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CHECK UP BEFORE YOU CHECK OUT:
RETAIL CLINICS AND EMERGENCY ROOM USE

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ABSTRACT

Retail clinics are an innovation that has the potential to improve competition in health care markets. We use the universe of emergency room (ER) visits in New Jersey from 2006-2014 to examine the impact of retail clinics on ER usage. We find significant effects of retail clinics on ER visits for both minor and preventable conditions; Residents residing close to an open clinic are 4.1-12.3 percent less likely to use an ER for these conditions. Our estimates suggest annual cost savings from reduced ER usage of over $70 million if retail clinics were made readily available across New Jersey.

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1. Introduction

The U.S. health care market is often viewed as a market in which competition does not work well: it is increasingly concentrated (Gaynor and Townsend, 2011); prices are not transparent; and many studies highlight imperfections and asymmetries in the information available to providers, patients, and insurers. These shortcomings are thought to entail large efficiency and welfare losses both from unnecessary procedures and delayed interventions, such as costly emergency room (ER) visits, that could have been avoided with proper preventive care. This state of affairs makes it especially interesting to consider an innovation that has the potential to increase competition in some health care markets: The development of the retail clinic.[1]

Retail clinics first appeared in 2000 and have since grown rapidly, with over 2,000 clinics operating in 41 states and Washington D.C. in 2015 (National Conference of State Legislatures, http://www.ncsl.org/research/health/retail-health-clinics-state-legislation-and-laws.aspx). Retail clinics are generally located within retail stores, such as pharmacies or "big-box" outlets like Wal-Mart. They tend to be staffed by nurse practitioners or physician assistants and offer a limited range of services. They are typically open seven days a week, have extended hours in the evenings, and do not require appointments. Prices may be a quarter to a third less expensive than the price a doctor would charge for the same services (Mehrotra et al., 2009; Tu and Cohen, 2008, Thygeson et al., 2008) and are usually posted online.

[1] Policy makers have long advocated for increased competition in health care markets while at the same time warning that competition is not a panacea. For example, a joint commission of the Federal Trade Commission (FTC) and the Department of Justice (DOJ) stated that "Competition cannot provide its full benefits to consumers without good information and properly aligned incentives. Moreover, competition cannot eliminate the inherent uncertainties in health care, or the informational asymmetries among consumers, providers, and payers. Competition also will not shift resources to those who do not have them" (FTC and DOJ, 2004). Nevertheless, the committee recommended adopting measures to increase competition including increasing transparency in pricing and lowering barriers to entry into primary care for allied health professions (e.g. nurse practitioners). Retail clinics can be seen as responding to both of these recommendations.

Thus, retail clinics compete with doctors' offices for basic primary care services by offering lower and more transparent prices, shorter waiting times, and convenience (Ahmed and Fincham, 2010; Wang et al., 2010). Lowering the monetary and time costs of care might result in higher consumption of primary care and subsequent improvements in health. Retail clinics may also divert some patients from ERs, particularly for relatively minor conditions that arise outside of normal office hours when doctors' offices are typically closed, resulting in cost savings. On the other hand, retail clinics might sell unnecessary services or products (AMA, 2007), provide lower quality, or disrupt continuity of care (American Academy of Pediatrics, American Academy of Family Physicians), leading to higher costs and worse health outcomes.

In this paper, we use the universe of ER visits in New Jersey between 2006 and 2014 to examine the impact of retail clinics on ER use. We consider three classes of conditions: (1) conditions that frequently result in ER visits but which could have been prevented by adequate primary care; (2) relatively minor conditions which could nevertheless lead to an ER visit in the absence of an open or convenient doctor's office or retail clinic; and (3) a control group of conditions that are normally only treated in the ER and cannot be prevented by improved primary care. Severe yet preventable conditions include ER visits for influenza and complications of diabetes; relatively minor conditions include sprains and strains, urinary tract infections, conjunctivitis, upper respiratory tract infections, ear infections, and sore throat; and placebo conditions include fractures, poisonings, and childbirth.

In order to identify the effects of retail clinics on ER usage, we use a difference-in-difference framework. In particular, we compare ER visits among residents living 0 to 2 miles from any site where a clinic ever operated ("near"), to those among residents who live 2 to 5 miles from such a site ("far"), when the clinic is operating and when it is not.[2] Our identifying assumptions are therefore that those who live closest to a clinic are most likely to use it, and that ER visits would have shown similar trends in both distance bands in the absence of the opening and/or closing of a retail clinic. To absorb any time-invariant differences across neighborhoods, all of our specifications include a fixed effect for each retail clinic location. Finally, as there are both openings and closings of retail clinics, we are able to exploit rich identifying variation.

We find that residents who live close to an open clinic are 12.3 percent less likely to go to the ER for influenza and 4.1 percent less likely to use the ER for complications of diabetes. They are also between 4.7 and 11.4 percent less likely to go to the ER for relatively common, minor conditions. As predicted, retail clinics do not have any statistically significant effect on ER visits for fractures, poisonings, or childbirths.

Our estimates suggest annual cost savings from reducing ER visits of $817,492 per 100,000 people. Scaled to the population of New Jersey in 2010 (8,791,894), these estimates suggest potential savings of over $70 million annually. The bulk of these savings come from reductions in visits for the two preventable conditions we consider: influenza and diabetes. While it is unclear whether cost savings from reduced ER visits completely offset cost increases from additional visits to retail clinics, over 700,000 annual visits to retail clinics in New Jersey costing $100/visit would be required to offset the estimated savings from reduced ER usage alone. Furthermore, to the extent that preventing sickness is socially beneficial, even when illness does not result in interaction with the healthcare system, the fact that retail clinics reduce the burden of preventable diseases may swing the balance of welfare calculations in favor of regulatory changes that promote competition from retail clinics.

Two previous studies have examined the effects of retail clinics on the utilization of

[2] Results are robust to using 0 to 1 vs. 1 to 3 mile bands.

medical care. Sussman et al. (2013) use claims for CVS Caremark employees and their dependents and find that individuals using a retail clinic have fewer ER visits and lower expenses from physician visits and inpatient hospital care than patients not using retail clinics. Ashwood et al. (2016) use claims data for patients with insurance coverage from Aetna and find that while some patients switch from doctors' offices and ERs to retail clinics for the treatment of relatively minor conditions, retail clinic patients have a higher overall number of visits for these conditions. They argue that the costs of these new visits outweigh the savings generated by patients who switch to retail clinics from more expensive providers for treatment of minor conditions.

Our paper builds on this previous work in four ways. First, we consider the universe of patients who ever use an ER rather than a subset of patients who are covered by a particular insurance. This feature of our data ensures that we capture all of the changes in ER utilization that occur as a result of retail clinic operation. Second, we consider ER visits for an immunization preventable disease (influenza), a prevalent chronic condition (diabetes), low acuity conditions, as well as a range of placebo conditions that are not treated in retail clinics and should therefore be unaffected.[3] This allows us to obtain a more complete picture of the impact of retail clinics on ER usage than previous work. Third, given the length of our panel, we are able to exploit both openings and closings of retail clinics. This rich variation allows us to distinguish the effects of retail clinics from underlying trends in ER use. Finally, our difference-in-difference framework does not require us to match patients on observables. Our estimates are therefore not subject to the selection biases that result when matching does not perfectly control for differences between those who use retail clinics and those who do not.

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[3] Ashwood et al. (2016) note that it may be important to consider conditions that can be prevented through adequate primary care rather than only treatment for minor illnesses.

This paper proceeds as follows. In Section 2, we provide background on retail clinics and discuss the categories of conditions that we consider. Section 3 introduces a conceptual framework that highlights the predicted impacts of retail clinic expansion on ER visits for preventable and non-preventable conditions of different severities. We discuss the datasets used in our analysis in Section 4. Section 5 outlines our empirical specification, and results are provided in Section 6. Section 7 discusses and concludes.

2. Background

Retail clinics are themselves highly concentrated among just a few retailers: CVS MinuteClinics and Walgreens Healthcare Clinics make up 75 percent of the market nationwide (market shares of 50 and 25 percent, respectively) with Kroger, Wal-Mart, and Target accounting for most of the rest (NCSL, 2016).[4] In recent years, Wal-Mart and Target have begun to exit the retail clinic business; at the end of 2015, CVS acquired all of Target's pharmacies and in-store clinics for $1.9 billion. In New Jersey, ShopRite closed all six of its locations between 2008 and 2012, while CVS opened at least two new stores in every year between 2011 and 2014.

Retail clinics are primarily staffed by nurse practitioners (NPs).[5] Under New Jersey’s scope of practice laws, NPs must be supervised by a doctor both to practice and to prescribe medication. However, the supervising doctor is not required to be on site. In practice, NPs adhere to a manualized practice handbook outlining protocols and refer to their supervising physician when a situation requires further guidance.

Prices charged by retail clinics are on average between 0.25-0.33 less expensive than the prices charged by physicians’ offices for the same services (Mehrotra et al., 2009; Tu and Cohen,

[4] CVS owns and operates all of its clinics while Walgreens outsources clinics to health care groups.
[5] NPs are advanced practice nurses who have obtained either a masters degree or PhD in nursing.

2008). These cost savings are likely salient to consumers as retail clinics are used primarily by younger adults and families who are more likely to be uninsured and to pay out of pocket than those using other health care providers (ICPSR, 2010). However, most visits are still covered by insurance, with about 70 percent of retail clinic customers being insured (compared to 90 percent for patients visiting primary care physicians). Most private insurers reimburse retail clinics, although some of New Jersey's Medicaid plans do not.

Despite lower and more transparent prices, patients cite convenience (i.e. time costs) as the main reason for using retail clinics (Weinick et al., 2010). Almost all New Jersey retail clinics are open on weekends and weekday evenings, and every retail clinic in New Jersey has a pharmacy on site (see Table 1). Patients are generally seen on a first come, first served basis, although some clinics allow patients to make an appointment or "get in line" online before arriving at the clinic.

Retail clinics are very transparent about the types of medical care they can and cannot provide. Services include treating minor illnesses such as urinary tract infections, ear infections, conjunctivitis, and sore throat (see http://www.cvs.com/minuteclinic/services/minor-illnesses/N-d8Z3a3jkZd5); minor injuries such as sprains and strains; immunizations including influenza; and health screenings such as diabetic glucose screenings. Retail clinics do not have imaging equipment or intravenous drips and are not equipped to handle fractures, childbirth, or life threatening emergencies such as poisonings.

In what follows, we examine the impact of retail clinics on ER visits for three sets of conditions: (1) emergent, preventable; (2) primary care treatable; and (3) emergent, not preventable. An overview of these condition categories and how their treatment relates to the services provided by retail clinics is outlined below.

Emergent, Preventable Conditions

The first group of conditions that we consider includes ER visits for influenza and complications of diabetes. We refer to this group as "emergent, preventable" since these conditions can be prevented with adequate primary care but often result in ER visits once they develop.

While visits for influenza represent a relatively small fraction of ER visits in New Jersey (0.21 percent; see Table 2), they are particularly important from a public health perspective. For each person whose influenza is sufficiently severe to be treated at a hospital, there are many more cases that result in visits to doctors' offices and an even larger number of cases that did not result in contact with health care providers but may have caused days missed from work or school.[6] Moreover, there is a non-trivial risk of death from influenza. According to the Centers for Disease Control (CDC), annual U.S. deaths related to influenza ranged from 12,000 to 56,000 between 2010 and 2014 (https://www.cdc.gov/flu/about/disease/us_flu-related_deaths.htm).

Retail clinics are particularly well placed to increase influenza vaccination rates and in turn to decrease the severity of seasonal outbreaks. One of the most common reasons adults give for foregoing the vaccine is that they forgot or "didn't get around to it" (Harris et al., 2010). When adults do get immunized, they receive the vaccination from many different sources, suggesting that convenience plays an important role.[7] Located within high foot traffic stores, retail clinics are convenient and advertise to remind their shoppers to get a flu shot. According to one large retailer, over half of those immunized did not intend to get a flu shot when they entered the store (Sifferlin, 2013). Anecdotal evidence further suggests that NPs routinely offer flu shots

[6] It is estimated that for every flu hospitalization there are approximately 5.6 ER visits, 66 cases which sought medical care, and around 149 cases total (Kostova et al., 2013; Uscher-Pines and Elixhauser, 2013).

