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Check up before you check out: Retail clinics and emergency room use☆

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ABSTRACT

Given concern about inefficient use of the emergency room (ER) increasing health care costs, we use all ER visits in New Jersey from 2006 to 2014 to examine the impacts of retail clinics on ER use in a difference-in-difference framework. We find that among people residing close to an open retail clinic, the rate of ER use falls by 3.3–13.4% for preventable conditions and 5.7–12.0% for minor acute conditions, while a range of placebo conditions are not affected. Our estimates suggest annual cost savings of nearly $70 million from reduced ER use if retail clinics were readily available across New Jersey.

1. Introduction

Retail clinics first appeared in 2000 and have grown rapidly since, with over 2000 clinics operating in 41 states and Washington D.C. in 2015 (NCSL, 2016). These clinics are generally located within retail stores, such as pharmacies or "big-box" outlets such as Walmart. They offer a limited range of services and are primarily staffed by nurse practitioners (NPs). Retail clinics are typically open seven days a week, have extended hours in the evenings, and do not require appointments. Prices are posted online and may be a quarter to a third less expensive than the price a doctor would charge for the same services (Mehrotra et al., 2009; Thygeson et al., 2008; Tu and Cohen, 2008). 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).

In this paper, we use the universe of emergency room (ER) visits in New Jersey between 2006 and 2014 to examine the impacts of retail clinics on ER use. We focus on ER use because it is thought that many cases that end up in the ER reflect inefficient allocations of medical care, and reducing the unnecessary use of emergency services has long been a focus of public policy.[1] Lowering the monetary and time costs of care might result in higher consumption of primary care and subsequent improvements in health that could

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[1] For example, Kellermann and Weinick (2012) discuss Washington state's attempt to reduce Medicaid costs by restricting the use of ERs for non-urgent care. They argue that the policy ultimately failed because inappropriate use of ERs reflected lack of access to other sources of primary care. This is exactly the sort of deficiency that retail clinics could possibly remedy.

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be reflected in fewer ER visits. 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, professional physician organizations have expressed fears that retail clinics might sell unnecessary services or products, provide lower quality, or disrupt continuity of care, leading to higher costs and worse health outcomes including additional ER visits (AAFP, 2014; AAP, 2014). In light of these concerns, the American Medical Association has called for greater regulation of store-based clinics (AMA, 2007).

To identify the effects of retail clinics on ER use, we use a difference-in-difference framework. In particular, we compare ER visits by residents living 0–2 mi from any site where a retail clinic ever operated ("near") to visits by residents living 2–5 mi away ("far"), both when the retail clinic is operating and when it is not.[2] Our identifying assumptions are therefore that those who live closest to a retail 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. We exclude patients who live farther than 5 mi away from sites where a retail clinic ever operated over our sample period because patients in unserved areas are quite different than those in areas where retail clinics locate. To absorb any time-invariant differences across neighborhoods, all of our specifications include a fixed effect for each retail clinic location.

We consider three classes of conditions: (1) conditions that frequently result in ER visits but that could have been prevented by adequate primary care; (2) relatively minor conditions that 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. The first category of conditions—severe yet preventable conditions—includes ER visits for influenza and complications of diabetes. These conditions are common reasons for ER visits and both flu shots and routine diabetes care are explicit foci of retail clinics. The second category—relatively minor conditions—includes sprains and strains, urinary tract infections, conjunctivitis, upper respiratory tract infections, ear infections, and sore throat. Finally, placebo conditions that cannot be treated in a retail clinic include fractures, poisonings, and childbirth.

We find that residents who live close to an open retail clinic are 13.4% less likely to go to an ER for influenza and 3.3% less likely to visit an ER for complications of diabetes. They are also 5.7–12.0% less likely to go to an ER for relatively common, minor conditions.[3,4] As predicted, retail clinics do not have any statistically significant effects on ER visits for fractures, poisonings, or childbirths. While we are not able to directly measure the care provided in retail clinics, we show suggestive evidence using data from the Behavioral Risk Factor Surveillance System (BRFSS) that retail clinics are associated with an increase in influenza vaccinations, an important preventive service.

Our estimates suggest that retail clinics result in annual cost savings of $791,581 per 100,000 people from reduced ER use alone. Scaled to the 2010 population of New Jersey (8,791,894), these estimates suggest potential cost savings from reduced ER use of nearly $70 million annually. The bulk of these savings come from reductions in ER visits for the two preventable conditions we consider: influenza and diabetes.

Previous work has suggested that retail clinics may increase health care costs by encouraging more primary care visits outside of the ER (Ashwood et al., 2016).[5] It is unclear whether cost savings from reduced ER visits completely offset increases in health care costs from additional visits to retail clinics. Since New Jersey does not have an "all payer claims" database, it is not possible to ask how total outpatient visits have changed over time. However, we calculate that it would take nearly 700,000 annual visits to retail clinics in New Jersey, costing $100 per visit, to offset the estimated savings from reduced ER use. Furthermore, to the extent that preventing illness is socially beneficial, even when such illness does not result in an interaction with the health care system, the fact that retail clinics reduce the burden of preventable disease may swing the balance of welfare calculations in favor of regulatory changes that promote retail clinics.

Our paper improves on 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 plan. 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 like sprains and strains, and placebo conditions that are not treated in retail clinics and should therefore be unaffected, such as childbirth.[6] This range of conditions allows us to obtain a more complete picture of the impacts of retail clinics on ER use 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 in timing 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.

This paper proceeds as follows. In Section 2, we provide additional 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 data sets used in our analysis in Section 4. Section 5 outlines our empirical specification, and results are provided in Section 6. Section 7 provides a variety of robustness checks. Section 8 offers a brief discussion and concludes.

2. Background

Retail clinics are highly concentrated among just a few retailers: CVS MinuteClinics and Walgreen's Healthcare Clinics make up 75% of the market nationwide (market shares of 50% and 25%, respectively) with Kroger, Walmart, and Target accounting for most of the rest (NCSL, 2016).[7] In recent years, Walmart and Target began 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

[2] We demonstrate that results are robust to using alternative distance bands.

[3] One recent paper from the medical literature also looks at the effect of retail clinics on low-acuity ER visits and finds little to no effect (Martsolf et al., 2017). Our analysis differs from Martsolf et al. (2017) in a number of ways that could explain the discrepancy. Notably, Martsolf et al. (2017) focus on the ratio of low-acuity ER visits to other ER visits. If ER visits for both low-acuity conditions and other preventable conditions fall (as we document), then they could find no effect or even a positive effect of retail clinics, as both the numerator and the denominator are affected by retail clinics. In contrast, we look at ER visits per capita. Our data are also richer, including both a finer level of geographical detail and ER visits that result in hospital admission.

[4] Using a similar identification strategy to Martsolf et al. (2017), Hollingsworth (2014) shows that the number of retail clinics within 5 mi of a Florida hospital in 2012 is associated with fewer ER visits for bronchitis in 2012 relative to 2006.

[5] In contrast, Sussman et al. (2013) find that total costs of care are lower among CVS Caremark employees and their dependents in the year following a visit to a CVS MinuteClinic.

[6] 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, but they do not do this.

[7] CVS owns and operates all of its clinics whereas Walgreens outsources clinics to health care groups.

Table 1
New Jersey retail clinics: summary statistics.

	(1)	(2)	(3)	(4)	(5)
	All	CVS	ShopRite	Walgreens	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
Clinic 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	–
Observations (clinics)	55	44	6	4	1

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

CVS opened at least two new stores in every year between 2011 and 2014.

