

ESSAYS ON HEALTH ECONOMICS AND WELLBEING

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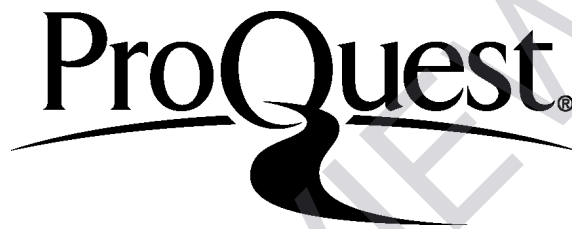
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PREVIEW

Abstract

The essays of this dissertation are concerned with different topics that affect individuals' health and wellbeing.

Chapter 1 analyzes the effect of a policy which reduced the frequency of prescription renewals from 30 to 90 days on patients' behavior and health outcomes. I find that stable hypertensive patients on the 90 day regime improved medication adherence, by reducing the number of days in which they were out of antihypertensive medication by 2.6 days (35%), and experienced no drawbacks in health outcomes. Patients appear to value being on this low-frequency regime, as they positively modified their adherence in order to remain on it. I also find evidence of positive spillovers in patients' adherence, as clinic congestion was reduced.

Chapter 2 studies the effects on human capital accumulation of the sharp increase in violence experienced in Mexico after 2006, known as "The War on Drugs". The upsurge in violence is expected to have direct effects on individuals' schooling decisions, but not indirect effects, as there was no severe destruction of infrastructure. This chapter finds evidence that there were no significant effects on human capital accumulation. My analysis shows that, at most, there are very small effects on total enrollment, and that they may be driven by some students migrating. These minimal effects on human capital accumulation today should have little to no adverse effects on long-term growth outcomes in Mexico. This chapter is coauthored with Francisco Pérez-Arce and Carlos Rodríguez-Castelán.

Chapter 3 analyzes the sensitivity of *self-reported* measures of subjective wellbeing to country-specific factors that affect the interpretation of questions and scales without affecting wellbeing itself. I find evidence that arbitrary differences in grading systems affect the distribution and mean of wellbeing measures. Since the choice of grading systems is unlikely to be correlated with variables affecting wellbeing, the chapter concludes that grading systems affect the *interpretation* of wellbeing scales—probably by providing different reference points that anchor individuals' responses. In particular, I find that countries with a

higher threshold for passing grades tend to report higher levels of happiness. This chapter is coauthored with Jorge Álvarez.

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To my father, in loving memory,

To my mother, with gratitude,

✂

To Felix, for the chapters to come

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Chapter 1

When Less is More: Can Reduced Health Monitoring Improve Medication Adherence?

1.1 Introduction

An active area of health policy focuses on allocating scarce medical resources as efficiently as possible. Much debate has revolved around some prominent policies that seek to reallocate inputs for the production of health, such as reducing the frequency of certain procedures (i.e., consider the ongoing debate about the recommended frequency of mammograms) or allowing nurse practitioners to prescribe controlled medications. The value of these policies lies in the extent to which they can reduce the costs of providing healthcare, while not generating additional costs in terms of patients' health or general wellbeing.

These types of policies are particularly relevant for developing countries, where resources for providing healthcare are limited and health costs are increasing. As countries develop, the burden of life-long chronic conditions increases. During this epidemiological transition, the prevalence of non-communicable chronic diseases increases relative to that of communicable

diseases. Low- and middle-income countries face new challenges for providing healthcare, and for allocating scarce medical resources as efficiently as possible.

Chronic conditions require constant health monitoring. However, there exists a trade-off in deciding the frequency with which this must be done. Frequent monitoring by healthcare providers may be favorable for managing chronic conditions, but it is costly in terms of resources such as clinic space and physician time. The costs of high monitoring may outweigh the benefits in certain stances.

To shed light on this trade-off, I study a recent Mexican policy that reduced the frequency of monitoring for stable hypertensive patients—patients with high blood pressure. It intended to eliminate arguably unnecessary appointments for patients whose condition was under control. This was done by allowing physicians to issue multiple refillable prescriptions, thus reducing the number of appointments necessary from one every month to one every three months.