[7] According to the CDC (2012), while most children receive flu shots at doctors' offices or health centers (65 percent and 19 percent, respectively), more adults get vaccinated at pharmacies, stores, and workplaces than at a doctor's office.

to retail clinic patients at the end of each visit. According to Uscher-Pines et al. (2012), vaccines were administered in 40 percent of visits to retail clinics from 2007 to 2009, with 95 percent of the vaccinations being for influenza.[8]

In addition to offering immunizations, retail clinics are increasingly advertising that they can provide monitoring for common chronic conditions, such as diabetes. Unlike influenza, complications of diabetes make up a large share of ER visits. In New Jersey, 8.74 percent of ER visits had diabetes listed as either a primary or secondary diagnosis (see Table 2). If properly managed, diabetes should not result in ER visits, and thus a reduction in ER visits for diabetes represents evidence of an improvement in primary care.

According to the U.S. National Library of Medicine's Medline Plus (https://medlineplus.gov/ency/patientinstructions/000082.htm), recommended care for diabetics includes two to three visits per year to monitor blood pressure, weight, and blood glucose levels (using A1C tests) and to check for any infections or loss of feeling in the feet. Diabetics must also monitor cholesterol and check for protein in the urine. The necessity for frequent visits for routine monitoring, combined with the many supplies (insulin, other drugs such as metformin, needles, testing strips) that must be purchased from pharmacies, make diabetics a natural market for retail clinics.

Primary Care Treatable Conditions

The second set of conditions that we consider includes the following minor conditions: urinary tract infection, conjunctivitis, upper respiratory tract infections, sore throat, ear infection, and sprains and strains. We chose these six categories because they together account for the

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[8] 55 percent of the vaccinations were administered to adults aged 18 to 64. Patients who visit retail clinics specifically to receive influenza vaccinations are older and less likely to be black or Hispanic relative to the retail clinic patient population as a whole (Lee et al., 2009). This pattern likely reflects national differences in vaccination rates between racial and ethnic groups: vaccination rates for non-Hispanic whites are much higher than for blacks or Hispanics.

largest share of ER visits among minor illnesses and injuries (12.36% of ER visits in New Jersey over our sample period; see Table 2) and are all explicitly listed online as treated at CVS MinuteClinics (the majority of retail clinics in New Jersey; see Table 1).

Emergent, Non-Preventable Conditions

The third set of conditions that we examine are placebo conditions that retail clinics do not treat and are not likely to be prevented by routine preventive care: fractures, childbirth, and poisonings. On their list of services, CVS MinuteClinics specifically tell patients with suspected poisonings not to seek care at their clinics. Furthermore, conversations with NPs at CVS MinuteClinics in New Jersey suggest that practitioners immediately send patients who arrive with a suspected broken bone to the ER. Finally, while retail clinics do provide limited family planning services, it is unlikely that retail clinics affect aggregate fertility patterns.[9] We therefore do not expect retail clinics to have any impact on the use of ERs for these services.

3. Conceptual Framework

In this section, we consider where patients choose to receive care. This decision depends on both the availability of different treatment options (ER, doctor's office, retail clinic) and the severity of the patient's condition. We start by assuming that there are no retail clinics, and ask how the availability of a primary care doctor influences ER usage. We then introduce retail clinics to ask how ER usage is affected by the presence of this new treatment option, both when a primary care doctor is available and when a primary care doctor is unavailable.

All of the intuition presented below can be displayed graphically using value functions that depict the net benefit of care (benefit - cost) as a function of the patient's severity. In

[9] While a short-term prescription for birth control can be obtained at a retail clinic, retail clinics are not intended to be a regular source of care for reproductive health. Anecdotal evidence suggests that NPs in New Jersey advise patients to follow up with an OB-GYN whenever a prescription for birth control is administered.

drawing these curves, we make three sets of assumptions. First, we assume that the value of treatment is weakly increasing in the severity of the patient's condition. Second, as there are bounds on both the costs and benefits of treatment, we assume that the value function is either concave or S-shaped.[10] Finally, we assume that retail clinics are the most valuable treatment option for patients with low-severity conditions, doctors' offices are the most valuable treatment option for patients with mid-severity conditions, and ERs are the most valuable treatment option for patients with high-severity conditions.[11]

Without retail clinics

In the absence of retail clinics, ER usage is determined by both the availability and the relative costs and benefits of receiving emergency versus primary care. When a primary care doctor is not available, either because it is after hours or because appointments are limited, patients will go to the ER only if the value of receiving emergency care is greater than zero.[12] Since the value of receiving care is weakly increasing in the severity of the patient's condition, only patients with severities exceeding some threshold will find it beneficial to go to an ER. This result is displayed graphically in Figure 1: When neither a retail clinic nor a primary care doctor is available, only patients with severities exceeding d will go to the ER (case 1).

When a primary care doctor is available but there is no retail clinic (case 2 in Figure 1), two things change: (1) more patients receive care and (2) fewer patients go to the ER. More

[10] As drawn below, we assume that there is an inflection point in the value function for care received in either an ER or a doctor's office: while the marginal value of treatment is increasing at an increasing rate from low-severity to mid-severity conditions, the marginal value of treatment is increasing at a decreasing rate from mid-severity to high-severity conditions.

[11] These relative values derive from underlying assumptions about the relative costs and benefits of receiving care in each location. In terms of costs, evidence suggests that retail clinics are the lowest cost option, either because of direct monetary costs or time costs, whereas ERs are the most expensive option. In terms of benefits, since retail clinics only treat low-severity conditions, the benefits of receiving treatment for more severe conditions are greater at doctors' offices and ERs. Finally, since many high-severity conditions require emergency care, ERs are the most beneficial option for high-severity conditions.

[12] Recent work by Bruni et al. (2016) in Italy suggests that extending hours of primary care availability alone can generate significant reductions in the use of the ER.

patients receive care because it is beneficial for patients with relatively low-severity conditions to receive primary care but not emergency care ("market expansion"; patients with severities between *b* and *d* in Figure 1). If some of these patients receive preventive care, such as flu shots, then ER visits will also decline in the future from fewer patients developing high-severity conditions ("prevention"; some fraction of severities greater than *d* in Figure 1). Finally, as it is more valuable for mid-severity patients to receive primary care than emergency care, even though mid-severity patients would go to an ER in the absence of available primary care, fewer patients go to the ER in the current period ("substitution"; patients with severities between *d* and *f* in Figure 1). Note that since the value of receiving emergency care exceeds the value of receiving primary care for high-severity conditions, high-severity patients will go the ER regardless of whether primary care is an option (patients with severities exceeding *f* in Figure 1).

With retail clinics

How do retail clinics affect who receives treatment and in which health care setting the treatment is received? The impacts of retail clinics on the market when a primary care doctor is unavailable or available are depicted in cases 3 and 4 of Figure 1, respectively. As with the introduction of a primary care doctor discussed above, retail clinics affect the market through three mechanisms: market expansion, prevention, and substitution.

Since retail clinics are more valuable than doctors' offices and ERs for low-severity conditions, more patients will receive care in the current period when a retail clinic is present (in Figure 1, patients with severities between *a* and *b* if a primary care doctor is available or between *a* and *d* if a primary care doctor is unavailable). If some of these patients receive preventive care, a fraction of these patients will avoid developing high-severity conditions that would require emergency care in the future.

Finally, the entrance of a retail clinic will cause substitution between different types of health care providers. If a primary care doctor is available, low-severity patients will substitute from doctors' offices to retail clinics (patients with severities between *b* and *c*). If a primary care doctor is unavailable, mid-severity patients will substitute from ERs to retail clinics (patients with severities between *d* and *e*). Note that since the value of receiving treatment from a doctor's office or ER exceeds the value of receiving care at a retail clinic for more severe conditions, the presence of retail clinics does not affect the provision of care for these patients.

The theoretical framework outlined above delivers three testable predictions about ER visits:

1. *Prevention: Fewer visits to ERs for emergent, preventable conditions*. ER visits for high-severity conditions that can be prevented through adequate primary care should decrease when a retail clinic opens if retail clinics effectively expand consumption of preventive care.
2. *Substitution from ERs for primary care treatable conditions*: ER visits for low-severity conditions that can be treated at either an ER, a doctor's office, or a retail clinic should decrease when a retail clinic opens.
3. *No substitution from ERs for emergent, non-preventable conditions*: ER visits for high-severity conditions that cannot be prevented by primary care and are not usually treated in a doctor’s office or retail clinic should stay the same when a retail clinic opens.

In addition to predictions about the number of ER visits for conditions of various types, our theoretical framework further delivers predictions on the average severity of conditions that continue to be treated in an ER in the presence of a retail clinic. Since patients with relatively low-severity primary care treatable conditions will substitute from ERs to retail clinics when a retail clinic opens, we expect the remaining primary care treatable cases that are seen in the ER to be of higher severity than before the retail clinic opened. However, since there is no reason to believe that increased prevention will affect the *severity* of patients who nevertheless develop emergent conditions, we do not expect the remaining emergent, preventable cases that are seen in the ER to be of a systematically different severity than before the clinic opening. Similarly, since ER cases for emergent, non-preventable conditions should be unaffected by the presence of a retail clinic, the average severity of these cases treated in an ER should remain the same after a retail clinic opens.

4. Data

Data for this study come from two main sources: (1) The location and operation dates of retail clinics in New Jersey from 2006 to 2014 are from Merchant Medicine, and (2) data on all visits to New Jersey ERs over the same time period are from the New Jersey Department of Health. We supplement these data with information from the 2010 Census and the five-year pooled (2008-2012) American Community Survey (ACS).

The data from Merchant Medicine include the geocoded locations of all retail clinics in New Jersey and each clinic's opening and/or closing dates. A total of 55 retail clinics operated in New Jersey at some point over our sample period: two clinics opened before 2006 and 53 opened between 2006 and 2014. By 2014, 18 retail clinics had closed. The majority of clinic openings occurred in 2006, 2007, 2008, and 2011, and there was an increase in closures during the great recession (Figure 3).[13] There is a seasonal pattern to openings and closings, with openings frequently occurring towards the end of the year and closings concentrated in March. Figure 2 shows the locations of all the clinics in these data, whether they opened or closed during our

[13] We have been told that some retail clinics closed over this time period because of difficulties retaining practitioners. The high demand for NPs outside of retail clinics, combined with the requirement that practitioners work nights and weekends, makes it difficult for some clinics to retain their providers.

sample period, and the ownership of the pharmacies. The clustering of locations along the I-95 corridor reflects the distribution of New Jersey's population.

The hospital discharge data come from the New Jersey Uniform billing records. These records are compiled by the state from information that all general medical and surgical hospitals are required to submit about every individual encounter with a patient. We include *all* records where there is an ER revenue code on the billing record; some of these visits resulted in admission to the hospital whereas others did not.[14] In most cases, the patient was seen in the ER and then sent home. Importantly, these data include the address of each patient. We use this information to extract each patient's residential census block group using ArcGIS.

We create a panel at the retail clinic-week level by linking the retail clinic and ER data geographically. For each retail clinic in these data, we create two distance groups: (1) a near ("treated") group that consists of census block groups with centroids within 2 miles of the retail clinic and (2) a far ("control") group that consists of census block groups with centroids between 2 and 5 miles from the retail clinic.[15] The ER data are then collapsed into retail clinic-week-distance group cells so that for each retail clinic-week we have the number of ER visits per 100,000 people residing within 0 to 2 and 2 to 5 miles of the clinic.[16] Patients who reside more than 5 miles from a retail clinic are not considered in our analysis, as we make the conservative assumption that they are not affected by distant retail clinics. Figure 4 displays the resulting distance groups geographically. For robustness, we generate alternative estimates using distance bands of 0 to 1 miles for "near" and 1 to 3 miles for "far."

To control for local demographics, we take the population-weighted average across block

[14] Some ER discharge data only includes information on ER visits resulting in admission. Our data includes all ER visits regardless of whether the visit resulted in an admission.
[15] For irregular shapes, we use the point inside the boundary that is nearest to the geographic center and on land.
[16] Population is from the 2010 Census and is aggregated from the census block group level.

group-level demographics from the ACS within each distance group. As can be seen in Table 3, both the treated and control groups are more affluent and densely populated than those living in areas more than 5 miles from a retail clinic. The treatment and control groups have similar age profiles, while block groups further than 5 miles away have a larger proportion of older residents. Despite being more similar than block groups further away, the treatment and control groups are not identical. The treatment block groups are wealthier, more densely populated, and have a lower fraction of black residents than the control groups. We control for these differences in all of our regressions and explore the key assumption of parallel pre-trends across the treatment and control groups using event study graphs.