Retail clinics are predominately staffed by NPs. 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 practice handbook outlining protocols and refer to their supervising physician only when a situation requires further guidance. The use of NPs is a key difference between retail clinics and urgent care centers. The latter can be difficult to distinguish from traditional doctors' offices, since they are staffed by doctors and often take appointments in advance. In fact, urgent care centers are treated as doctor's offices for regulatory purposes.

Prices charged by retail clinics are on average between 25% and 33% less expensive than the prices charged by physicians' offices for the same services (Mehrotra et al., 2009; Tu and Cohen, 2008). These cost savings are likely to be salient to consumers as retail clinics are used primarily by younger adults and families who are more likely to be uninsured and pay out of pocket than those using other health care providers. However, most retail clinic visits are still covered by insurance, with about 70% of retail clinic customers being insured (compared to 90% for patients visiting primary care physicians). Retail clinic patrons are also less likely to have a usual source of care (39% compared to 80% of the general population), which may make them particularly important for treatment of patients who would otherwise default to an ER (Weinick et al., 2011).

Despite lower and more transparent prices, patients cite convenience (i.e., time costs) as the main reason for using retail clinics (Weinick et al., 2011). 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; 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. These three severity categories are in the spirit of those used in Billings et al. (2000) and Taubman et al. (2014). Our classification focuses on diagnoses that are both known to be treated in retail clinics and where there is little ambiguity in severity class. An overview of these condition categories and how their treatment relates to the services provided by retail clinics is given below.

2.1. 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%; 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.[8] 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 (CDC, 2018).

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.[9] Located within high foot traffic stores, retail clinics are convenient and advertise to remind 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 to retail clinic patients at the end of each visit. According to Uscher-Pines et al. (2012), vaccines were administered in 40% of visits to retail clinics from 2007 to 2009, with 95% of the vaccinations being for influenza.[10]

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% 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 MedlinePlus,[11] 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 of frequent visits for routine monitoring, combined with the many supplies (e.g., insulin,

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

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

[10] Fifty-five percent of the vaccinations were administered to adults aged 18–64. 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.

[11] Available at https://medlineplus.gov/ency/patientinstructions/000082.htm; last accessed July 2018.

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.

other drugs such as metformin, needles, and testing strips) that must be purchased from pharmacies, make diabetics a natural market for retail clinics.

2.2. Primary care treatable conditions

The second set of conditions that we consider includes the following minor conditions: urinary tract infections, conjunctivitis, upper respiratory tract infections, sore throat, ear infections, and sprains and strains. We chose these six categories because together they account for the largest share of ER visits among minor illnesses and injuries (12.46% 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).

2.3. Emergent, non-preventable conditions

The third set of conditions that we examine are placebo conditions that retail clinics do not treat and that 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.[12] 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 use. We then introduce retail clinics to ask how ER use 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 minus cost) as a function of the severity of the patient's condition. In 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.[13] 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.[14]

3.1. Without retail clinics

In the absence of retail clinics, ER use 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 net value of receiving emergency care is greater than zero.[15] 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 Fig. 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 Fig. 1), two things change: (1) more patients receive care, and (2) fewer patients go to the ER. More 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 Fig. 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 Fig. 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 Fig. 1).[16] 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

[12] 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.

[13] 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.

[14] These relative values derive from underlying assumptions about the relative costs and benefits of receiving care in each location. In terms of costs, the evidence suggests that retail clinics are the lowest cost option, due to both low direct monetary costs and 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.

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

[16] Providing evidence of this substitution, Buchmueller et al. (2006) find that hospital closures in Los Angeles County shifted some care to doctors' offices.

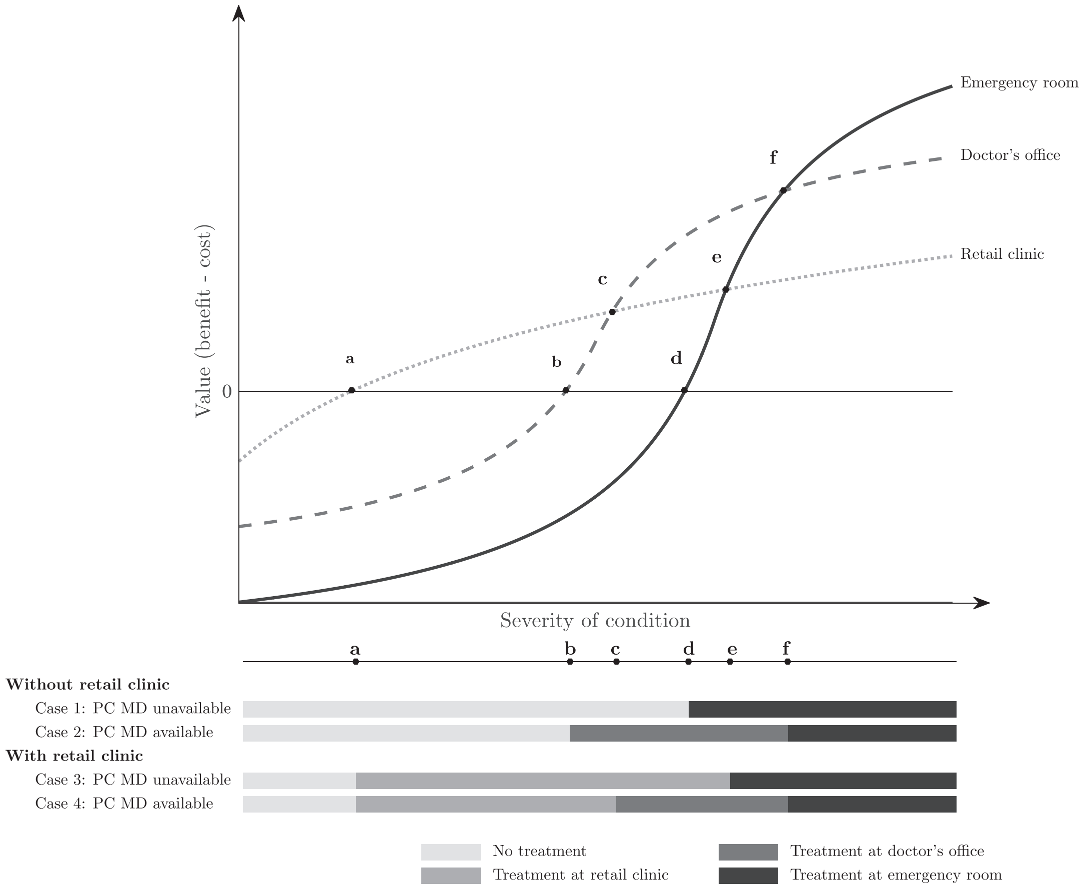

Fig. 1. Value of treatment by severity of illness and location. Notes: The top panel of the above figure depicts the value of care (benefit minus cost) as a function of patient severity at retail clinics, doctors' offices, and ERs. The bottom panel displays in which locations patients of different severities 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).

primary care is an option (patients with severities exceeding *f* in Fig. 1).

