomy? How much money can be saved from these changes in decisions? How much more social welfare will this policy generate?

The first dataset the author used is California patient level cancer registry data. This dataset has information of every cancer diagnosis since 1988. It includes information such as cancer type, stage of cancer, treatment information, exact address of patient at the time of diagnosis. The second dataset they used is radiation facility locations. The author computed the

distance of each breast cancer patient's home to the nearest radiation center. The final dataset includes 323612 breast cancer patients' information.

To estimate the demand curve for lumpectomy. The author use a binary choice model with treatment choice as dependent variable and distance from patient's home to nearest radiation center as independent variable. The dependent variable is a dummy variable with 1 associated with choosing lumpectomy and 0 associated with choosing mastectomy. The model is, $u = \alpha - \beta(\theta d + p)$ where u is the utility from treatments, α and β are preference parameters, d is the distance of patient to nearest radiation center, θ is opportunity cost of time, p is the radiation therapy price the patient need to pay under the new policy. Furthermore, the author normalizes the utility from mastectomy to zero. People choose lumpectomy if $u>0$, so $Pr(Lumpectomy) = Pr(u>0)$. However, based on the current policy, the patients do not need to pay for the increment price of lumpectomy, so they set $p=0$, combine β and θ, let $\beta' = \beta\theta$. The model became $u = \alpha - \beta' d$. This model shows how the probability of choosing lumpectomy will change with distance. There are five models with different variables being controlled. The first model has no control, the second one controls for demographics, the third one controls for census block characteristics, the fourth one controls for clinical characteristics and the last one has all controls and interacted with distance. The effect of travel time is statistically significant for all models. If the patient's house is 10 minutes further from the nearest radiation center, it will reduce her probability of choosing lumpectomy by 0.7 to 1.1 percentage points.

After the author estimated the effect of distance on treatment choice, they used these estimates to study how patients will respond to new policies. They used the current insurance plan, which is full coverage of both treatments, as benchmark. Under current plan, 57.9% of patients will choose lumpectomy. Next, they studied the effect of proposed insurance plan which requires those who choose lumpectomy to pay for the incremental cost. It is estimated that under the new plan, patient who chooses lumpectomy is expected to pay 10000 dollars for the radiation costs. The author estimated that 10000 dollars are equivalent to the cost of 8.7 hours of travel. They used the estimate from the binary choice model, the share of patients who choose lumpectomy will decrease by 33.5 to 43.8 percentage points. This will increase the welfare by about $2000 per patient.

There are several limitations of this study. Firstly, this study assumes that risk exposure to patients are the same among each policy. In the last section of the paper, the author found that with a high enough risk aversion, the level of social welfare under current full coverage plan could actually higher than the proposed plan. This is because the proposed plan gives patients greater risk exposure. Secondly, when looking at the value of the two treatments, they only focus on survival rate. There are other benefits associated with lumpectomy such as "body integrity". Future studies could incorporate these benefits into the analysis.