Reducing opioid use by incentivizing inputs and outcomes

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Overview

The opioid epidemic is a central challenge for U.S. health care policy. Over the past decade, the annual number of drug-related deaths more than doubled in the U.S. (Swensen, 2015), with opioid abuse the primary cause. Offering incentive payments for abstinence and abstinence-promoting behaviors is a promising approach to combat the epidemic. A meta-analysis found that it is the intervention with the greatest effect size in treating substance use disorders (Dutra et al., 2008), and a cost-effectiveness analysis concluded that the benefits are roughly 20 times the normal program costs (WSIPP, 2017). However, incentive programs have not been scaled up widely to date. A key barrier is that, while the benefits are largely born by patients and taxpayers, there are logistical costs that must be born by clinics, which have prevented the programs from scaling up widely (Benishek et al., 2014).

This project conducts the first evaluation of a scalable incentive program delivered through a mobile application. The app, developed by our implementing partner Dynamicare Health, provides a “turnkey” solution that clinics can prescribe with minimal start-up costs. It enables remote monitoring of behavior; for example, drug tests can be administered in patients’ homes, as patients submit “selfie-videos” showing them taking saliva drug tests, which are then verified by trained remote staff. Treatment adherence can similarly be checked through GPS tracking for on-site methadone pharmacotherapy. The efficacy of this approach in reducing substance abuse has not been tested rigorously before. In addition, we will use our treatment as a source of exogenous variation in abstinence to produce some of the first causal evidence on the link between abstinence from opioids and employment and hospitalization outcomes. 

Our experiment will also address a broader question in the literature on incentive design: whether it is more effective to directly incentivize the outcome of interest (here: drug abstinence), or to incentivize behaviors that are inputs into production of the outcome. Theory suggests that the answer varies by context, but provides guidance for the key economic features that matter. Input incentives could be more effective if outcomes are noisy and patients are risk averse (Holmstrom and Milgrom, 1991), if patients are not sure how to achieve the desired outcome (Fryer, 2011), or if patients are myopic (Kaur et al., 2015). In contrast,  

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1Existing incentive programs involve manual, in-person measurement of behaviors, and prize or voucher purchase and delivery by clinic staff.

2Most existing evidence is correlational, linking opioid use with labor supply or absenteeism (Krueger, 2017; Birnbaum et al., 2011; Florence et al., 2016; Van Hasselt et al., 2015; Rice et al., 2014).
outcome incentives may be more effective if there are important non-contractable inputs that can raise “multi-tasking” concerns, or if there is variation across the population in the production function, making it more efficient to let each individual choose their appropriate input combination. We will test these theoretical predictions by conducting heterogeneity analysis.

**Experimental design**

We are conducting a randomized controlled trial (RCT) of incentives to encourage either abstinence or inputs to abstinence among 600 adults with opioid use disorders in New York. This sample size gives us power to test for small-to-moderate size differences between treatments such that even null results will be informative. Participants will be outpatients in treatment at facilities affiliated with our other partner, Mt. Sinai Health Systems. Incentivized behaviors will be monitored and rewarded through a mobile application developed by Dynamicare. We will measure outcomes using a combination of administrative data and surveys.

We will randomly divide the sample into 4 treatment groups. The study will include a twelve-week intervention period, during which each group receives different interventions, followed by a 6-month follow-up period, during which all groups receive identical treatment.

1. **Control group:** Receives outpatient “treatment-as-usual” from Mt. Sinai, consisting of pharmacotherapy and individual and group psychotherapy, based on the patient’s needs. Patients also receive weekly urine drug screens.

2. **Inputs group:** Receives incentives for behaviors that are inputs to abstaining from drug use through a mobile app, in addition to the same services and urine drug-test schedule as the Control group. The app prompts patients to complete inputs, including pharmacotherapy adherence, psychotherapy attendance, and online cognitive behavioral therapy modules. If they complete the inputs, patients receive immediate financial rewards through a restricted-use debit card which cannot be used for purchases such as alcohol.

3. **Outcomes group:** Receives incentives for abstaining from drug use, along with the same services and urine drug-test schedule as the Control group. The app prompts patients to submit saliva drug tests through their mobile phones on a random schedule. Patients receive immediate financial rewards if they submit drug-negative samples.

4. **Monitoring group:** Receives the same services and urine drug-test schedule as the Control group, but also registered for the mobile app, which prompts them to complete incentives pooled vs. control or monitoring, all of which are smaller than the effects of previous studies.

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3The sample size of 200 patients in each incentive group, and 100 each in control and monitoring is based on power calculations using Mt. Sinai data. Our minimum detectable effects (MDE’s) are 0.28 std.dev. or 1 extra week of abstinence in our 12-week intervention between the two incentive groups, and 0.31 std.dev. or 1.1 extra week between incentives pooled vs. control or monitoring, all of which are smaller than the effects of previous studies.
various inputs and outcomes to match the incentive groups. No financial rewards are given. This group gives us the first evidence disentangling what share of the impacts of incentives for substance-users reflect behavioral monitoring versus the incentive payments themselves.

Our primary outcome is abstinence, measured using administrative data on urine tests administered at the health clinics. To estimate the effect on hospital utilization and labor market outcomes, we hope to use administrative data on emergency hospitalizations, preventive health care use, controlled substance prescriptions, and Medicaid claims; and survey data on labor force participation, employment, and wages. Finally, to test theoretical predictions about the optimal choice of what to incentivize, we will gather detailed baseline data, including knowledge of the production function for abstinence, risk aversion, etc., and use these measures to perform heterogeneity analysis. For example, to test the prediction that outcomes work relatively better when outcomes are less noisy or patients are risk averse, we will test whether the relative impact of outcomes vs. inputs depends on agent-level risk aversion and perceived noise in the production function. As another example, to test whether the relative efficacy of outcomes is higher when agents understand the production function, we will test for heterogeneity based on baseline production function knowledge.
References


