

# Healthcare I: Insurance Company Incentives

November 17, 2016

## 1 Discussion about Matt Desmond's talk at Cornell

- There has been a lot of bipartisan effort and understanding in DC about trying to address eviction problem.
- Extending vouchers to everyone below the poverty line would cost \$22 billion (without accounting for the lack of mental/physical health costs as a result); instead the funds are going to programs that help home owners.
- He did not talk about other policies or regulation; just about eviction and vouchers.
- Desmond is excited about working with computer scientists!

## 2 Background

- In order to make sure insurance companies don't discriminate against unhealthy patients, if the expected cost of insuring a patient is high, the government pays a subsidy to the insurer for that individual.

How does the government determine the subsidy?

- Option #1: Pay insurers a fixed subsidy for every individual patient.
  - Problem #1: Companies will target healthier patients, as they are reimbursed the same amount as an unhealthy patient, but it costs them less.
  - Option #2: Reimburse insurance companies at the end of the year for all excessive treatment costs the insurer paid.
  - Problem #2: Insurance companies are not incentivized to keep their treatment costs down, because they will get fully reimbursed independent of their costs.
  - Option #3: Reimburse the expected treatment costs per individual at the beginning of the year. (This incentivizes companies to keep costs down.)
  - Problem #3: Insurance companies target people who are poorly estimated, where the subsidy is likely to be larger than the actual costs for that patient. This is called "cream-skimming."
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### 3 Braverman and Chassang: Data-Driven Incentive Alignment in Capitation Schemes

Below is a high-level and simplified (removes some features/parameters) description of their model. The point is to understand the setup and high-level conclusions more than the detailed result.

- Focusing more on what Medicare looks like than the above model:
    - The government supplies insurance to the elderly if they want it. The elderly also have the option of using a voucher program: they can instead choose to be covered by a private provider, and the government pays a subsidy on their behalf to the private provider.
    - Insurance providers have different costs for various treatments. It may cost a certain provider less to treat a cancer patient than other providers, but more to treat a diabetes patient, making different providers better or worse at covering different kinds of patients (with respect to minimizing costs). Hence the government’s cost of covering a patient might be lower if they have one provider than another.
  - **The model:** There is a finite set of patient types. The type contains all information necessary to estimate the patient’s annual treatment cost, or rather, it maps to a distribution of costs. We assume that the type space is rich enough that patients with the same type really have exactly same distribution of costs. We also assume access to many samples from each type. In this paper, patients are not strategic agents, and types are completely observable.
  - The government can directly insure patients as the public provider, or patients may be covered by a private provider to whom the public provider pays a subsidy.
  - Based on the idea that the public provider has treated several patients in the past, there are 3 datasets:
    1. Completely public data, observed by public and private providers.
    2. Data observed by only the public provider (“holdout data”).
    3. Data observed by only the private provider.
  - We assume that the samples are rich enough that both public and private providers see every type and have samples too. This is why they have the same type space for patients.
  - The private provider sees some extra information about patients *after treating them*. This gives the private provider more features to use in deciding whether to cover patients, but the public provider does not get access to this information. more features they can use and public provider cannot).
  - The paper abstracts away from any specific assumptions about the type space.
  - The players are the public provider and the private providers.  
Private providers:
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- Decide: who to cover.
- Objective: maximize reimbursement from government – actual costs.

Public provider (before announcing reimbursement scheme):

- Decide: how to reimburse private providers.
- Objective: minimize total cost of patients.

Public provider (once the reimbursement scheme has been designed and announced):

- Decide: which holdout data to report and whether or not to manipulate it.
- Objective: minimize actual costs of covering everyone publicly – how much they paid the private providers.

- People insured by Medicare Advantage do not pay anything out of pocket.
- Reasons private providers might target (aim to cover) a certain type of patient:
  1. The private provider might be better at treating them, that is, it costs them less to treat this type than other providers. This is good.
  2. The patient isn't evaluated correctly. Hence, because the private provider can more accurately estimate the patient's costs than the government, they can profit if the subsidy is larger than the actual costs.

This is legitimate vs. illegitimate selection, respectively.

- Public providers are not minimizing their payment to private providers, just the overall cost of treatment.
- Straw-man proposal: The public provider publishes all of the data, including estimates for what it should cost to treat each patient. The private provider decide to cover a patient if their estimated cost by the private provider is lower than the government's published estimate.

This is not a good proposal for the two reasons above.

The private providers have strictly more data, and to earn profits, they will decide to cover people who it is actually most efficient for the government to cover.

- According to Mark Shepard, this is actually a major source of inefficiency in the system.
  - According to Dan, according to health economists at MIT: Medicare Advantage takes patients who are unobservably cheaper to cover.
  - Question: Are there other areas where this occurs too? Perhaps in transportation, or legal representation?
  - Proposed solution: The government has a holdout dataset that is unknown to the private providers. The public provider should reimburse the average of the holdout set, which they should reveal after the private provider has chosen who to cover. Then the private provider
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will a priori believe the subsidies to be the same as their estimated costs, so they will choose people.

Slight issue: The government may be strategic and lie about the holdout data.

Solution: The subsidy scheme uses an unbiased estimated based on the holdout data that the private provider doesn't know. The data that is already public to both providers is used to hold the government accountable. i.e. If the holdout data is very different than the public data, the government incurs a large cost for lying.

- It should seem like the government wants to correct for the private information that they don't know. The government should either illicit it or make it irrelevant.
- The government's only choice with respect to the holdout data is when to reveal it.
- Question: Why not reimburse up to cap of expected costs at the end of year?
- Question: Is it actually fair to assume that the data partitioning is random?

## 4 Hardt et al.: Strategic Classification

- Recommend reading at least the introduction and model section of the paper.
  - The main problem of this paper as related to healthcare is “upcoding” and “downcoding.” The idea is that hospitals and providers have some control over the data used to estimate costs.
  - Upcoding: It is in the private provider's interest to over-classify the diagnoses of their patients. Then the government will estimate higher treatment costs and pay higher subsidies to the private provider.
  - Downcoding: It may be in the government's interest to under diagnose; this makes the population seem healthier than otherwise.
  - There are start-ups that exist to perform an extremely thorough physical on patients in order to upcode for private providers.
  - In general: Sometimes the data being classified is actually strategic and has a stake in the outcome. There's a cost to changing it (either the potential to get caught, or the actual costs of manipulation). The classifier is announced before people pay to change their data. The goal is to design a classifier that is accurate even after people have the option to make changes.
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