As introduced in Section 2, our primary outcome measures are the number of ER visits for conditions within three categories: (1) emergent, preventable; (2) primary care treatable; and (3) emergent, not preventable. The ICD-9 codes used to define each diagnosis category are provided in Table 2. All visits are categorized based on the primary diagnosis code with the exception of diabetes. In order to capture complications associated with poor disease management, we include visits with diabetes listed in any diagnosis field when coding diabetes visits (up to nine diagnoses can be listed for each visit).[17] We treat diabetes differently from the other diagnoses because it is a chronic disease with a high comorbidity burden that often complicates the management of other conditions. While diabetes can be controlled in an outpatient setting with adequate primary care, unstable diabetes is associated with a wide range of conditions that can result in hospitalizations.

For influenza, we look at both the total number of visits and the number of visits by

[17] In contrast to the other conditions we consider, diabetes is most often recorded as a secondary—rather than a primary—diagnosis (see Figure A.1). For example, even if diabetes is the underlying cause of a person's heart failure, heart failure is usually listed as the primary diagnosis with diabetes listed as a secondary diagnosis. Table A.1 lists the most common primary diagnoses for visits in which diabetes is listed as a secondary diagnosis.

patients in different age groups (ages 0-4, 5-17, 18-44, 45-64, and 65+). Age is particularly important to consider when studying influenza, as there are important differences across age groups in both the riskiness of the disease and vaccination rates.[18] Despite the CDC's recommendation that everyone aged six months and older get an annual flu vaccination, prime-aged adults are much less likely to be vaccinated than other age groups, with vaccination rates around 30 percent versus over two thirds for young children and older adults (CDC).

In addition to the number of ER visits, we further consider the average severity of individuals arriving at the ER within each diagnosis category. Our main proxy for severity is the total list charges reported for each patient. List charges come from a hospital's charge master—a list of charges for all billable items—and are not the prices paid by either insurers or patients but rather the starting point for negotiations between hospitals and insurers. As such, list charges are the same for all patients who receive particular services at a given hospital whereas actual amounts paid vary depending on the individual's insurance. Total list charges incurred during a visit therefore measure how much was done to a patient and are an (imperfect) proxy for severity. As cases with more comorbidities are on average more complicated and difficult to treat, we further consider the number of diagnoses recorded as an alternative proxy for severity.[19] For each severity proxy, we create an average of the proxy at the retail clinic-distance group-week level for visits in each diagnosis category.

5. Empirical Specification

Our difference-in-difference strategy compares the number of ER visits among residents living in

[18] Very young children and the elderly are both the most likely to die from influenza and the most likely to be vaccinated.

[19] As illnesses and injuries tend to be more severe for older patients, we also experimented with the average age of patients and the fraction of patients over 80 years old. Since most visits for primary care treatable diagnoses are made by relatively young patients, there is unfortunately little meaningful variation in this measure for these conditions.

areas near a retail clinic to those among residents living slightly farther away, both before and after a retail clinic opened or closed. For each retail clinic *c*, there are two observations per week: (1) the number of ER visits or average severity of patients who live within 2 miles of the retail clinic and (2) the same outcomes for patients living between 2 and 5 miles from the retail clinic. The second group provides a counterfactual for the group of people living near the retail clinic. Note that we use all locations where a retail clinic ever operated over our sample period when defining observations, whether the retail clinic was currently operating or not.

Two assumptions must hold for this research design to identify the causal effect of retail clinics on ER use. First, it must be true that people who live closer to a retail clinic are more likely to use it. Survey evidence supports this assumption. According to the 2010 Health Tracking Household Survey, 76 percent of families said the fact that “the location was more convenient than another source of care” was either a major (49 percent) of minor (27 percent) factor in choosing to use a retail clinic. In addition, Tu and Boukus (2013) report that the rate of retail clinic use was 40 percent higher for patients living less than 1 mile from a retail clinic relative to those living 1 to 5 miles away in 2010.[20]

Since it is unclear exactly how far a typical consumer is willing to travel to use a retail clinic, we repeat our main analysis using distance groups of 0 to 1 and 1 to 3 miles in place of our primary groups of 0 to 2 and 2 to 5 miles.[21] The wider distance band definitions (0 to 2 and 2 to 5 miles around a retail clinic) draw larger areas into both treatment and control groups, reducing noise in our estimates of ER visit rates. However, if only people within 1 mile are actually more likely than people further away to use retail clinics, the wider distance band

[20] The Tu and Boukus (2013) study is based on a very small sample, so exact magnitudes should be interpreted with caution.

[21] Figure A.2 demonstrates the distance bands used in both our primary analysis and robustness exercises for a specific example: a retail clinic located in North Arlington (near Newark).

definition will lead us to underestimate the true treatment effect of retail clinics on ER use.

The second assumption we need to make for our research design to identify a causal effect is that the treatment and control groups would have shown similar trends in ER use in the absence of a retail clinic opening or closing. In order to probe this assumption, Figures 5 through 7 plot the average number of ER visits per 100,000 people for the near (treatment) and far (control) groups for primary care treatable conditions (Figure 5); emergent, preventable conditions (Figure 6); and emergent, non-preventable conditions (Figure 7). Both clinic openings and closings are considered events (with closings treated as the negative of openings with respect to event time), and month, year, and retail clinic fixed effects are first removed from the data. The trends in ER visits between the near and far distance groups are reasonably similar before a clinic opens (or after it closes), suggesting that the parallel trends assumption is justified.

We estimate regressions of the following form:

$$(1)\ ER\ Visits/Pop_{ctd} = \beta_0 + \beta_1 I[near]_{cd} + \beta_2 I[clinic\ open]_{ct} + \beta_3 (I[near]_{cd} * I[clinic\ open]_{ct}) + \beta X_{cd} + \lambda_c + \lambda_{year} + \lambda_{month} + \varepsilon_{ctd}.$$

where $ER\ Visits/Pop_{ctd}$ denotes the number of ER visits for a given diagnosis in week t per 100,000 residents who live within distance group d of retail clinic c. In some specifications, this dependent variable is replaced by average list charges. The variable $I[clinicopen]_{ct}$ is an indicator equal to one if retail clinic c is operating in week t and zero otherwise for both distance groups associated with a clinic. The indicator $I[near]_{cd}$ is equal to one for observations from the near category, regardless of whether the retail clinic is currently operating. Equation (1) further includes year, month, and retail clinic location fixed effects to flexibly account for trends in hospital visits over time and differences across space. We also control for demographic characteristics in each retail clinic-distance group by including X_{cd}, a vector of population-weighted averages of block group demographic characteristics from the ACS.[22] Standard errors are clustered by retail clinic, and all of our regressions are population weighted.[23]

The parameter of interest in Equation (1) is β_3, the coefficient on the interaction term $I[near]_{cd}$ * $I[clinic\ open]_{ct}$. This coefficient captures the differential impact of an open retail clinic on locations near the clinic relative to those further away. Given that our models include retail clinic fixed effects, β_3 is identified by changes in the operating status of a clinic (i.e., clinic openings and closings).

6. Results

Figures 5 and 6 show suggestive evidence of decreases in ER visits for influenza, diabetes, and a range of primary care treatable conditions in the treatment groups relative to the control groups in the months after a retail clinic opens. For diabetes and primary care treatable conditions, we see a widening of the gap between the near and far distance groups after a retail clinic opens. For influenza, the relationship between the near and far distance groups actually reverses: after a retail clinic opens, the near distance group switches from having more ER visits to having fewer ER visits relative to the far group. Reassuringly, Figure 7 demonstrates that no such pattern emerges among our placebo conditions.

To more formally examine the impact of retail clinics on ER use, we estimate Equation (1). Results for the full sample are provided in Table 4. As seen in the first row, we do not find a statistically significant, main effect of a retail clinic being open for any condition. The main effect of being within 0-2 miles of a retail clinic is also statistically insignificant except for

[22] Demographic controls include population density, fraction black, a quadratic in median household income, and the fraction of the population in detailed age bins (5-9, 10-14,15-17, 18-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75+).
[23] The qualitative patterns and statistical significance of our results are unaffected by weighting. Unweighted regression results are available upon request.

childbirth, confirming that the near and far groups have very similar patterns of ER use prior to clinic openings.

The coefficient of interest, the interaction term "Open*Near," behaves as predicted in our conceptual framework. Looking first to the results for emergent, preventable conditions, we see that ER visits for influenza fall by 13.6 percent and ER visits for diabetes fall by 3.6 percent among those near an open retail clinic (bottom panel of Table 4; columns 1 and 2). This later estimate is only significant at the 90 percent level of confidence, however. This is in accordance with the prediction that ER visits for emergent, preventable conditions should decrease when a retail clinic opens due to increased use of preventive services.

Recall that ER visits for primary care treatable conditions are likewise predicted to fall among the near group when a retail clinic opens. As seen in the top panel of Table 4, we find significant negative interactions for all of the primary care treatable conditions we examine, indicating that people substitute away from ERs when a retail clinic is available. The reductions in ER visits for these minor conditions range from 5.7 percent (for urinary tract infections and sprains and strains) to 12 percent for sore throat. Finally, as predicted, we do not find any statistically significant effect of being near an open retail clinic on the placebo conditions of fractures, poisonings, and childbirth.

Table 5 probes the results for influenza further by estimating separate regressions by age. The results suggest that the largest effect (a 17 percent reduction in ER visits) is among adults aged 18-44, the group that previous work suggests is most likely to obtain a flu shot from a retail clinic. We also find large reductions in visits among children, suggesting either that they too get flu shots at retail clinics or that they benefit from reduced transmission among people their parents' age.

Figures 8, 9, and 10 show event study graphs for average list charges—our preferred proxy for severity.[24] While average list charges are very similar in the near and far groups prior to the opening of a retail clinic for primary care treatable conditions, average list charges in the near areas are higher than those in the far areas after an opening (Figure 8). This finding provides suggestive evidence that the simplest cases in each primary care treatable condition substitute away from ERs to retail clinics, leaving the more complicated cases in the ER.

Perhaps unsurprisingly, Figure 9 provides little evidence of substitution for influenza. While increased vaccination should prevent flu cases from occurring in the first place, the serious flu cases that do emerge likely require hospital care, and thus there is no reason to believe that increased vaccination will affect the severity of the marginal patient who becomes infected. However, there is again suggestive evidence of some substitution away from ERs for the simplest diabetes cases starting around one year after the opening of a retail clinic. Finally, Figure 10 shows that for placebo conditions like fractures and childbirth, charges remain roughly the same in both near and far areas before and after clinic openings and closings.

Table 6 provides estimates of the effects of being near an open retail clinic on list charges for ER visits estimated in a regression similar to Equation (1). The results here are somewhat inconclusive. The interaction term "Open*Near" is uniformly positive, but it is only marginally statistically significant for urinary tract infections and otitis (ear ache). There is therefore some, albeit inconclusive, evidence that patients with less severe cases in these categories substitute

[24] Figure A.3 shows event time graphs using the number of diagnoses listed as an alternative proxy of severity. This figure suggests that among people who are close to an open retail clinic, the average severity of ER visits for urinary tract infections, upper respiratory infections, and sprains and strains increases when a retail clinic opens. There is no effect on severity for sore throats, ear infections, or pink eye using the number of diagnoses. However, this null result likely reflects the fact that comorbities are rarely recorded for these conditions, making the number of diagnoses not a very sensitive severity measure.

from ERs to retail clinics to receive treatment.[25]

Robustness

The estimated effects of retail clinics on the number of ER visits when we instead use distance bands of 0-1 miles (near) and 1-3 miles (far) are provided in Table A.4. These estimates are somewhat noisier than those discussed above but show the same qualitative patterns. In particular, among those who live near an open retail clinic, we see reductions in ER visits for both influenza and a range of primary care treatable conditions. Our results are therefore robust to the use of alternative distance bands.

Qualified pharmacists in New Jersey have been able to administer vaccines to adults since 2004.[26] However, in May 2014, New Jersey pharmacists gained the ability to administer the influenza vaccine to patients aged 7-17 with the permission of their parents or legal guardian and to patients under 12 with a prescription from an authorized provider (NJ Board of Pharmacy, 2015). All of our results are robust to including an indicator for the time period during which pharmacists were allowed to administer the flu vaccine to children or to dropping the last eight months of our sample. Furthermore, since we find the largest effect of retail clinics on ER flu visits for adults, we do not think that this change in the scope of practice of New Jersey pharmacists is confounding our main results.