The original motivation for the policy was to liberate resources for the provision of healthcare and reduce crowding in clinics. However, reducing the number of appointments could have either negative or positive effects on the affected patients. The reduction in care could make it more difficult for some patients to manage their condition. But the policy also lowered transaction costs of accessing treatment, which could help improve medication adherence. Moreover, if patients value the convenience of having to meet a doctor less frequently, it gave patients an incentive to improve adherence in order to remain on the low-frequency regime, and reduce the transactions costs associated with accessing medical care. In this sense, reducing hypertension monitoring could have *unintended benefits* with respect to medication adherence.

Finally, clinic congestion is reduced as the frequency of monitoring for stable patients declines. This could lead to positive spillovers for patients who were not directly affected by the policy (i.e., whose health monitoring frequency remained unchanged). I explore whether

medication adherence for patients that did not receive automatic-refill prescriptions improved as clinics became less crowded.

While the lessons learned from the IMSS reform—that reducing health monitoring might positively affect patients’ health behaviors and that some patients view this as a benefit for which they would actually improve the management of their disease in order to retain it—may apply to different dimensions of patient behavior, medication adherence is of interest in its own right.

Medication adherence is defined as patients’ conformance with their provider’s recommendations of timing, dosage, and frequency of medication-taking. Improving medication adherence could have substantial health benefits, in addition to important reductions in the costs associated with hypertension and other chronic conditions which require life-long therapeutic treatment. The costs associated with medication non-adherence—which include poor health outcomes and increased health care costs—are larger as the burden of chronic diseases increases (WHO (2003)).

While there has been increasing interest in medication adherence in developed countries—where the prevalence of chronic conditions has been historically higher—, relatively few studies (such as Case, Le Roux and Menendez (2004) and Tarozzi et al. (2009)) have addressed the phenomenon of medication non-adherence in the context of developing and middle-income countries. Understanding medication non-adherence in this context particularly relevant for middle-income countries, such as Mexico, which have experienced epidemiological transition towards chronic-degenerative diseases in recent years. From a global perspective, low- and middle-income countries that experience an increase in chronic non-communicable diseases such as hypertension or diabetes, or where where other chronic lifelong communicable diseases—namely HIV/AIDS—has high prevalence could benefit from implementing policies to promote better medication adherence, as these have been found to be cost-effective, at least in the context of developed countries (Roebuck et al. (2011), Sokol et al. (2005)).

I find that reducing the frequency of health monitoring significantly improves medication adherence. Receiving a prescription that covers treatment for 90 days (as opposed to 30) reduces the number of days a patient is out of medication by 2.6 days, a reduction of 35% with respect to the number of days patients were—on average—out of medication before the beginning of the program. The magnitude of the effect compares favorably to other interventions aimed directly at improving medication adherence. A meta-analysis of interventions to improve medication adherence in the US finds increases in adherence of only between 4 and 11% (Peterson, Takiya and Finley (2003)).

As further evidence of the role of transaction costs, I show that patients treated at the most congested clinics show a larger effect of the policy on their prescription filling behavior. Additionally, I observe positive spillovers in all patients' adherence from the general reduction in transaction costs of filling prescriptions as clinics' congestion falls. I also find evidence that patients value being on the low-frequency regime, as they improve adherence not only in response to the reduction in transaction costs when they may receive automatic-refill prescriptions, but also in order to remain on the 90-day regime.

My results show that the policy has had a positive effect on clinic congestion, as originally intended. Additionally, patients that experience a reduction in health monitoring remain stable, and their diseases appears to remain under control. Patients' current health as measured by blood pressure does not increase. It may additionally be argued that the improvements in medication adherence will result in improved long-term health outcomes.

