Drug Search and Physician Hazard: An Investigation into Addict Behavior and Policy Remedies

Tate Mason*
University of Georgia
Athens, Georgia

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Abstract

Keywords:

*Tate.Mason@uga.edu

1 Introduction

1.1 Background and Motivation

Over the last few decades, prescription drug abuse has become a significant and growing public health concern across the globe. The misuse of prescription drugs, specifially opioids, benzodiazepines, and stimulants, has led to the question of how to mitigate the practice of physician search. Physician search refers to the practice of patients seeking multiple doctors in the hope of "scoring" a presription to continue their addiction. While there are preventative measures in place, like registries of offenders, the practice persists. Coninciding with this question, it would be of great use to ascertain the incentive for physicians to enable the misuse of drugs, gaining a repeat source of revenue.

This paper seeks to understand the interplay of addicts and physician search, in hope of policy remedies which are more effective than a list. Further, the analysis of prescriber responsibility is also of great importance. Being able to understand how morals and fiscal incentives contrast in this case could help to implement policy which negates the opportunity for prescribers to mis-prescribe a sensitive drug. Finally, this paper will look to gain an insight into potential rehabilitation remedies which may help take the onus off both addicts and physicians.

1.2 Problem Statement

To ascertain the interplay between physician and addict behavior, it would be of interest to model physician WTP, in a sense, with their reputation. That is, how much risk are physicians willing to onboard for the profits associated with increased and repeat prescriptions? This would be interesting for many reasons, since physicians have many reasons to uphold their standing from liability, licensure, and even word of mouth advertisement. The last one may be increased as addicts see a pathway to drug access, but that would also increase liabilty and risk of loss of their licensure.

For addicts, it is interesting to inquire about their search cost allocation, as well as habit based expenditure on health. Tolerance necessarily grows with prolonged use of drugs, thus modeling this sort of depletion of both search and health budgets is of interest to understand the impact on patients of finding a willing prescriber.prescriber

From these two avenues, I think there is a worthwhile question to answer. That is, what is the risk threshold physicians will take on in exchange for profit as well as understanding time and health costs applied to addicts once they find a willing prescriber.

1.3 Contributions

1.4 Paper Organization

2 Related Work

2.1 Previous Approaches

2.2 Limitations of Existing Work

3 Methodology

3.1 Theoretical Framework

Agents and Functions

There will be two classes of agents in this model, physicians and addicts.

$$\text{addicts} \in \mathcal{A} = \{a_1, a_2, \ldots, a_n\}$$
$$\text{physicians} \in \mathcal{M} = \{m_1, m_2, \ldots, m_m\}$$

The objective function of the addict is given by:

$$\max_p \sum_{t=1}^{T} \delta_i^t \gamma_i^t c_{it} x_i$$
$$\text{s.t.}$$
$$\gamma_i^t c_{it} x_i <= s_i$$
$$s_i = x_i vj + r_{it} x_i = \gamma_i^t \cdot y_i$$

Where δ_i^t is discount factor of addicts, γ_i^T is a tolerance parameter, indicating how deeply addicted the agent is, c_i is utility from prescription consumption, x_i, a willingness to pay parameter, s_i is a search cost comprised of v_j, a visit cost for each doctor normalized by the willingness to pay (relative price), and r_i a risk cost of being reported for the behavior. x_i is comprised of one's tolerance scaling their money to determine how much they're willing to pay for a chance at drugs.

The objective function of the prescriber is:

$$\max_x x_i \cdot v_j$$
$$\text{s.t.}$$
$$x_j \cdot v_i <= r_j i_j$$
$$v_i = r_j p_j$$

Where i_i is the cost of insurance for a physician and p_j is the amount of active prescriptions they have out. All other variables are defined above, with a subscript j to indicate physician specific parameters.

Comparative Statics and Counterfactuals

Understanding how willingness to pay and price of a visit affect the equilibrium would be of importance, as these would have a direct effect on the equilibrium matching. For a counterfactual, I am interested in modeling some sort of rehabilitation "punishment" for being caught searching. This would be of policy relevance due to the ongoing national drug epidemic.

Description of Environment and Equilibrium Behavior

Let me first define how the order of events occurs each period. First, physicians set price v_j, which can vary. Then, addicts will begin searching, meeting with one doctor per period with probability $a(\theta)$. After that, if they can secure an appointment, doctors will prescribe with probability $m(\theta) = \theta a(\theta)$. At the end, risk evolves, and if it is larger than a threshold yet to be determined, addicts and doctors will face a repercussion. I think punishments for addicts comprise of overdose or reporting, and thus they move to the illegal market. I am still working on this part, as overdose is risk of prescription and reporting is risk of search. In either case, they are removed. Doctors only face risk of removal when their license is seized as a result of frivalous prescribing. Then there is the state of the world in which risk is still under the threshold so nothing changes for either party.

Each addict can only be mapped to one doctor, but doctors will have a subset $G_j \subset \mathcal{A}$ which can be singleton and empty. γ_i in period 0 is chosen from a normal distribution, and thus determines an addict natural addiction proclivity. After period 0, it will grow deterministically with prescription consumption. I am still deciding what risk tolerance should be drawn from. It will grow unexpectedly, with the addict being unaware, of how much they need to satiate utility. Help here would be massively appreciated.

The basic search model will look something like:

$$V(c_i, \gamma_i, \theta) = \max_{c_i}\{u(a_{it}) + \sum\sum \Pi(\gamma_i^{t+1}|\gamma_i^t)\Psi(c_{i,t+1}|c_{i,t}, \gamma_i^t)\mathbb{E}[u(a_{i,t+1})]\}$$

It will evenutally include risk probability, but I am still working that out.

Equilibrium is achieved via all available matches being fulfilled and stability is present.

To-Do

Work out risk probabilities, work out distributions, incorporate any feedback.