A potential limitation of our work is that we have been unable to obtain information on the openings and closings of urgent care centers in New Jersey. Urgent care centers differ from

[25] Since the distribution of list charges is very skewed to the right, Table 6 is based on data that trims the top 0.1 percent of charges. Table A.2 shows estimates from regressions using untrimmed list charges. As an alternative approach to mitigating outliers, Table A.3 shows estimates from regressions in which list prices are first residualized from hospital fixed effects and an indicator denoting whether the patient was admitted. In both tables we again see suggestive evidence that less severe primary care treatable cases substitute away from ERs when a retail clinic is available.

[26] Unfortunately, our hospital data does not go back far enough to look at the effect of allowing pharmacists to provide vaccinations on ER usage.

retail clinics in that they are staffed, run, and often owned by doctors. They also compete more directly with ERs in that they offer services such as imaging and intravenous drips and can treat conditions such as simple fractures and poisonings. Like retail clinics, however, they offer patients convenience via walk-in appointments and transparent pricing.

The key issue for our analysis is whether patients who live within 2 miles of a retail clinic are more likely to live closer to an urgent care center than those who live 2-5 miles from a retail clinic. An analysis of the locations of urgent care centers in 2017 suggests that this is not the case: the number of urgent care centers per square mile is quite similar in the near and far distance bands. We therefore do not believe that the presence of urgent care centers biases our results.

7. Discussion and Conclusions:

Our study shows that retail clinics reduce ER visits both for minor conditions and for conditions like influenza and diabetes that are preventable given adequate primary care. These findings suggest that encouraging competition in the form of retail clinics, with their transparent prices and convenient access, has the potential to be welfare improving. Indeed, if Figure 1 is cast in terms of social benefits and social costs, then all of the visits between points *a* and *b* represent clear welfare improvements because these visits have positive value but would not have taken place in the absence of retail clinics. Likewise, the visits between points *b* and *d* have positive social value but would not have taken place when doctor's offices were closed in the absence of retail clinics. On the other hand, visits that are diverted from physicians offices to retail clinics represent a transfer from one group to another and may be neutral in terms of welfare consequences. If, however, the net social cost of treatment (including costs due to congestion) is higher in the ER than elsewhere, then visits diverted from ERs to retail clinics (visits between points *d* and *e* in Figure 1) are likely to also be socially beneficial.

The difficulty that arises in making welfare calculations is that insured health care consumers do not pay the full cost of their care, so the private value (benefit minus cost for the patient) of the visit often exceeds the social value. This distortion in valuation means that patients may consume too much health care from a social perspective, and making consumption cheaper and easier should increase the size of this distortion.

While we cannot compute the size of the welfare gain or loss from the introduction of retail clinics, we can provide estimates of some of the costs and benefits of retail clinics on the healthcare system. First, we can compute the cost savings implied by the reductions in ER use that we observe. To do so, we use the cost data shown in Tables A.5 and A.6. As there is some evidence that visits for primary care treatable conditions that substitute from ERs to retail clinics are less severe, we use the 25th percentile of costs to evaluate cost savings for these conditions. However, because improved preventive care should prevent visits for both minor and severe emergent, preventable conditions, we use mean costs for influenza visits and diabetes. Finally, because list prices overstate the actually amounts paid, we use an approximate cost-to-charge ratio drawn from Medicare of one third to deflate estimated cost savings.

Combining these assumptions about cost with the estimated reductions in ER visits from Table 4, we estimate that an open retail clinic reduces spending on ER visits by at least $15,721 per week per 100,000 people with convenient access to a clinic. This implies annual cost savings of $817,492 per 100,000, or $8.80 per person. Of this amount, $7.60 is accounted for by reductions in costs for ER visits due to influenza and diabetes alone.

This is likely an underestimate of the cost savings attributable to retail clinics for three reasons. First, we only consider two important preventable conditions that are easy to track in our data. However, increased access to primary care through retail clinic expansion likely reduces the burden of other emergent, preventable conditions. For example, there might well be important cumulative effects on conditions such as heart disease and stroke from more frequent monitoring of blood pressure and cholesterol levels. Second, we only consider the effect of retail clinics on ER visits. To the extent that we are missing savings in doctors' offices from better preventive care, as well as savings downstream from hospital visits such as those generated when patients are discharged into skilled nursing facilities or to home health care, the cost benefits of retail clinics will be greater.[27] Third, Spetzl et al. (2013) argue that the costs of treating patients at retail clinics could be reduced further by loosening scope of practice laws that currently limit the services nurse NPs are allowed to provide.

According to Ashwood et al. (2016), retail clinics cause an increase in the number of visits for "low-acuity" conditions (conditions that we refer to as primary care treatable) that cost an additional $14 per person after netting out reductions in ER visits for these conditions.[28] Our results suggest that over half of this increased spending ($7.60) is offset by reductions in preventable ER visits for just two conditions: influenza and diabetes. Are these costs savings enough to overcome the costs of increased use? While we cannot provide a definitive answer to this question, the fact that retail clinics appear to improve preventive care and prevent disease suggests that competition from retail clinics may well be welfare enhancing. To the extent that preventing sickness is socially beneficial, even when illness does not result in doctor visits, such considerations may swing the balance of welfare calculations in favor of promoting competition from retail clinics.

[27] Around 1% of influenza and 9% of diabetes related ER visits are discharged to skilled nursing facilities.
[28] Ashwood et al. (2016) do not include sprains and strains in their measure of primary care treatable conditions, and so the increased spending of $14 is not net of savings from substitution away from ERs for these conditions.

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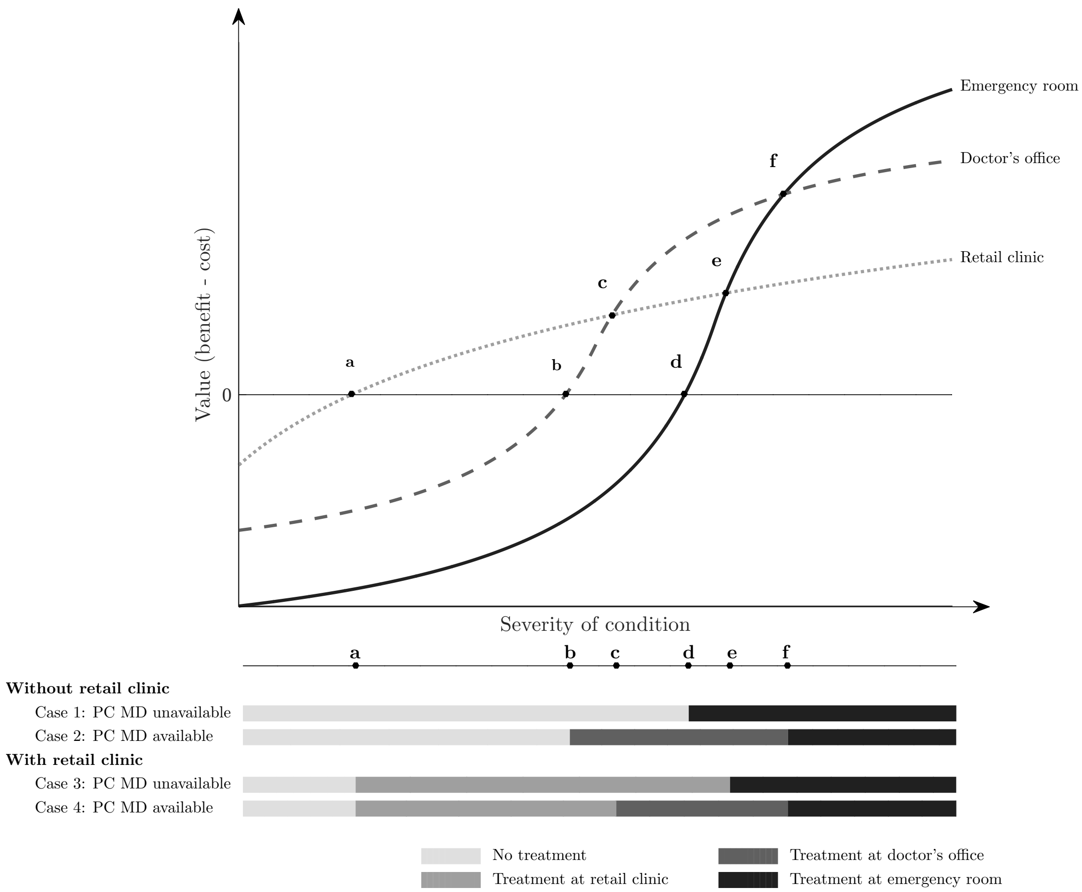
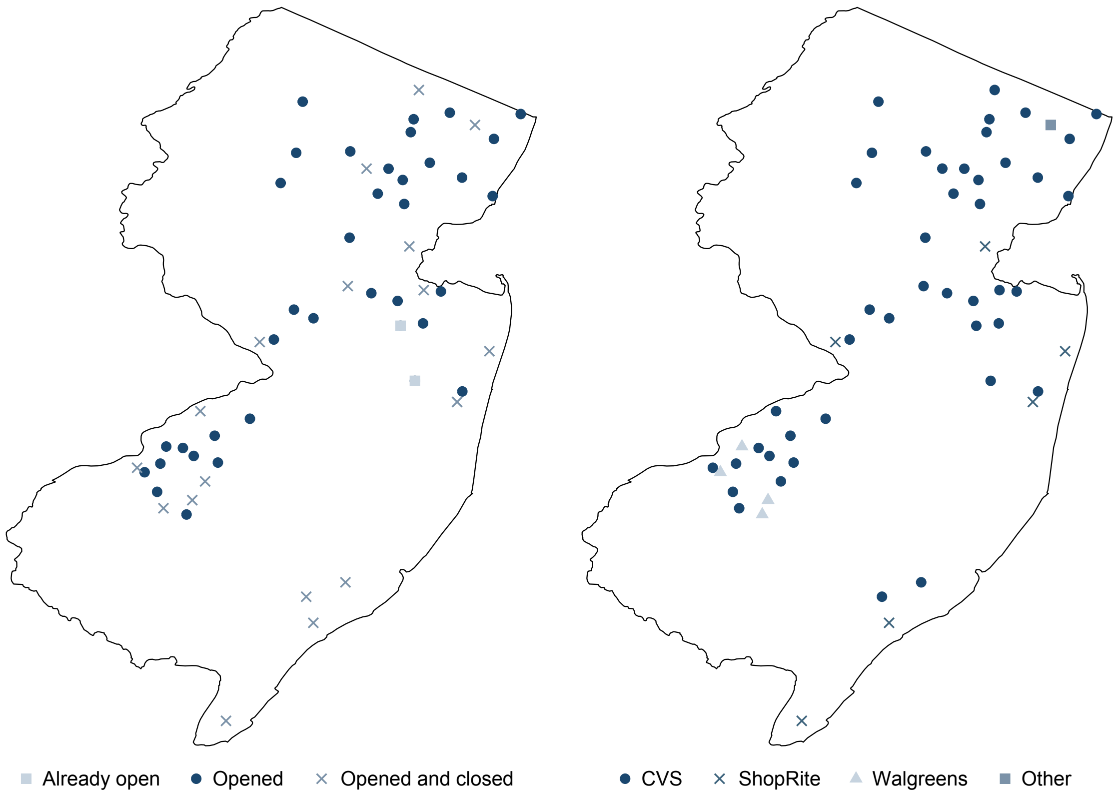
1 Figures

Figure 1: Value of Treatment by Severity of Illness and Location



Notes: The top panel of the above figure depicts the value of care (benefit - cost) as a function of patient severity at retail clinics, doctors' offices, and ERs. The bottom panel displays in which locations patients of different severities choose to seek care in different states of the world (a primary care MD is available or unavailable; a retail clinic is available or unavailable).