My research uses a specific change in policy with particular eligibility criteria which provides a clean identification strategy. I use the *Receta Resurtible* program, implemented by the Mexican Social Security Institute, IMSS (the largest social security institution in Latin America, covering around half of the Mexican population), to study the effect of prescription duration on medication adherence. In particular, drug prescriptions for patients suffering from certain chronic conditions went from covering 30 days of treatment to covering 90 days. Patients in the new regime receive three “automatic-refill” prescriptions (each covering 30

days of treatment), where one is filled at the time of the doctor's appointment, and two may be refilled in the following months without having to see a physician again.

High quality administrative longitudinal data for low- and middle-income countries is rare. My research uses a novel administrative database from IMSS set up in a panel structure on patients' prescription fillings. It covers a large segment of the population as it includes the universe of hypertensive patients receiving treatment from this institution (over 4 million patients), the single largest public healthcare provider in Mexico. I directly observe every prescription filling at IMSS pharmacies.

For my empirical strategy, I use econometric models with patient fixed effects in order to assess the effect of reducing health monitoring on a variety of patient level outcomes. I additionally exploit the variation in the timing of clinics' adoption of the policy to control for potential endogeneity issues at the patient level. This also allows me to analyze whether there have been spillovers at the clinic level from reduced congestion.

My paper contributes to the literature by being one of the few which analyzes medication adherence in the context of less developed countries. It benefits from using high quality administrative panel data, covering the prescription filling history of over four million patients. I am able to exploit a specific change in policy which gives me a clean identification strategy. Additionally, given the unique policy design, I am able to explore whether patients improve adherence because of a decrease in transaction costs of accessing treatment or because of increased patient effort in order to remain on the low-cost regime (or both).

My paper speaks to the literature on the determinants of non-adherence. Although no consensus exists regarding how to improve patients' adherence, some strategies such as cost reduction (Atella et al. (2006)), health education interventions (Morisky et al. (1983), Lee, Grace and Taylor (2006)), and patient reminders (Smith et al. (2008), Piette, Weinberger and McPhee (2000)) appear to be the most effective. Improving patients' knowledge of the disease and medications, as well as of the long-term risks of hypertension appear to be key for improving adherence (Gwadry-Sridhar et al. (2013)). Volpp et al. (2008) found

a daily lottery-based financial incentive to be a useful tool to improve adherence. All of the above mentioned studies were conducted in developed countries—with the exception of Atella et al. (2006) which looks at the case of Italy, and Gwadry-Sridhar et al. (2013) (which is a systematic review of the literature), all studies focus on the United States.

Reducing the cost of medications appears to have a significant effect on patient compliance, whether this reduction is monetary or nonmonetary. Changes in the co-payment structure appear to have a strong effect on the average compliance of previously low compliant patients (Atella et al. (2006)). Nonmonetary factors measured as travel time are also found to play an important role in determining the demand for medical care (Acton (1975)).

The rest of the paper is organized as follows. Section 1.2 presents some background information on the Mexican healthcare system and IMSS, and the *Receta Resurtible* program. Section 1.3 presents a theoretical model about transaction costs and adherence which yields some predictions which I will later test in the data. Section 1.4 describes the novel data that I use and presents some summary statistics. Section 1.5 discusses my empirical strategy, and Section 1.6 presents my main findings regarding the effects of reduced monitoring on medication adherence, health outcomes, clinic congestion, and the existence of positive spillovers, as well as some robustness checks. Section 1.7 concludes.

1.2 Background

1.2.1 Hypertension

This paper takes a disease specific approach, focusing on chronic hypertension for a series of reasons: (i) good medication adherence has the potential to improve health outcomes for chronic diseases; (ii) hypertensive patients are easily identifiable from their prescription fillings; (iii) health measures relevant to hypertensive patients are consistently and systematically measured; and (iv) it is highly relevant within the Mexican health context.

Hypertension is a chronic medical condition where the blood pressure in the arteries is elevated, putting strain on the heart. Uncontrolled high blood pressure can lead to heart attacks, strokes, aneurysms, and is associated with a shortened life expectancy. Hypertension is a chronic disease which generally implies life-long therapy.