3.2. 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 either unavailable or available are depicted in cases 3 and 4 of Fig. 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 Fig. 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, then 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* in Fig. 1). If a primary care doctor is unavailable, mid-severity patients will substitute from ERs to retail clinics (patients with severities between *d* and *e* in Fig. 1). 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. *Fewer ER visits 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 expand consumption of preventive care.
2. *Substitution: Fewer ER visits 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. *Placebo: No change in ER visits 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 delivers predictions on the average severity of cases 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 among 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 opened. 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. The locations and operation dates of retail clinics in New Jersey from 2006 to 2014 are from Merchant Medicine. 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, the five-year pooled (2008–2012) American Community Survey (ACS), and the BRFSS's "Selected Metropolitan/Micropolitan Area Risk Trends" data (SMART BRFSS) from 2006 to 2010.

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 (Fig. 2).[17] There is a seasonal pattern to openings and closings, with openings frequently occurring towards the end of the year and closings concentrated in March. Fig. 3 shows the locations of all the retail clinics in these data, whether they opened or closed during our 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.[18] 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 0–2 mi from the retail clinic, and (2) a far ("control") group that consists of census block groups with centroids 2–5 mi from the retail clinic.[19,20,21] The ER data are then collapsed into retail clinic–week–distance group cells

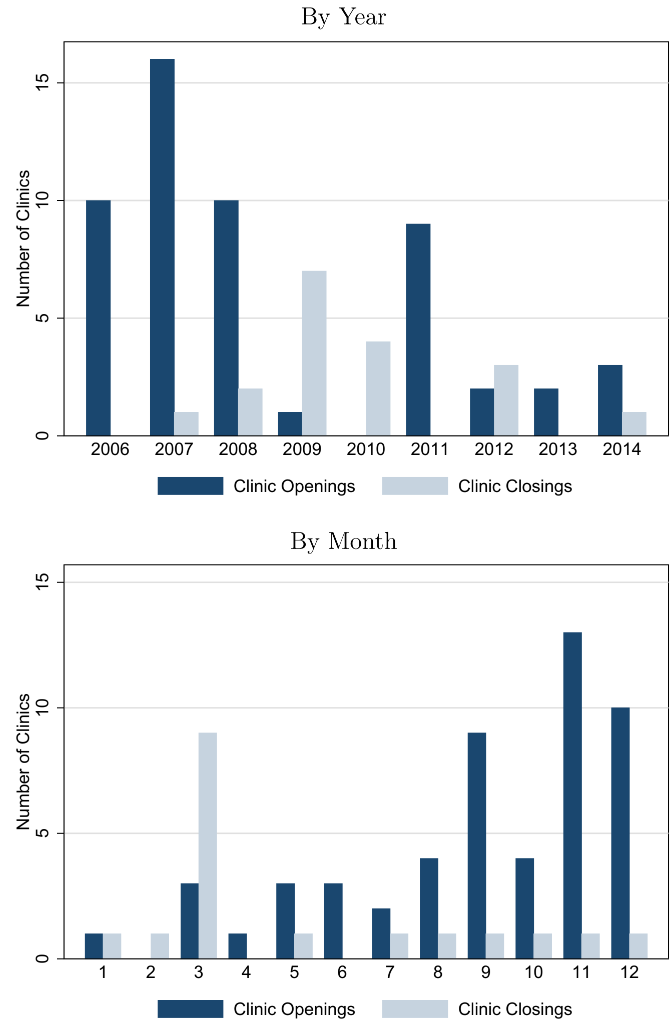

Fig. 2. New Jersey retail clinics: timing of openings and closings. Notes: The above figures display the years and months in which retail clinics opened and closed in New Jersey between 2006 and 2014.

so that for each retail clinic–week we have the number of ER visits per 100,000 people residing 0–2 and 2–5 mi from the retail clinic.[22] Patients who reside more than 5 mi from a retail clinic are not considered in our analysis. As there is no obvious choice for how to define the distance bands, we discuss estimates using alternative distances to define the near group in the Robustness section.

As can be seen in the first panel of Table 3, the demographic characteristics of those living more than 5 mi from a retail clinic are different from those living in the other two distance groups. In particular, the population of areas more than 5 mi from a retail clinic is poorer, older, and more rural than either of the other two distance groups, and thus we do not think these areas serve as good control groups for the areas closest to where retail clinics locate. The second panel of Table 3 shows that in the first quarter of our data (when only two retail clinics were operating in New Jersey), the block groups more than 5 mi from an eventual retail clinic site also had more weekly ER visits per 100,000 residents across diagnosis groups. By dropping these areas from our analysis, we create control groups

[17] In interviews with retail clinic staff, we were 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.

[18] Some ER discharge data only include information on ER visits that do not result in admission. Our data include all ER visits regardless of whether the visit resulted in an admission.

[19] Fig. A1 demonstrates the distance bands used in our primary analysis for a specific example: a retail clinic located in North Arlington (near Newark).

[20] Some households fall within the catchment area of two retail clinics. In these cases, households are counted in both retail clinic groups. Our results are not sensitive to this empirical choice.

[21] An alternative "treated" group would be visits occurring outside of normal business hours. Unfortunately, we do not observe the exact time stamp in the discharge data.

[22] Population is taken from the 2010 census and is aggregated from the census block group level. We note that intercensal population estimates are not available at the block group level.

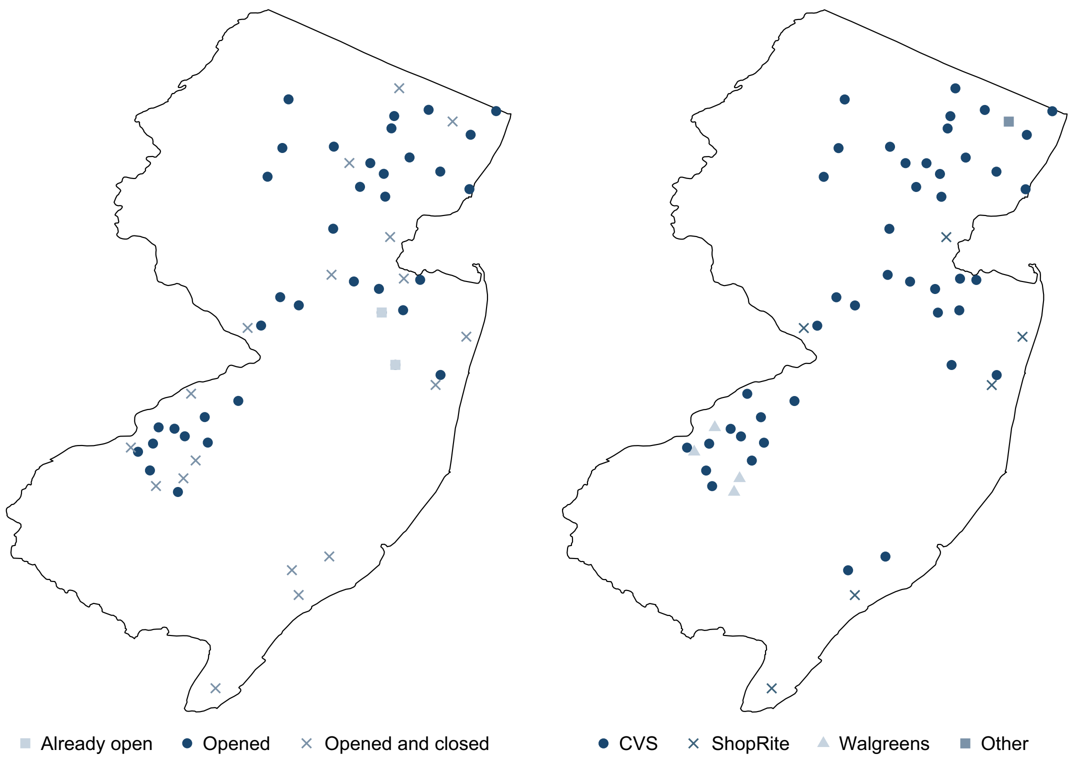

Fig. 3. New Jersey retail clinics: locations and ownership. Notes: The above maps display the location, operation status between 2006 and 2014, and ownership of all retail clinics in New Jersey. As seen in the map on the left, two clinics were open before 2006, 53 opened between 2006 and 2014, and 18 opened and closed between 2006 and 2014. The single retail clinic not operated by CVS, ShopRite, or Walgreens was called Simple Simon Pharmacy.