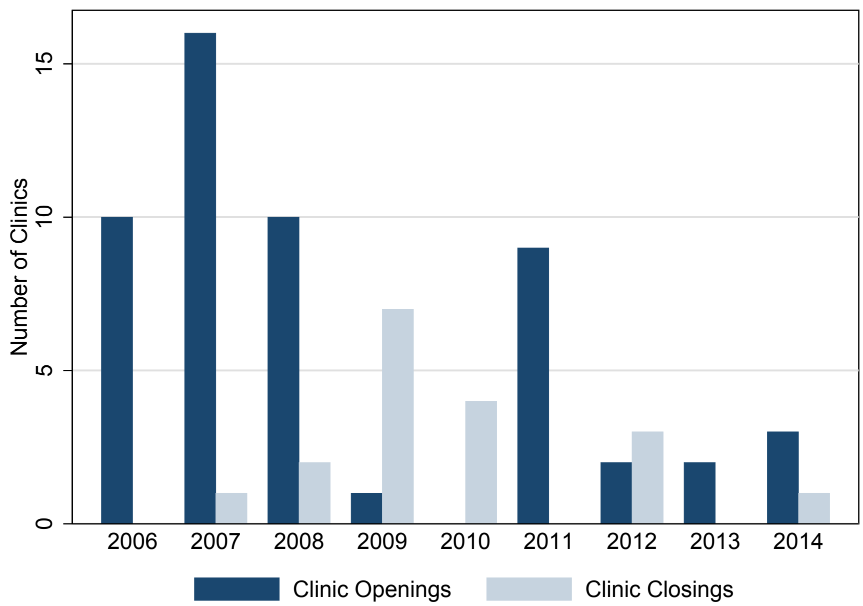
Figure 2: New Jersey Retail Clinics: Locations and Ownership



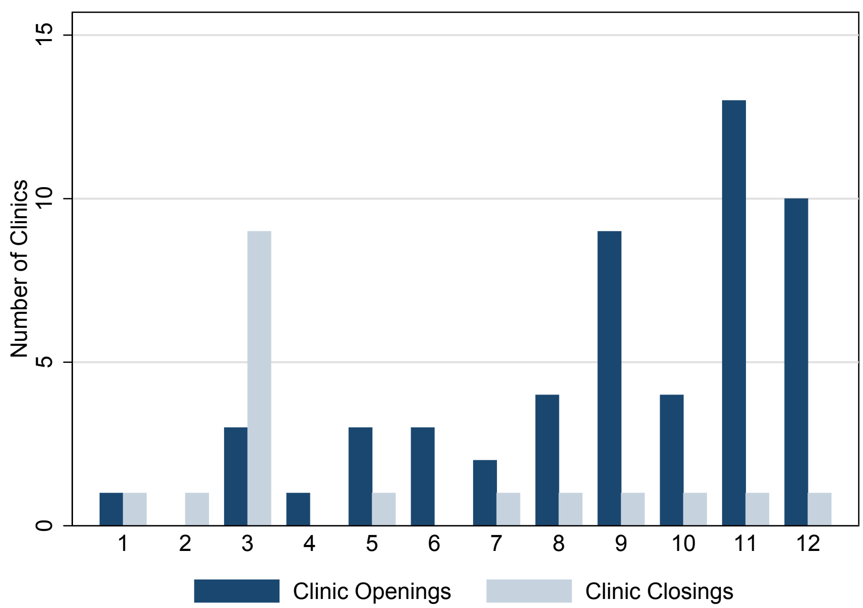
Notes: The above maps display the location, operation status between 2006 and 2014, and ownership of all retail clinics in New Jersey. As seen in the map on the left, two clinics were open before 2006, 53 opened between 2006 and 2014, and 18 opened and closed between 2006 and 2014. The single retail clinic not operated by CVS, ShopRite, or Walgreens was called Simple Simon Pharmacy.

Figure 3: New Jersey Retail Clinics: Timing of Openings and Closings

By Year

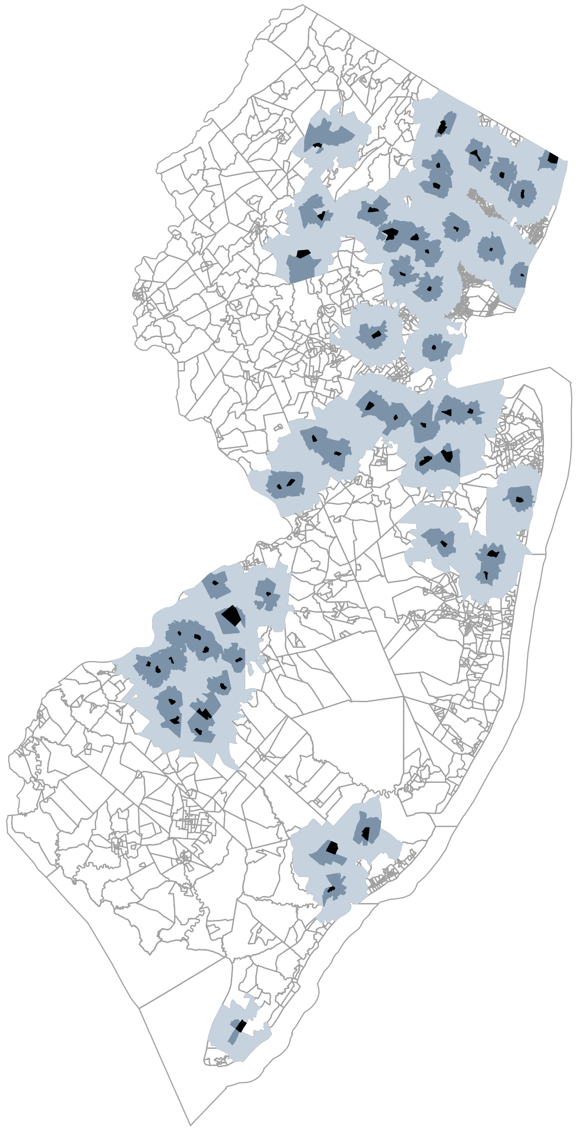


By Month



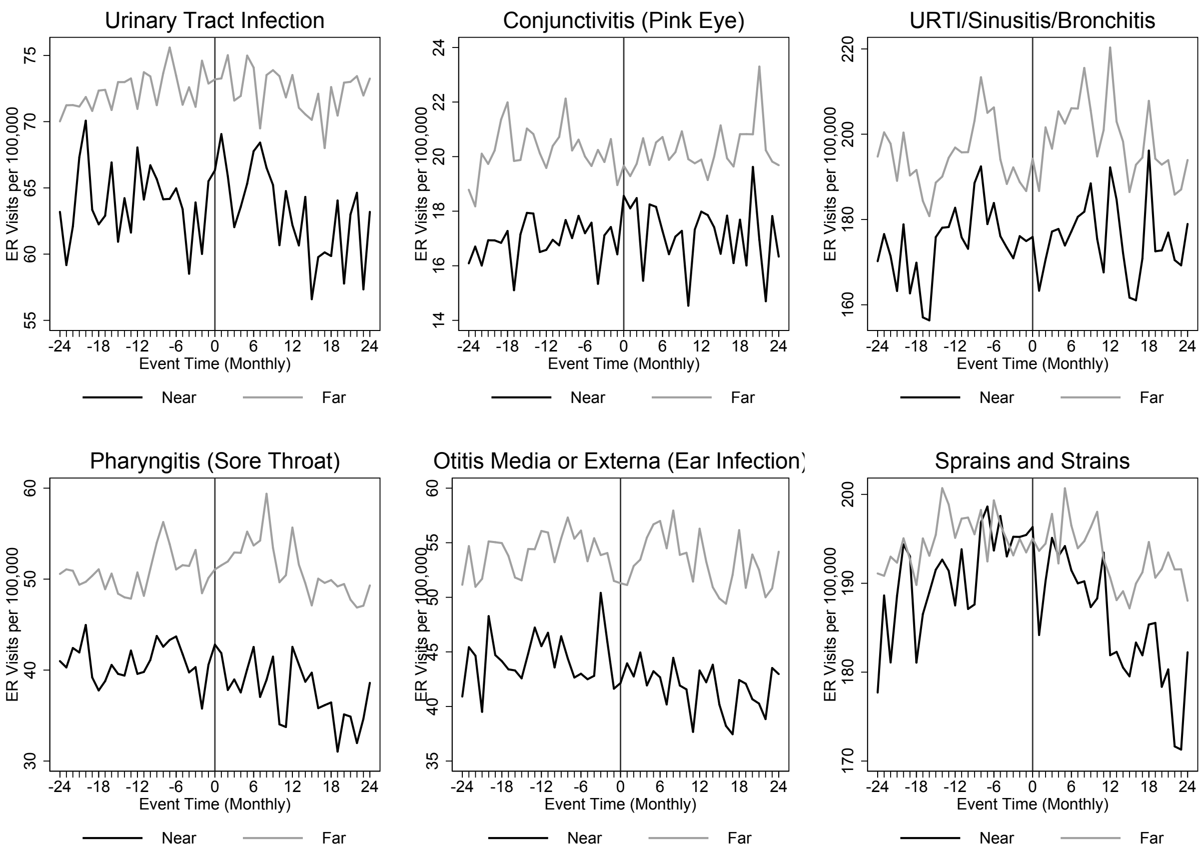
Notes: The above figures display the years and months in which retail clinics opened and closed in New Jersey between 2006 and 2014.

Figure 4: New Jersey Retail Clinic Distance Groups: 0-2 Miles vs. 2-5 Miles



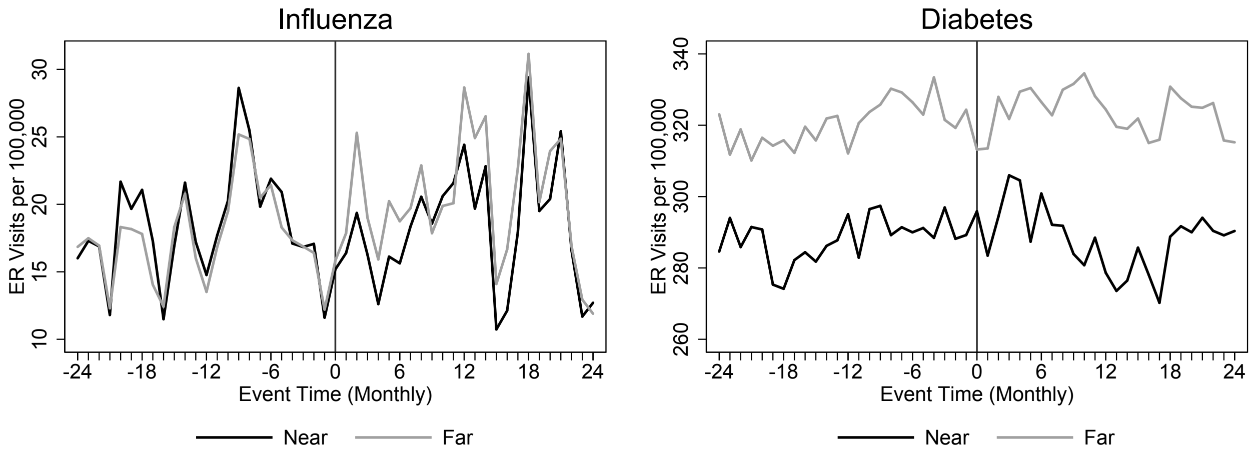
Notes: The above map displays the distance bands used in our analysis. The black block groups contain a retail clinic. The rings of block groups are shaded lighter as one moves away from a retail clinic and depict distances between 0 to 2 miles and 2 to 5 miles from each retail clinic.

Figure 5: Primary Care Treatable Conditions: ER Visits in Event Time



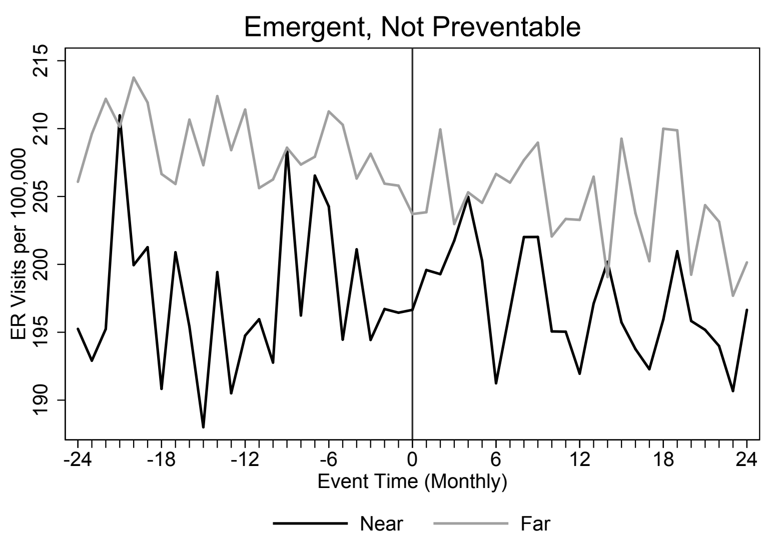
Notes: The above plots display coefficients from regressions of monthly ER visits on a full set of near*event time and far*event time indicators. All regressions include month, year, and retail clinic fixed effects; are population weighted; and use a balanced panel (i.e., openings and closings within two years of the beginning or end of the sample are excluded). An event is defined as either a clinic opening or closing (clinic closings are treated inversely to clinic openings). "URTI" denotes upper respiratory tract infections.