In recent years, Mexico has experienced an important increase in the share of deaths occurring from non-communicable, chronic conditions, which currently represent the most serious public health issues in the country. In 2011, diabetes mellitus, cerebrovascular diseases (i.e., strokes), and hypertensive diseases—all non-communicable diseases—accounted for 29.2% of total deaths (IMSS (2012)).¹ Approximately one out of every three Mexicans over 20 in Mexico is hypertensive (ENSANUT (2012)).

Antihypertensive drugs have been found to have a major impact on health, and to be an extremely effective and highly cost-efficient treatment. Cutler et al. (2007) estimate that antihypertensive medication has a benefit-to-cost ratio of 6:1 (women) to 10:1 (men), for example. Additionally, the treatment for hypertensive patients is well defined and effective.² Non-adherence to cardioprotective medications (β -blockers, statins, and/or angiotensin-converting enzyme inhibitors) was associated with a 10% to 40% relative increase in risk of cardiovascular hospitalizations and a 50% to 80% relative increase in risk of mortality (Ho, Bryson and Rumsfeld (2009)).

Costs associated with hypertensive diseases have been estimated to account for at least 14% of the total health budget in Mexico (Villarreal-Ríos et al. (2002)).³ Additionally, there exists no consensus regarding the optimal frequency of health monitoring for hypertension (Guthmann et al. (2005)).

¹In contrast, in 1976, these same conditions accounted to less than 11% of total deaths. Communicable diseases such as pneumonia, perinatal health problems, and intestinal infectious diseases accounted for around 36.5% of total deaths in 1976, while they represented less than 8% of total deaths by 2011.

²It mainly consists of administering β -blockers, angiotensin-converting enzyme (ACE) inhibitors, or diuretics.

³In the United States hypertension affects 43-50 million adults. About 50% of those who have been diagnosed are treated, and only 51% of the treated population adheres to the prescribed treatment. Low adherence has been identified as the primary cause of unsatisfactory blood pressure control, and only 30% of those treated achieved the expected blood pressure (WHO (2003)).

1.2.2 IMSS and the *Receta Resurtible* Program

IMSS is one of the largest government institutions in Mexico and the main provider of public health services. It has a mandatory coverage of all private-sector employees, broadly corresponding to individuals in formal jobs and their families.⁴ Medical benefits from IMSS are available to approximately 58 million Mexicans (IMSS (2012)).

As a public health provider, IMSS delivers a number of medical services. Services are provided to formal workers (insured individuals) and other beneficiaries (family members also covered by IMSS) free of charge.⁵ Medical prescriptions are issued by attending physicians and are then filled at IMSS pharmacies free of charge.⁶

Most outpatients receive medical care in Family Medicine Units (*Unidades de Medicina Familiar*, UMF), which represent the most basic level of care provided by IMSS. These are often referred to as primary care centers, and there are 1,118 UMF's across the country. Finally, IMSS administers 1,347 pharmacies nationwide where drug prescriptions issued by IMSS may be filled free of charge by patients.⁷ Availability of medications at IMSS compares favorably to that of other public healthcare providers in the country, as 86% of patients reported to have completely filled their prescription at the place where they received outpatient care (ENSANUT (2012)).

Although almost 80% of patients describe the healthcare services provided by IMSS as 'good' or 'very good', waiting times are often cited as a problem. In particular, attending a doctor's appointment may be a time consuming activity, as the mean waiting time for outpatient care at IMSS is 75 minutes, a high number relative to other public and private healthcare providers in Mexico (ENSANUT (2012)).

⁴The other main public health provider in Mexico is *Seguro Popular*, which provides healthcare to individuals not covered by IMSS, thus providing access to health services to individuals working in informal sectors of the economy.

⁵Benefits include general healthcare, maternity, and specialist care, surgery, hospitalization or care in a convalescent home, medicine, laboratory services, and dental care.

⁶IMSS doctors are salaried workers who earn a monthly wage, and receive no additional benefits depending on the number of patients they receive or their health outcomes, or on the type of treatment prescribed.

⁷All pharmacies are located at an IMSS healthcare unit. A pharmacy can be found at every UMF.