Table 3
Retail clinic distance groups: block group summary statistics at baseline.

	(1)	(2)	(3)	(4)
	All	0–2 mi	2–5 mi	5+ mi
a. Demographics				
Population	1391	1361	1385	1415
Population density	9148	11,463	9338	7721
Median household income	75,367	82,236	76,900	69,311
Pct. black	14.36	10.83	15.81	13.37
Pct. under 18	23.06	22.13	23.51	22.67
Pct. aged 18–54	50.71	52.49	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
Urgent care center density	0.15	0.19	0.16	0.11
Distance to hospital	2.93	2.36	2.37	4.20
Observations (block groups)	6320	894	3499	1927
b. Weekly ER visits per 100,000				
Urinary tract infection	13.973	14.377	13.715	14.257
Conjuctivitis	4.400	3.808	4.371	4.730
URTI/sinusitis/bronchitis	38.250	31.919	37.756	42.116
Pharyngitis	14.459	12.479	14.174	15.906
Otitis	15.293	12.240	15.461	16.414
Sprain/strain	41.032	37.608	39.512	45.416
Influenza	1.899	1.632	1.894	2.033
Diabetes	73.206	67.636	70.834	80.151
Fracture	26.119	24.767	25.973	27.020
Poisoning	4.130	3.987	4.091	4.269
Births	21.735	21.483	21.860	21.623
Observations (block groups)	6320	894	3499	1927

Notes: The above table provides average baseline demographic information (Panel a) and outcomes (Panel b) for block groups in different distance bands around retail clinics in New Jersey. Baseline weekly ER visits per 100,000 are weekly rates averaged over the first quarter of our sample. Data is taken from both the 2010 census and the 2008–2012 ACS.

that are more similar to the treatment groups. Fig. 4 displays the resulting distance groups geographically.

Despite being more similar than block groups more than 5 mi away, the treatment and control groups are not entirely identical. While there is no difference in average distance to the closest ER across treatment and control groups, Table 3 shows that the treatment block groups are wealthier, more densely populated, and have a lower fraction of black residents than the control groups. To account for differences in local demographics, we control for the population-weighted average across block group–level demographics from the ACS within each distance group in our primary regressions. We also 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 (influenza and diabetes); (2) primary care treatable (urinary tract infections, conjunctivitis, upper respiratory tract infections, pharyngitis, otitis externa/media, and sprains and strains); and (3) emergent, not preventable (fractures, poisonings, and births). 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 (up to nine diagnoses can be listed for each visit).[23] We treat diabetes differently from the other

[23] In contrast to the other conditions we consider, diabetes is most often recorded as a secondary—rather than a primary—diagnosis (see Fig. A2). 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 A1 lists the most common primary diagnoses for visits in which diabetes is listed as a secondary diagnosis.

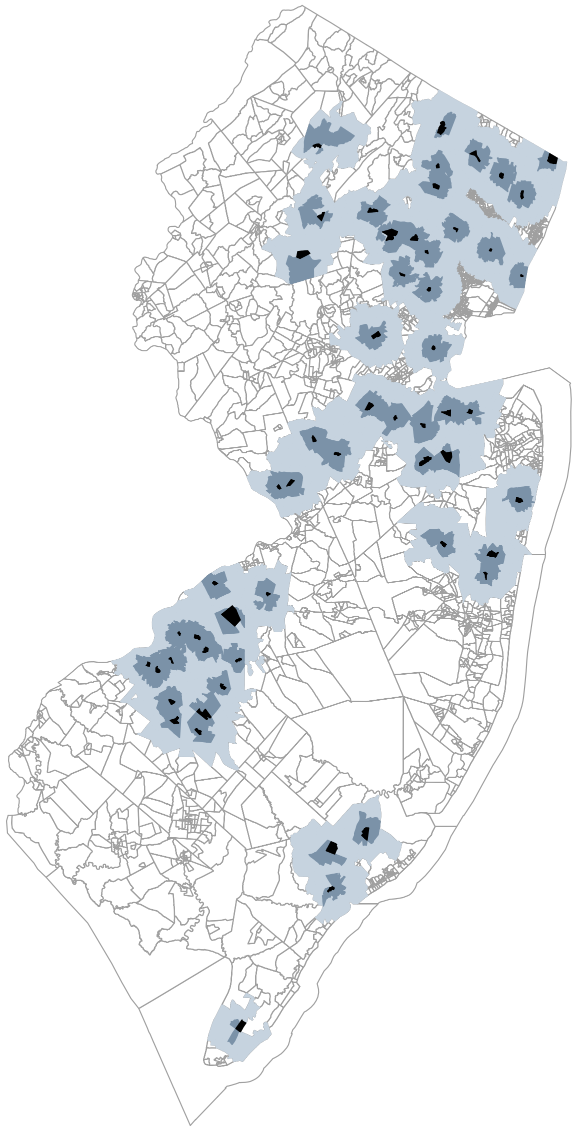

Fig. 4. Retail clinic distance groups: 0–2 mi versus 2–5 mi. Notes: The above map displays the distance bands used in our main analysis. The black block groups contain a retail clinic. The rings of block groups are shaded lighter as one moves away from a retail clinic and depict distances of 0–2 mi and 2–5 mi from each retail clinic.

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 hospitalization.

For influenza, we look at both the total number of visits and the number of visits by patients in different age groups (ages 0, 1–4, 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 in vaccination rates.[24] Despite the CDC's recommendation that everyone aged six months and older get a flu shot each year, prime-aged adults are much less likely to be vaccinated than other age groups, with vaccination rates around 35% versus over two-thirds for young children and older adults (CDC, 2012).

In addition to the number of ER visits, we further consider the average severity of cases arriving at the ER within each diagnosis category. Our main proxy for severity is the total list charges reported for each patient.[25] 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 care was given to a patient and proxies for severity.[26]

Finally, while we cannot directly measure the care provided in retail clinics in our data, we use the SMART BRFSS from 2006 to 2010 to explore the association between retail clinics and the prevalence of flu vaccinations. In response to demand for localized health information, the SMART BRFSS uses BRFSS data to produce county-level estimates for select locations with at least 500 respondents. Over 2006–2010, 19 of the 21 counties in New Jersey were included in the SMART BRFSS. In addition to the county of the respondent and the month of the interview, these data indicate whether the respondent received a flu shot in the past 12 months.

5. Empirical specification

Our difference-in-difference strategy compares the number of ER visits by residents living near a retail clinic to visits by residents living slightly farther away, both before and after a retail clinic opened or closed. There are two observations per week for each retail clinic: (1) the number of ER visits or average severity among patients living 0–2 mi from the retail clinic, and (2) the same outcomes for patients living 2–5 mi away. 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, regardless of whether the retail clinic was currently operating.