Figure 6: Emergent, Preventable Conditions: ER Visits in Event Time



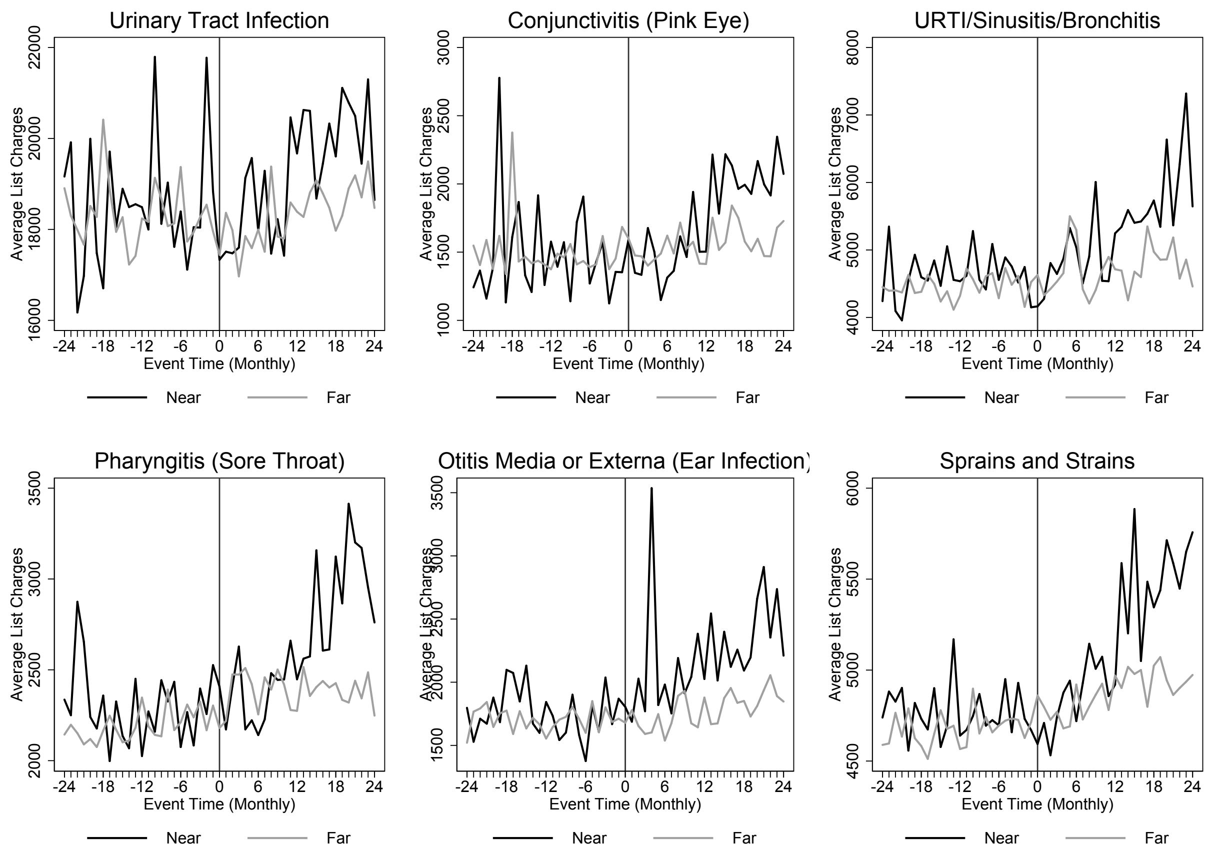
Notes: The above plots display coefficients from regressions of monthly ER visits on a full set of near*event time and far*event time indicators. All regressions include month, year, and retail clinic fixed effects; are population weighted; and use a balanced panel (i.e., openings and closings within two years of the beginning or end of the sample are excluded). An event is defined as either a clinic opening or closing (clinic closings are treated inversely to clinic openings).

Figure 7: Emergent, Non-Preventable Conditions (Placebo): ER Visits in Event Time



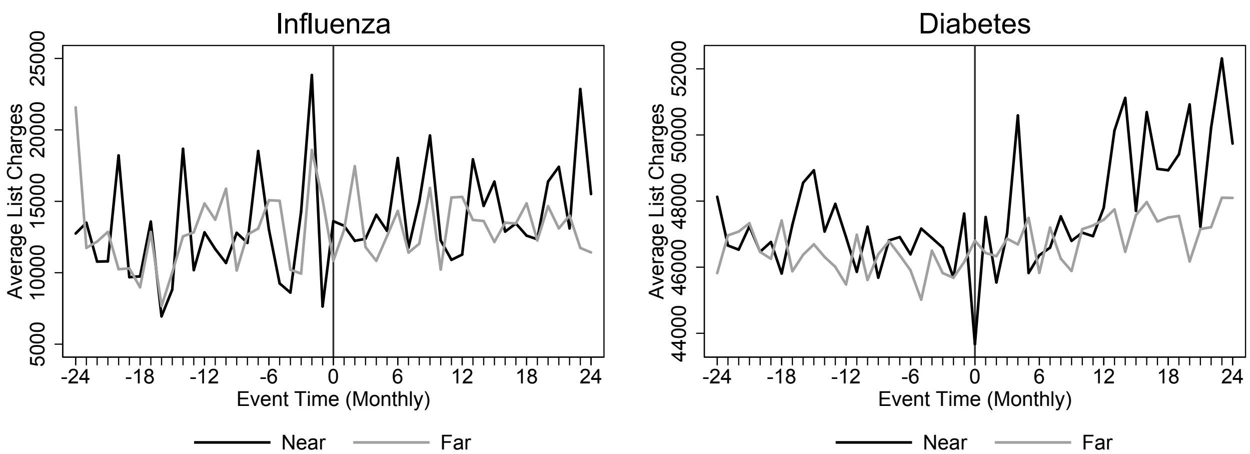
Notes: The above plot displays coefficients from a regression of monthly ER visits on a full set of near*event time and far*event time indicators. The regression includes month, year, and retail clinic fixed effects; is population weighted; and uses a balanced panel (i.e., openings and closings within two years of the beginning or end of the sample are excluded). An event is defined as either a clinic opening or closing (clinic closings are treated inversely to clinic openings). "Emergent, Not Preventable" is the sum of visits for fractures, births, and poisonings.

Figure 8: Primary Care Treatable Conditions: List Charges in Event Time



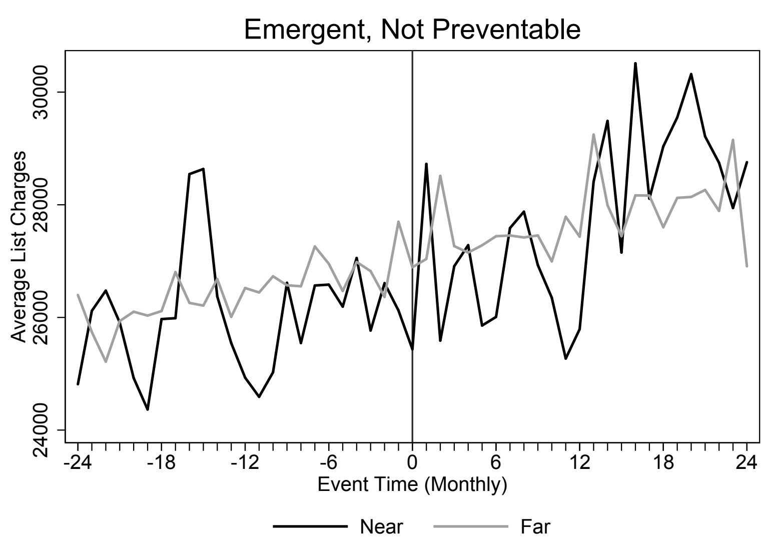
Notes: The above plots display coefficients from regressions of average monthly list charges on a full set of near*event time and far*event time indicators. All regressions include month, year, and retail clinic fixed effects; are population weighted; and use a balanced panel (i.e., openings and closings within two years of the beginning or end of the sample are excluded). An event is defined as either a clinic opening or closing (clinic closings are treated inversely to clinic openings). "URTI" denotes upper respiratory tract infections.

Figure 9: Emergent, Preventable Conditions: List Charges in Event Time



Notes: The above plots display coefficients from regressions of average monthly list charges on a full set of near*event time and far*event time indicators. All regressions include month, year, and retail clinic fixed effects; are population weighted; and use a balanced panel (i.e., openings and closings within two years of the beginning or end of the sample are excluded). An event is defined as either a clinic opening or closing (clinic closings are treated inversely to clinic openings).

Figure 10: Emergent, Non-Preventable Conditions (Placebo): List Charges in Event Time



Notes: The above plot display coefficients from a regression of average monthly list charges on a full set of near*event time and far*event time indicators. The regression includes month, year, and retail clinic fixed effects; is population weighted; and uses a balanced panel (i.e., openings and closings within two years of the beginning or end of the sample are excluded). An event is defined as either a clinic opening or closing (clinic closings are treated inversely to clinic openings). “Emergent, Not Preventable” is the sum of visits for fractures, births, and poisonings.

2 Tables

Table 1: New Jersey Retail Clinics: Summary Statistics

	(1) All	(2) CVS	(3) ShopRite	(4) Walgreens	(5) Other
Open Saturdays	0.96	0.98	0.83	1.00	1.00
Open Sundays	0.95	0.98	0.83	1.00	0.00
Pharmacy on Site	1.00	1.00	1.00	1.00	1.00
Clinics Shut Down	0.33	0.23	1.00	0.25	1.00
Weekday Open Time	08:32	08:30	09:20	08:00	08:00
Weekday Close Time	07:33	07:30	08:00	07:30	08:00
Saturday Open Time	09:02	09:00	09:00	09:30	09:00
Saturday Close Time	05:25	05:30	05:00	05:00	06:00
Sunday Open Time	09:48	09:55	09:00	09:30	.
Sunday Close Time	05:18	05:25	04:24	05:00	.
Clinics	55	44	6	4	1

Notes: The above table summarizes characteristics of all retail clinics in operation in New Jersey at some point between 2006 and 2014. The "Other" category is Simple Simon Pharmacy.

Table 2: Overview of Condition Categories

Diagnosis group	ICD-9-CM codes	Percent of ER visits
Primary care treatable		
Urinary tract infection	599*, 595*	1.71%
Conjunctivitis	372*	0.46%
URTI/sinusitis/bronchitis	460*-461*, 465*-466*, 473, 490	3.15%
Pharyngitis	462*-463*, 034	1.37%
Otitis externa/media	380*-382*	1.39%
Sprains/strains	840*-848*	4.38%
Emergent, preventable		
Influenza	487*-488*	0.21%
Diabetes	249*-250*	8.74%
Emergent, not preventable		
Fractures	800*-829*	2.94%
Poisonings	909.0*, 909.1*, 909.5*, 995.2*, 960*-989*	0.53%
Childbirth	DRGs 372-375	2.20%

Notes: The above table provides an overview of the three categories of conditions used in our analysis. For all conditions other than diabetes, we consider a visit as being for the condition in question only if the condition is listed as the primary diagnosis. For diabetes, we consider all visits in which diabetes is listed in any diagnosis field. The percent of ER visits reflects the total share of ER visits in New Jersey between 2006 and 2014 with the corresponding ICD-9 codes.

Table 3: New Jersey Retail Clinic Distance Groups: Summary Statistics

	(1) All	(2) 0-2 Miles	(3) 2-5 Miles	(4) 5+ miles
Population	1,391	1,361	1,385	1,415
Population density	9,148	11,463	9,338	7,721
Median household income	75,367	82,236	76,900	69,311
Pct. black	14.36	10.83	15.81	13.37
Pct. under 18	23.05	22.14	23.5	22.67
Pct. aged 18-54	50.7	52.5	51.03	49.28
Pct. aged 55-74	19.33	18.68	18.89	20.44
Pct. aged 75 and over	6.90	6.70	6.57	7.61
Block groups	6,320	894	3,499	1,927

Notes: The above table provides demographic information for distance bands surrounding retail clinics in New Jersey. Data is taken from both the 2010 Census and the 2008-2012 ACS.