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 conditional on being within a 5-mi radius of a clinic, 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% of families using retail clinics said the fact that "the location was more convenient than another source of care" was either a major (49%) of minor (27%) factor in choosing to use a retail clinic. In addition, Tu and Boukus (2013) report that the rate of retail clinic use was 40% higher for patients living less than 1 mi from a retail clinic relative to those living 1–5 mi away in 2010.[27]

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 alternative distances to define the near group (0–0.5, 0.5–1, 1–1.5, and 1.5–2 mi from a retail clinic) while holding the far group fixed at 2–5 mi. The wider distance band definitions draw larger areas into the treatment group, reducing noise in our estimates of

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

[25] We considered three additional proxies for severity: (1) hospital admission, (2) the fraction of patients over 80 years old, and (3) the number of comorbidities. However, as most ER visits for primary care treatable conditions are made by relatively young patients with no other diagnoses who do not require admission, there is unfortunately little meaningful variation in these measures for the conditions that we consider.

[26] Total list charges are an imperfect proxy, however, since hospitals could respond to retail clinic entry by changing their charge master. We think it is unlikely that hospitals respond in this way, at least immediately.

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

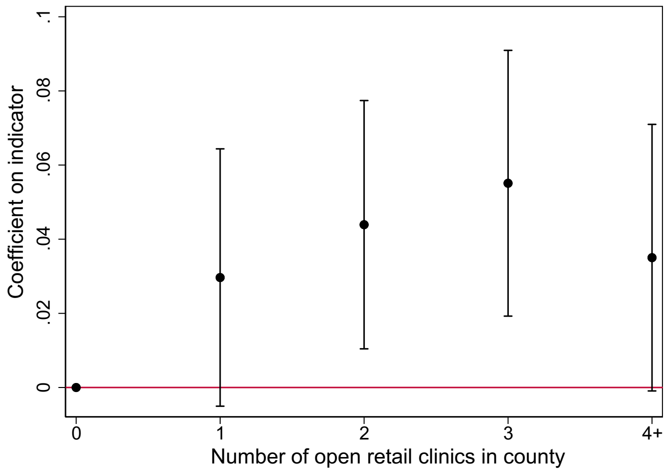

Fig. 5. Retail clinics and the prevalence of influenza vaccinations. Notes: The above figure displays coefficients and 95% confidence intervals from a regression of an indicator denoting whether respondents received a flu shot in the past 12 months on indicators for the number of open retail clinics in a given county-month. Data on flu shots comes from the SMART BRFSS from 2006 to 2010; 19 of the 21 counties in New Jersey are in this data. Observations are at the individual level and are weighted using BRFSS sample weights. Standard errors are clustered by county.

ER visit rates. However, if only people very close to a retail clinic are actually more likely to use it, then using the wider distance band definition will lead us to underestimate the true effects of retail clinics on ER use by including untreated areas in the treatment group. Alternatively, and perhaps more likely, if the true treated population decays with distance but is not zero by 2 mi away from the clinic, some of the population in the “far” distance group in our main specification will also be treated. If some of the control group is in reality treated, our results will again underestimate the true effects 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, Figs. 6–8 plot the average difference in the number of ER visits per 100,000 people between the near (treatment) and far (control) groups for primary care treatable conditions (Fig. 6); emergent, preventable conditions (Fig. 7); and emergent, non-preventable conditions (Fig. 8). Both clinic openings and closings are considered events (with closings treated as the negative of openings with respect to event time), and month-by-year and retail clinic fixed effects are removed from the data. The trends in ER visits between the near and far distance groups are reasonably similar before a retail clinic opens (or after it closes), suggesting that the parallel trends assumption is justified. Note that our “near” and “far” definitions refer to distance to a retail clinic, which is uncorrelated with distance to the nearest ER.[28] It is therefore unsurprising that there are similar pre-trends in ER use in the two groups.

To measure the effects of retail clinics on ER use, we estimate regressions of the following form:

$$\left(\frac{ER \quad Visits}{Population/100,000}\right)_{cdt} = \beta_0 + \beta_1 \mathbb{I}\{near\}_{cd} + \beta_2 \mathbb{I}\{open\}_{ct} + \beta_3 \left[\mathbb{I}\{near\}_{cd} * \mathbb{I}\{open\}_{ct}\right] + \beta X_{cd} + \lambda_c + \lambda_{month} + \epsilon_{cdt} \quad (1)$$

where $\left(\frac{ER \quad Visits}{Population/100,000}\right)_{cdt}$ 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 indicator $\mathbb{I}\{near\}_{cd}$ is equal to one for observations from the near category, regardless of whether the retail clinic is currently operating. The variable $\mathbb{I}\{open\}_{ct}$ is an indicator equal to one if retail clinic c is operating in week t and zero otherwise for both distance groups associated with the retail clinic. Eq. (1) further includes month-by-year and retail clinic 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.[29] We further control for the time-varying distance from each retail clinic to the nearest hospital.[30] Standard errors are clustered by retail clinic, and all of our regressions are weighted by population.[31]

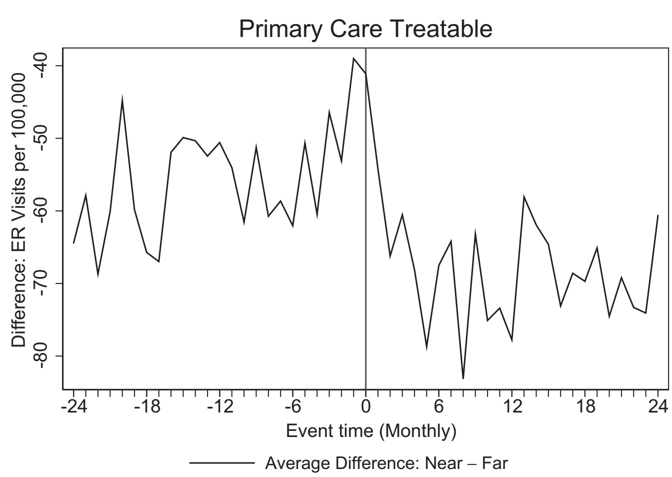

Fig. 6. Primary care treatable conditions: ER visits in event time. Notes: The above figure displays output from a regression of ER visits per 100,000 people at the retail clinic–distance band–month level on an indicator for near, event time indicators, near ∗ event time indicators, and month-by-year and retail clinic fixed effects. We plot the sum of each near ∗ event time coefficient and the main effect of near, which represents the regression-adjusted average difference in ER visits per 100,000 between the near and far distance groups. Observations are weighted by population and the panel is balanced. The near (far) group includes block groups that are 0–2 (2–5) mi from a retail clinic. An event is defined as either a clinic opening or closing; clinic closings are treated inversely to clinic openings. “Primary care treatable” is the sum of ER visits for urinary tract infections, conjunctivitis, upper respiratory tract infections, pharyngitis, otitis media, and sprains and strains.

28 At the block group level, the correlation between distance to the nearest open retail clinic and distance to the nearest hospital-based ER is 0.036.

29 Demographic controls include population density, the fraction black residents, 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+).

30 The distance between each retail clinic and the nearest hospital is time varying because of hospital closings. In principle we could run the analysis separately on areas that are near versus far from an ER, but unfortunately there is little variation in distance to the nearest hospital across population centers in New Jersey.

31 The qualitative patterns and statistical significance of our results are unaffected by weighting. Unweighted regression results are available upon request.

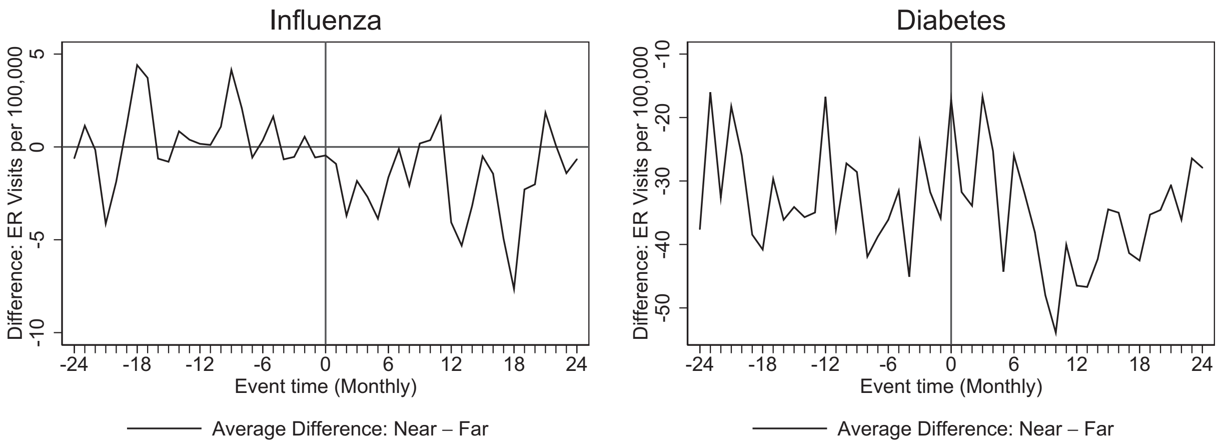

Fig. 7. Emergent, preventable conditions: ER visits in event time. Notes: Each figure displays output from a regression of ER visits per 100,000 people at the retail clinic–distance band–month level on an indicator for near, event time indicators, near ∗ event time indicators, and month-by-year and retail clinic fixed effects. We plot the sum of each near ∗ event time coefficient and the main effect of near, which represents the regression-adjusted average difference in ER visits per 100,000 between the near and far distance groups. Observations are weighted by population and the panel is balanced. The near (far) group includes block groups that are 0–2 (2–5) mi from a retail clinic. An event is defined as either a clinic opening or closing; clinic closings are treated inversely to clinic openings.

The parameter of interest in Eq. (1) is β_3, the coefficient on the interaction term $\mathbb{I}\{near\}_{cd} * \mathbb{I}\{open\}_{ct}$. 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., retail clinic openings and closings).

Our main specification exploits variation in open retail clinics stemming from both retail clinic openings and closings. However, it is possible that the effects of openings and closings are asymmetric. For example, a closure will force people to immediately switch providers whereas it may take time for patients to start using a new retail clinic when it opens. To examine whether the effects are symmetric, we estimate Eq. (1) separately for openings and closings. When considering openings, we exclude observations following a closure such that clinics are either not yet open or open. When considering closures, we exclude observations prior to an opening such that clinics are either open or have closed.

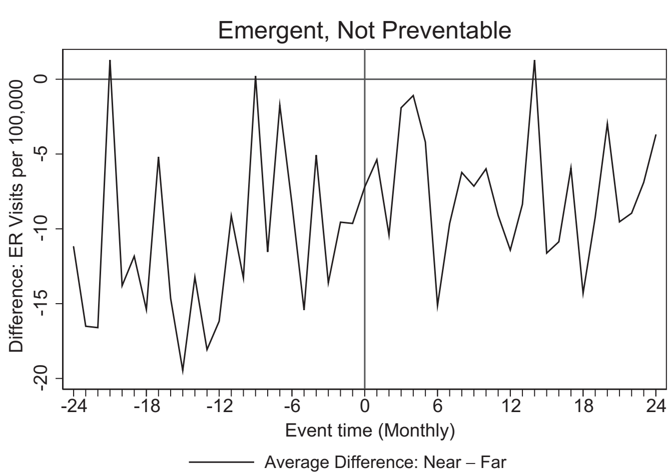

Fig. 8. Emergent, non-preventable conditions (placebo): ER visits in event time. Notes: The above figure displays output from a regression of ER visits per 100,000 people at the retail clinic–distance band–month level on an indicator for near, event time indicators, near ∗ event time indicators, and month-by-year and retail clinic fixed effects. We plot the sum of each near ∗ event time coefficient and the main effect of near, which represents the regression-adjusted average difference in ER visits per 100,000 between the near and far distance groups. Observations are weighted by population and the panel is balanced. The near (far) group includes block groups that are 0–2 (2–5) mi from a retail clinic. 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 ER visits for fractures, births, and poisonings.

Missing from our analysis of the ER data is the ability to estimate a first stage; that is, we cannot directly show the effects of retail clinics on the use of primary care services. While the SMART BRFSS data do report information on influenza vaccinations, the data only include county of residence (and not exact residential address), so we cannot construct precise distance-based treatment and control groups. Furthermore, the data only cover the first half of our sample (2006–2010). We therefore cannot replicate our primary specification using influenza vaccinations as the dependent variable. However, we can use the SMART BRFSS data to show suggestive evidence of the relationship between retail clinics and vaccination rates. In particular, we regress an indicator denoting whether an individual had a flu shot in the past year on indicators denoting the number of open retail clinics in each county-month. Regressions are weighted using BRFSS sample weights, and standard errors are clustered at the county level.

6. Results

Figs. 6 and 7 show suggestive evidence that ER visits for primary care treatable and emergent, preventable conditions decrease 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 appears to reverse: after a retail clinic opens, the near distance group switches from having slightly more ER visits to having slightly fewer ER visits relative to the far group. Reassuringly, Fig. 8 demonstrates that no such pattern emerges among our placebo conditions.[32]

To more formally examine the impacts of retail clinics on ER use, we estimate Eq. (1). Results for the full sample are provided in Table 4. As can be seen in the first row, we do not find a statistically significant main effect of a retail clinic being open for any condition.

[32] The null results for the placebo conditions tell us two things: (1) trends in underlying health are not changing differentially in the treatment and control groups, and (2) other changes in the provision of care that occurred over a similar period, such as the expansion of urgent care centers and walk-in physician clinics, do not bias our results (as these types of clinics do treat some of the placebo conditions).

Table 4
Effects of retail clinics on ER visits.

	Primary care treatable					
	(1)	(2)	(3)	(4)	(5)	(6)
	UTI	Conjunctivitis	URTI	Pharyngitis	Otitis	Sprain/strain
Open	0.117	0.228	1.077	0.189	0.251	1.104
	(0.308)	(0.146)	(0.841)	(0.490)	(0.325)	(0.693)
Near	−0.041	0.151	−0.064	0.082	−0.138	1.738
	(0.455)	(0.200)	(1.032)	(0.566)	(0.497)	(1.088)
Open * Near	−0.890**	−0.402**	−1.597*	−1.435**	−0.715*	−2.289***
	(0.390)	(0.179)	(0.879)	(0.619)	(0.421)	(0.813)
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	0.521	0.454	0.732	0.661	0.642	0.679
Observations	51,480	51,480	51,480	51,480	51,480	51,480

	Emergent, preventable		Placebo: emergent, not preventable		
	(1)	(2)	(3)	(4)	(5)
	Influenza	Diabetes	Fracture	Poisoning	Births
Open	0.028	−0.321	0.216	0.053	−0.267
	(0.120)	(1.183)	(0.327)	(0.102)	(0.301)
Near	0.102	0.816	0.706	0.054	−0.668**
	(0.078)	(1.937)	(0.560)	(0.136)	(0.282)
Open * Near	−0.251***	−2.526*	−0.555	−0.117	0.548
	(0.088)	(1.441)	(0.439)	(0.102)	(0.425)
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	0.502	0.790	0.458	0.401	0.616
Observations	51,480	51,480	51,480	51,480	51,480

Notes: Observations are at the retail clinic–distance band–week level and are population weighted. The dependent variable in each regression is the number of ER visits for a given condition per 100,000 people. All regressions include month-by-year and retail clinic fixed effects; additional controls include population density, fraction black, a quadratic in median household income, and the age structure at the retail clinic–distance band level and distance to the nearest hospital at the retail clinic–year level. The near (far) group includes block groups that are 0–2 (2–5) mi from a retail clinic. "UTI" denotes urinary tract infections; "URTI" denotes upper respiratory tract infections. Standard errors are clustered by retail clinic.