Table 4: Retail Clinics and ER Visits

	Primary Care Treatable					
	(1) UTI	(2) Conjunct.	(3) URTI	(4) Pharyngitis	(5) Otitis	(6) Sprain/strain
Open	0.116	0.218	0.809	0.125	0.234	1.136
	(0.304)	(0.141)	(0.794)	(0.479)	(0.316)	(0.680)
Near	-0.028	0.160	-0.113	0.001	-0.189	1.684
	(0.431)	(0.186)	(0.936)	(0.508)	(0.464)	(1.007)
Open*Near	-0.891**	-0.404**	-1.599*	-1.428**	-0.713*	-2.272***
	(0.383)	(0.176)	(0.859)	(0.607)	(0.410)	(0.801)
Mean per 100k	15.615	4.011	27.152	11.942	12.140	39.662
Mean Pop.	175,121	175,121	175,121	175,121	175,121	175,121
R-Squared	0.518	0.447	0.685	0.647	0.626	0.673
Observations	51,480	51,480	51,480	51,480	51,480	51,480

	Emergent, Preventable		Emergent, Not Preventable (Placebo)		
	(1) Influenza	(2) Diabetes	(3) Fractures	(4) Poisonings	(5) Births
Open	-0.153	-0.201	0.194	0.050	-0.260
	(0.123)	(1.161)	(0.324)	(0.102)	(0.298)
Near	0.104	2.407	0.688	0.065	-0.635**
	(0.073)	(2.079)	(0.483)	(0.118)	(0.279)
Open*Near	-0.256***	-2.773*	-0.549	-0.117	0.545
	(0.087)	(1.406)	(0.434)	(0.100)	(0.428)
Mean per 100k	1.878	76.390	27.495	5.064	20.804
Mean Pop.	175,121	175,121	175,121	175,121	175,121
R-Squared	0.191	0.784	0.435	0.393	0.614
Observations	51,480	51,480	51,480	51,480	51,480

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Notes: Observations are at the retail clinic-distance band-week level. The independent variable in each regression is the number of ER visits for a given condition. All regressions include month, year, and retail clinic fixed effects and are population weighted. Additional retail clinic-distance group controls include population density, fraction black, a quadratic in median household income, and the age structure. Standard errors are clustered by retail clinic. "UTI" denotes urinary tract infections; "URTI" denotes upper respiratory tract infections.

Table 5: Retail Clinics and ER Visits for Flu by Patient Age

	(1) All Visits	(2) Ages 0-4	(3) Ages 5-17	(4) Ages 18-44	(5) Ages 45-64	(6) Ages 65+
Open	-0.153	-0.578	-0.290	-0.143	-0.036	-0.100
	(0.123)	(0.598)	(0.274)	(0.108)	(0.049)	(0.071)
Near	0.104	0.740**	0.288*	0.052	-0.007	-0.017
	(0.073)	(0.340)	(0.150)	(0.089)	(0.036)	(0.059)
Open*Near	-0.256***	-0.870**	-0.386**	-0.330***	-0.080	0.054
	(0.087)	(0.432)	(0.173)	(0.106)	(0.066)	(0.089)
Mean per 100k	1.878	5.655	2.734	1.942	0.864	0.929
Mean Pop.	175,121	11,781	30,037	66,860	46,345	22,901
R-Squared	0.191	0.150	0.128	0.181	0.141	0.110
Observations	51,480	51,480	51,480	51,480	51,480	51,480

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Notes: Observations are at the retail clinic-distance band-week level. The independent variable in each regression is the number of ER visits for influenza. All regressions include month, year, and retail clinic fixed effects and are population weighted. Additional retail clinic-distance group controls include population density, fraction black, a quadratic in median household income, and the age structure. Standard errors are clustered by retail clinic.

Table 6: Retail Clinics and Average ER List Charges

	Primary Care Treatable					
	(1)	(2)	(3)	(4)	(5)	(6)
	UTI	Conjunct.	URTI	Pharyngitis	Otitis	Sprain/strain
Open	-330.317	35.972	79.040	90.786	9.320	47.755
	(230.307)	(50.100)	(83.881)	(76.526)	(58.924)	(89.175)
Near	-458.965	-68.730	3.980	-28.656	-23.843	-20.575
	(279.216)	(107.253)	(154.260)	(105.415)	(95.942)	(104.054)
Open*Near	847.679*	165.461	427.660	234.627	327.419*	247.593
	(504.357)	(214.460)	(294.260)	(217.165)	(191.895)	(210.771)
Mean per 100k	12,794.461	1,220.547	3,899.715	1,788.249	1,829.747	2,667.661
Mean Pop.	175,121	175,121	175,121	175,121	175,121	175,121
R-Squared	0.087	0.130	0.129	0.153	0.103	0.383
Observations	51,480	51,480	51,480	51,480	51,480	51,480

	Emergent, Preventable		Emergent, Not Preventable (Placebo)		
	(1)	(2)	(3)	(4)	(5)
	Influenza	Diabetes	Fractures	Poisonings	Births
Open	-214.543	-388.686	-347.490	27.087	91.058
	(997.012)	(362.217)	(340.134)	(429.094)	(464.000)
Near	-2,119.802	-427.187	-457.786	-625.744	-266.211
	(1,315.987)	(414.853)	(318.818)	(427.497)	(221.921)
Open*Near	1,827.985	764.090	467.331	886.099	389.109
	(1,246.891)	(642.152)	(455.722)	(624.454)	(379.694)
Mean per 100k	7,996.014	33,997.848	17,587.116	15,256.463	23,120.788
Mean Pop.	175,121	175,121	175,121	175,121	175,121
R-Squared	0.037	0.404	0.137	0.064	0.569
Observations	51,480	51,480	51,480	51,480	51,480

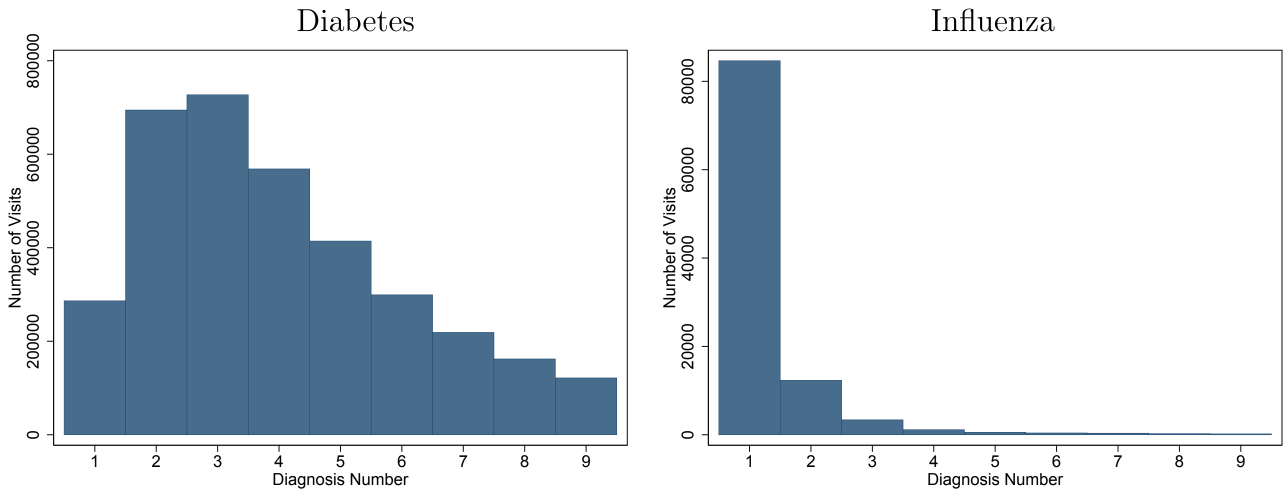
*** p<0.01, ** p<0.05, * p<0.1

Notes: Observations are at the retail clinic-distance band-week level. The independent variable in each regression is the average total list charges of ER visits for a given condition. Hospital visits with list charges at or above the 99.99th percentile across all ER visits for a given condition are excluded. All regressions include month, year, and retail clinic fixed effects and are population weighted. Additional retail clinic-distance group controls include population density, fraction black, a quadratic in median household income, and the age structure. Standard errors are clustered by retail clinic. "UTI" denotes urinary tract infections; "URTI" denotes upper respiratory tract infections.

Appendix

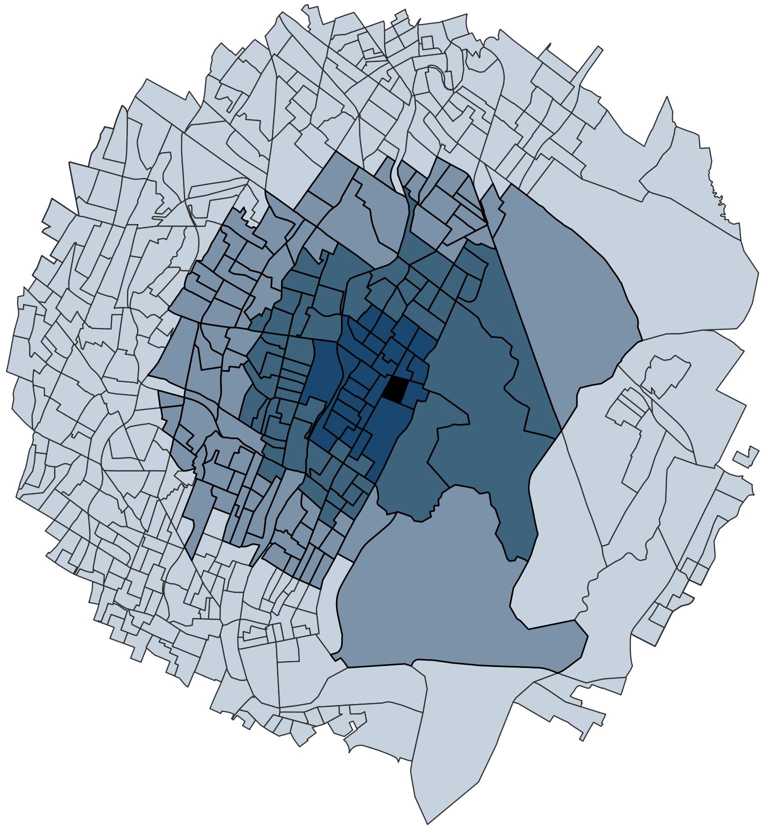
A Supplementary Figures

Figure A.1: Diagnosis Number of Diabetes and Influenza



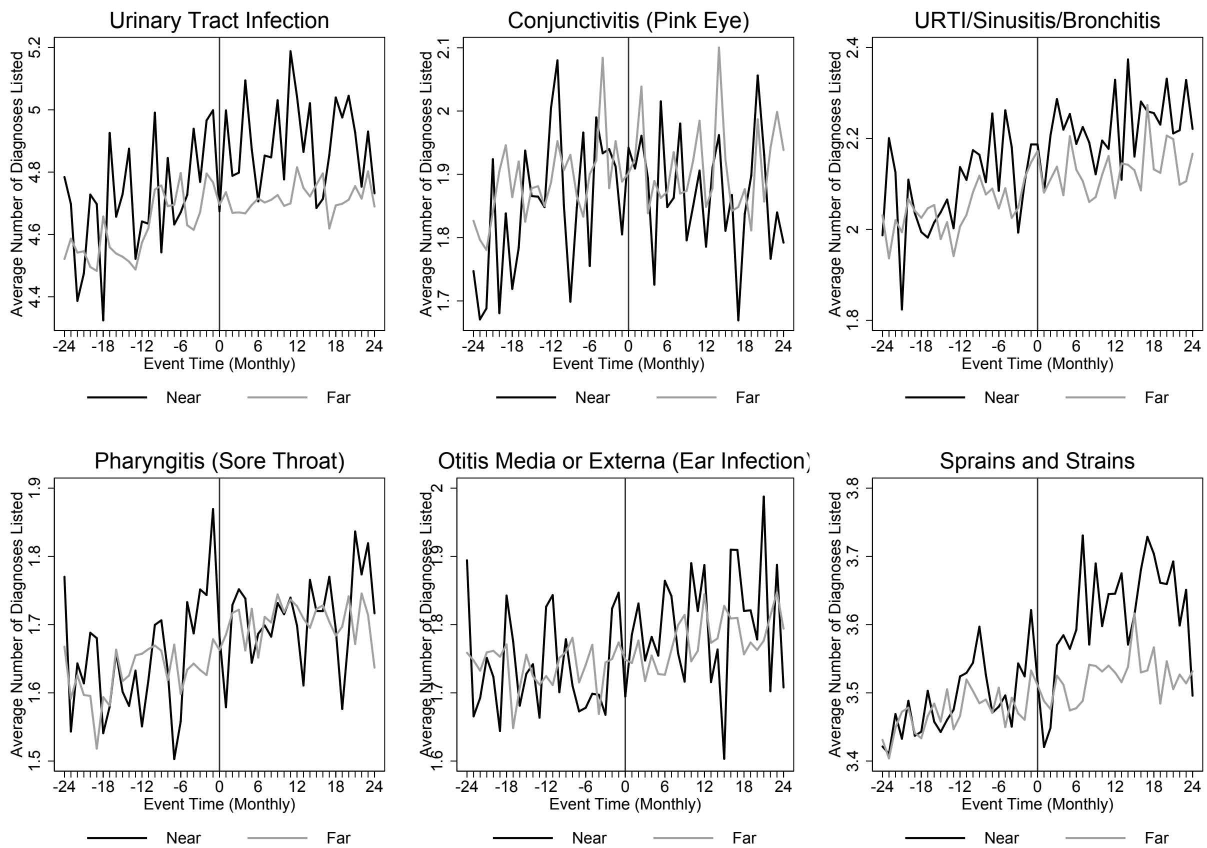
Notes: The above figures depict the frequency of all observed diagnosis positions for diabetes and influenza. That is, each figure considers all ER visits in which the diagnosis in question was recorded and displays the position in which the diagnosis appeared (i.e., "1" denotes the first diagnosis, "2" denotes the second diagnosis, etc.).