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

The main effect of being 0–2 mi from a retail clinic is also statistically insignificant except for the case of childbirth, confirming that the near and far groups have very similar patterns of ER use in the absence of an open retail clinic.

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 0.25 visits per 100,000 (13.4% relative to the mean) and ER visits for diabetes fall by 2.53 visits per 100,000 (3.3% relative to the mean) 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% level of confidence, however. This pattern 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.

To get a sense of the magnitudes of these effects, we compare the estimates in Table 4 to differences in vaccinations rates across counties with different numbers of retail clinics. Fig. 5 provides suggestive evidence that places with more retail clinics have more vaccinations: counties with open retail clinics have 3–4% more flu shots, suggesting that there is a "first-stage" effect of retail clinics on the use of preventive care.[33] Given the average population of a New Jersey county, a 3% increase in vaccination implies an additional 12,557 flu shots received. If 100 (80) percent of these shots were received by people living within 2 mi of an open retail clinic, then a retail clinic would lead to an additional 1030 (823) flu shots per 100,000 people within 2 mi (Table 3 indicates that 1,216,734 people live within 2 mi of a retail clinic in New Jersey). The CDC suggests that 6000 hospitalizations would be prevented if an additional 5% of the U.S. population were immunized (an additional 16.285 million people; CDC, 2017). This ratio implies that 679 additional flu shots per 100,000 would be necessary to reduce hospitalizations by 0.25 per 100,000, the reduction that we find as the result of an open retail clinic in Table 4. The CDC remarks that issues with vaccination data quality may cause them to overestimate the efficacy of flu vaccination in preventing hospitalization, suggesting that our numbers are quite reasonable.

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, there are significant negative interactions for all of the primary care treatable conditions examined, indicating that people substitute away from ERs when a retail clinic is available. The reductions in ER visits for these minor conditions range from around 6% for urinary tract infections, upper respiratory infections, otitis, and sprains and strains to 12% for pharyngitis. Finally, as predicted, there are no statistically significant effects 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 demonstrate that adults aged 18–44, the group that previous work suggests is the most likely to have low vaccination rates and to obtain a flu shot from a retail clinic, see a 17% reduction in ER visits for influenza. We also find large

[33] Fig. A4 shows coefficients and 95% confidence intervals from an analogous regression in which we use indicators for quartiles of open retail clinics per capita in place of indicators for the number of open retail clinics. The pattern is similar to that discussed above.

Table 5
Effects of retail clinics on ER visits for flu by patient age.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All visits	Age 0	Ages 1–4	Ages 5–17	Ages 18–44	Ages 45–64	Ages 65+
Open	0.028	0.086	−0.087	−0.038	0.051	0.044	−0.026
	(0.120)	(0.205)	(0.386)	(0.270)	(0.105)	(0.050)	(0.066)
Near	0.102	0.188	0.406	0.272*	0.057	−0.008	−0.013
	(0.078)	(0.133)	(0.248)	(0.157)	(0.102)	(0.039)	(0.060)
Open * Near	−0.251***	−0.027	−0.791***	−0.369**	−0.325***	−0.080	0.051
	(0.088)	(0.193)	(0.288)	(0.176)	(0.107)	(0.065)	(0.089)
Mean per 100k	1.878	1.958	3.697	2.734	1.942	0.864	0.929
Mean pop.	175,121	11,781	11,781	30,037	66,860	46,345	22,901
R-squared	0.502	0.206	0.289	0.355	0.460	0.351	0.358
Observations	51,480	51,480	51,480	51,480	51,480	51,480	51,480

Notes: Observations are at the retail clinic–distance band–week level and are population weighted. The dependent variable in each regression is the number of ER visits for influenza per 100,000 people in a given age group. All regressions include month-by-year and retail clinic fixed effects; additional controls include population density, fraction black, a quadratic in median household income, and the age structure at the retail clinic–distance band level and distance to the nearest hospital at the retail clinic–year level. The near (far) group includes block groups that are 0–2 (2–5) mi from a retail clinic. Standard errors are clustered by retail clinic. The youngest age bin available in the census is under five years; both columns 2 and 3 therefore use the population of children aged 0–4 as the denominator for the ER visit rate.

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

Table 6
Effects of retail clinics on ER visits: clinic openings versus clinic closings.

	Primary care treatable					
	(1)	(2)	(3)	(4)	(5)	(6)
	UTI	Conjunctivitis	URTI	Pharyngitis	Otitis	Sprain/strain
a. Main results						
Open * Near	−0.890**	−0.402**	−1.597*	−1.435**	−0.715*	−2.289***
	(0.390)	(0.179)	(0.879)	(0.619)	(0.421)	(0.813)
Mean per 100k	15.615	4.011	27.152	11.942	12.140	39.662
b. Clinic openings						
Open * Near	−0.635*	−0.317*	−1.223	−1.385**	−0.432	−1.999***
	(0.378)	(0.173)	(0.937)	(0.671)	(0.388)	(0.664)
Mean per 100k	15.336	3.930	26.310	11.651	11.818	38.872
c. Clinic closings						
Open * Near	−1.239*	−0.605**	−2.239	−1.187	−1.209	−3.009*
	(0.685)	(0.287)	(1.415)	(0.779)	(0.788)	(1.632)
Mean per 100k	15.684	3.948	27.131	11.790	11.777	39.498

	Emergent, preventable		Placebo: emergent, not preventable		
	(1)	(2)	(3)	(4)	(5)
	Influenza	Diabetes	Fracture	Poisoning	Births
a. Main results					
Open * Near	−0.251***	−2.526*	−0.555	−0.117	0.548
	(0.088)	(1.441)	(0.439)	(0.102)	(0.425)
Mean per 100k	1.878	76.390	27.495	5.064	20.804
b. Clinic openings					
Open * Near	−0.211**	−1.920	−0.417	−0.090	0.544
	(0.096)	(1.421)	(0.414)	(0.117)	(0.486)
Mean per 100k	1.765	73.930	27.222	5.033	20.421
c. Clinic closings					
Open * Near	−0.367***	−5.236**	−1.560**	−0.272	0.219
	(0.109)	(2.417)	(0.767)	(0.186)	(0.540)
Mean per 100k	2.198	77.495	27.408	4.918	20.182

Notes: Observations are at the retail clinic–distance band–week level and are population weighted. The dependent variable in each regression is the number of ER visits for a given condition per 100,000 people. All regressions include month-by-year and retail clinic fixed effects; additional controls include population density, fraction black, a quadratic in median household income, and the age structure at the retail clinic–distance band level and distance to the nearest hospital at the retail clinic–year level. For each condition, we use three sources of variation to estimate the effects of an open retail clinic: (a) clinic openings and closings as in our main specification, (b) clinic openings alone by only including retail clinics that opened over our sample period and dropping observations after a given clinic closes, and (c) clinic closings alone by only including retail clinics that closed over our sample period and dropping observations before a given clinic opens. The near (far) group includes block groups that are 0–2 (2–5) mi from a retail clinic. "UTI" denotes urinary tract infections; "URTI" denotes upper respiratory tract infections. Standard errors are clustered by retail clinic.