Figure A.2: Retail Clinic Distance Group Example: North Arlington (Newark)



Notes: The above picture displays a close-up of the distance bands used in both our primary analysis and robustness exercises for the retail clinic located in North Arlington, New Jersey. The black block group contains the North Arlington retail clinic. The rings of block groups are shaded lighter as one moves away from the retail clinic and depict distances of 0-1 miles, 1-2 miles, 2-3 miles, and 3-5 miles from the retail clinic.

Figure A.3: Primary Care Treatable Conditions: Number of Diagnoses in Event Time



Notes: The above plots displays coefficients from regressions of the average number of diagnoses on a full set of near*event time and far*event time indicators. All regressions include month, year, and retail clinic fixed effects; are population weighted; and use a balanced panel (i.e., openings and closings within two years of the beginning or end of the sample are excluded). An event is defined as either a clinic opening or closing (clinic closings are treated inversely to clinic openings). “URTI” denotes upper respiratory tract infections.

B Supplementary Tables

Table A.1: ER Visits for Diabetes: Most Common Primary Diagnosis

	Frequency	Percent	Cumulative
Diabetes mellitus (250)	285,743	8.43	8.43
Respiratory system/other chest symptoms (786)	160,203	4.73	13.16
General symptoms (780)	110,206	3.25	16.41
Other chronic ischemic heart disease (414)	107,351	3.17	19.58
Heart failure (428)	99,258	2.93	22.50
Other abdomen/pelvis symptoms (789)	74,681	2.20	24.71
Other cellulitis/abscess (682)	74,015	2.18	26.89
Other urinary tract disorder (599)	65,540	1.93	28.83
Cardiac dysrhythmias (427)	62,913	1.86	30.68
Other & unspecified back disorder (724)	57,266	1.69	32.37
Complications peculiar to certain spec. proc. (996)	53,709	1.58	33.96
Acute myocardial infarct ion (410)	50,227	1.48	35.44
Pneumonia, organism unspecified (486)	50,044	1.48	36.91
Chronic bronchitis (491)	45,409	1.34	38.25
Asthma (493)	447,66	1.32	39.58
Septicemia (038)	38,190	1.13	40.70
Fluid/electrolyte disorder (276)	36,838	1.09	41.79
Symptoms involving head/neck (784)	35,801	1.06	42.85
Osteoarthrosis & allied disorders (715)	35,629	1.05	43.90
Acute renal failure (584)	33,229	0.98	44.88
Cerebral artery occlusion (434)	32,516	0.96	45.84
Renal/ureteral calculus (592)	29,667	0.88	46.71
Essential hypertension (401)	29,252	0.86	47.57
Cataract (366)	28,985	0.86	48.43
Other soft tissue disorders (729)	27,886	0.82	49.25
GI system symptoms (787)	27,513	0.81	50.06

Notes: The above table displays the most common primary diagnoses for hospital visits with any diabetes diagnosis recorded. Each row lists the description; the corresponding ICD-9 code is provided in parentheses.

Table A.2: Retail Clinics and Average ER List Charges: Untrimmed Prices

	Primary Care Treatable	Emergent, Preventable		Emergent, Not Preventable
	(1)	(2)	(3)	(4)
	Combined	Influenza	Diabetes	Combined
Open	10.096	-287.840	-320.411	0.569
	(73.543)	(980.343)	(350.802)	(328.006)
Near	-104.187	-2,170.106	-489.617	-402.278
	(180.333)	(1,317.644)	(430.300)	(322.448)
Open*Near	474.526*	1,863.661	824.956	412.784
	(282.555)	(1,238.487)	(667.641)	(449.641)
Mean per 100k	4,030.004	8,047.146	34,139.164	19,637.637
Mean Pop.	175,121	175,121	175,121	175,121
R-Squared	0.484	0.037	0.394	0.547
Observations	51,480	51,480	51,480	51,480

*** p<0.01, ** p<0.05, * p<0.1

Notes: Observations are at the retail clinic-distance band-week level. The independent variable in each regression is the average total list charges of ER visits for a given condition. All regressions include month, year, and retail clinic fixed effects and are population weighted. Additional retail clinic-distance group controls include population density, fraction black, a quadratic in median household income, and the age structure. Standard errors are clustered by retail clinic.

Table A.3: Retail Clinics and Average ER List Charges: Residualized Prices

	Primary Care Treatable					
	(1)	(2)	(3)	(4)	(5)	(6)
	UTI	Conjunct.	URTI	Pharyngitis	Otitis	Sprain/strain
Open	-280.392	29.458	154.586	52.962	54.008	-6.126
	(197.169)	(69.217)	(133.758)	(79.129)	(78.472)	(85.581)
Near	-677.494***	-82.697	-131.861	-144.213	-104.856	-112.172
	(223.223)	(111.229)	(153.679)	(108.170)	(112.123)	(114.621)
Open*Near	952.289**	161.852	615.495**	305.274	346.609	274.012
	(397.480)	(208.919)	(302.572)	(221.984)	(222.429)	(233.502)
Mean per 100k	-11.948	29.194	210.073	25.170	105.067	26.844
Mean Pop.	175,121	175,121	175,121	175,121	175,121	175,121
R-Squared	0.044	0.016	0.047	0.123	0.064	0.281
Observations	51,476	51,477	51,473	51,477	51,473	51,474

	Emergent, Preventable		Emergent, Not Preventable (Placebo)		
	(1)	(2)	(3)	(4)	(5)
	Influenza	Diabetes	Fractures	Poisonings	Births
Open	4,019.556	-22.988	-51.293	166.862	186.730
	(2,848.726)	(436.149)	(263.449)	(429.721)	(466.919)
Near	-370.052	-451.070	-569.792*	104.494	-258.234
	(4,649.174)	(457.218)	(294.849)	(624.785)	(252.725)
Open*Near	-7,730.023	1,090.283	472.349	376.180	456.116
	(5,222.984)	(914.503)	(526.075)	(810.051)	(500.814)
Mean per 100k	-1,192.490	-152.406	-33.930	155.379	36.936
Mean Pop.	175,121	175,121	175,121	175,121	175,121
R-Squared	0.046	0.247	0.065	0.030	0.376
Observations	51,480	51,479	51,471	51,472	51,475

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Notes: Observations are at the retail clinic-distance band-week level. The independent variable in each regression is the average total list charges of ER visits for a given condition residualized from hospital fixed effects and an indicator for whether the patient was admitted. All regressions include month, year, and retail clinic fixed effects and are population weighted. Additional retail clinic-distance group controls include population density, fraction black, a quadratic in median household income, and the age structure. Standard errors are clustered by retail clinic. "UTI" denotes urinary tract infections; "URTI" denotes upper respiratory tract infections.

Table A.4: Retail Clinics and ER Visits: 0-1 Miles vs. 1-3 Miles

	Primary Care Treatable					
	(1)	(2)	(3)	(4)	(5)	(6)
	UTI	Conjunct.	URTI	Pharyngitis	Otitis	Sprain/strain
Open	-0.011	0.296	1.057	-0.038	0.255	1.230
	(0.432)	(0.214)	(0.930)	(0.639)	(0.371)	(0.899)
Near	0.327	0.337*	1.650*	0.253	0.576	2.117**
	(0.430)	(0.190)	(0.985)	(0.611)	(0.415)	(1.000)
Open*Near	-0.663	-0.541**	-2.576*	-1.421	-0.979**	-2.203*
	(0.660)	(0.225)	(1.381)	(0.864)	(0.485)	(1.158)
Mean per 100k	15.080	3.733	25.141	11.000	10.988	39.391
Mean Pop.	79,154	79,154	79,154	79,154	79,154	79,154
R-Squared	0.386	0.352	0.648	0.564	0.506	0.580
Observations	51,480	51,480	51,480	51,480	51,480	51,480

	Emergent, Preventable		Emergent, Not Preventable (Placebo)		
	(1)	(2)	(3)	(4)	(5)
	Influenza	Diabetes	Fractures	Poisonings	Births
Open	-0.248	-0.853	0.303	0.017	0.143
	(0.154)	(1.450)	(0.445)	(0.158)	(0.271)
Near	0.171**	1.798	0.556	0.181	-0.730**
	(0.084)	(2.315)	(0.449)	(0.131)	(0.288)
Open*Near	-0.305*	-0.180	-0.171	0.030	0.706
	(0.153)	(2.625)	(0.448)	(0.163)	(0.438)
Mean per 100k	1.803	75.452	27.523	4.990	19.199
Mean Pop.	79,154	79,154	79,154	79,154	79,154
R-Squared	0.162	0.727	0.304	0.238	0.226
Observations	51,480	51,480	51,480	51,480	51,480

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Notes: Observations are at the retail clinic-distance band-week level. In contrast to our primary analysis, the near (far) group is within 0-1 (1-3) miles of a retail clinic; residents living further than 3 miles from a retail clinic are excluded. The independent variable in each regression is the number of ER visits for a given condition. All regressions include month, year, and retail clinic fixed effects and are population weighted. Additional retail clinic-distance group controls include population density, fraction black, a quadratic in median household income, and the age structure. Standard errors are clustered by retail clinic. "UTI" denotes urinary tract infections; "URTI" denotes upper respiratory tract infections.

Table A.5: Distribution of List Charges by Diagnosis

	p5	p25	p50	p75	p95	Mean	Std. Dev.	Count
Influenza	495	1054	1787	3348	29425	6688.63	25927.55	82,676
Diabetes	895	3258	14527	42429	116862	32402.23	53472.52	3,389,333
Urinary tract infection	663	1396	2934	9220	53504	11773.92	26540.98	660,532
Conjunctivitis	293	513	785	1193	3145	1222.62	2364.37	178,601
URTI/sinusitis/bronchitis	373	776	1335	2387	12420	3322.52	9624.29	1,220,564
Pharyngitis	352	680	1046	1659	4446	1708.13	3428.79	528,145
Otitis	322	575	913	1415	6003	1728.56	4434.3	535,466
Sprains & strains	555	1034	1589	2378	7997	2666.38	7047.24	1,673,502
Poisonings	404	1086	2847	12874	64116	14797.16	41404.47	204,605
Fractures	802	1477	2523	11990	78526	17611.13	53310.2	1,120,181
Births	9108	15311	20730	27729	42460	22939.67	14193.1	854,560

Notes: The above table presents summary statistics for list charges by diagnosis across hospital visits.

Table A.6: CVS MinuteClinic Price List

	Posted price
General medical exams	89
Minor illnesses	89-129
Minor injuries	89-129
Adeno test (viral pink eye)	25
Blood sugar test	25
Flu test (A/B)	35
Strep test (rapid)	35
Diabetes monitoring	79-99
Diabetes screening (glucose)	59-69
Influenza vaccine (high dose)	69.99
Influenza vaccine (seasonal)	44.99

Notes: The above prices come from www.cvs.com/minuteclinic; last accessed May 2017. Minor illnesses include urinary tract and bladder infections, upper respiratory infections, sore and strep throat, and earaches and ear infections. Minor injuries include sprains, strains, and joint pain. High dose influenza vaccines contain more antigen and are intended to create a stronger immune response; these vaccines are available for people aged 65 years and older (CDC).