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

Table 7
Effects of retail clinics on ER visits: weekdays versus weekends.

	Primary care treatable					
	(1)	(2)	(3)	(4)	(5)	(6)
	UTI	Conjunctivitis	URTI	Pharyngitis	Otitis	Sprain/strain
a. Main results						
Open * Near	−0.890**	−0.402**	−1.597*	−1.435**	−0.715*	−2.289***
	(0.390)	(0.179)	(0.879)	(0.619)	(0.421)	(0.813)
Mean per 100k	15.615	4.011	27.152	11.942	12.140	39.662
b. Weekdays						
Open * Near	−0.702**	−0.313**	−1.221*	−1.017**	−0.554*	−1.780***
	(0.280)	(0.134)	(0.660)	(0.458)	(0.313)	(0.612)
Mean per 100k	11.389	2.686	19.262	8.129	8.358	28.850
Per day effect	−0.140	−0.063	−0.244	−0.203	−0.111	−0.356
c. Weekends						
Open * Near	−0.188	−0.089*	−0.376*	−0.419**	−0.160	−0.509**
	(0.121)	(0.052)	(0.224)	(0.167)	(0.116)	(0.221)
Mean per 100k	4.226	1.325	7.890	3.813	3.782	10.812
Per day effect	−0.094	−0.045	−0.188	−0.210	−0.080	−0.255

	Emergent, preventable		Placebo: emergent, not preventable		
	(1)	(2)	(3)	(4)	(5)
	Influenza	Diabetes	Fracture	Poisoning	Births
a. Main results					
Open * Near	−0.251***	−2.526*	−0.555	−0.117	0.548
	(0.088)	(1.441)	(0.439)	(0.102)	(0.425)
Mean per 100k	1.878	76.390	27.495	5.064	20.804
b. Weekdays					
Open * Near	−0.173***	−1.751	−0.509	−0.073	0.426
	(0.058)	(1.108)	(0.318)	(0.078)	(0.337)
Mean per 100k	1.302	60.908	19.329	3.590	16.746
Per day effect	−0.035	−0.350	−0.102	−0.015	0.085
c. Weekends					
Open * Near	−0.078**	−0.775**	−0.046	−0.043	0.122
	(0.033)	(0.352)	(0.137)	(0.038)	(0.094)
Mean per 100k	0.577	15.482	8.166	1.475	4.058
Per day effect	−0.039	−0.388	−0.023	−0.022	0.061

Notes: Observations are at the retail clinic–distance band–week level and are population weighted. The dependent variable in each regression is the number of ER visits for a given condition per 100,000 people. All regressions include month-by-year and retail clinic fixed effects; additional controls include population density, fraction black, a quadratic in median household income, and the age structure at the retail clinic–distance band level and distance to the nearest hospital at the retail clinic–year level. For each condition, we estimate the effect of an open retail clinic on three samples: (a) weekly ER visits as in our main specification, (b) ER visits on weekdays only, and (c) ER visits on weekends only. The "per day effect" is the total effect divided by the number of days included in the time period (five days for weekdays, two days for weekends). The near (far) group includes block groups that are 0–2 (2–5) mi from a retail clinic. "UTI" denotes urinary tract infections; "URTI" denotes upper respiratory tract infections. Standard errors are clustered by retail clinic.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

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. Reassuringly, we observe no effect of retail clinics on ER visits for influenza among infants.[34] As infants are unlikely to be treated in retail clinics, this analysis may be regarded as a placebo test.

Table 6 provides estimates from a model that allows the effects of openings and closings to differ. The estimates suggest that openings and closings have an asymmetric effect, with closings having larger effects in general. This pattern likely reflects the stickiness of where patients receive care: when a new retail clinic opens, it likely takes time for patients to discover the clinic and switch from their previous source of care. However, when patients are using a retail clinic and it closes, they may delay getting preventive care since it has become less convenient, or they may no longer have a usual source of care other than the ER. This asymmetry suggests that retail clinics affect care primarily by improving access: if the role of retail clinics was mainly to provide information, then one would expect to see more symmetric effects of openings and closings.

If it is easier to seek care at a doctor's office on weekdays versus weekends, then we would expect the effects of retail clinics on ER use to be more pronounced on weekends. To explore heterogeneity by day of the week, Table 7 splits the sample by whether the visit occurred on a weekday or on a weekend. The estimated coefficients are larger on weekdays, which reflects the fact that there are five weekdays per week and only two weekend days. Adjusting for this difference, the per day effects of having an open retail clinic are similar on weekends and weekdays. This likely reflects the difficulties that patients face getting a doctor's appointment on short notice: recent data demonstrate that new patients wait an average

[34] Population data from the census are only available in age bins at the block group level. As the youngest age bin is under five years, we use the population of children aged 0–4 as the denominator for the ER visit rate in both column 2 (age 0) and column 3 (ages 1–4) in Table 5.

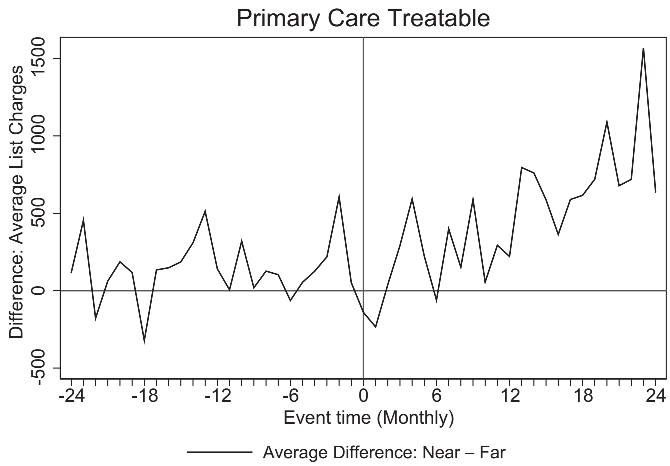

Fig. 9. Primary care treatable conditions: average total list charges in event time. Notes: The above figure displays output from a regression of average total list charges per ER visit at the retail clinic–distance band–month level on an indicator for near, event time indicators, near ∗ event time indicators, and month-by-year and retail clinic fixed effects. We plot the sum of each near ∗ event time coefficient and the main effect of near, which represents the regression-adjusted average difference in average total list charges per ER visit between the near and far distance groups. Observations are weighted by population and the panel is balanced. Hospital visits with list charges at or above the 99.99th percentile across all ER visits for a given condition are excluded. The near (far) group includes block groups that are 0–2 (2–5) miles from a retail clinic. An event is defined as either a clinic opening or closing; clinic closings are treated inversely to clinic openings. "Primary care treatable" includes ER visits for urinary tract infections, conjunctivitis, upper respiratory tract infections, pharyngitis, otitis media, and sprains and strains.

of three weeks for a primary care appointment, with only 10% of patients being able to see a doctor the same day (Hayhurst, 2017). These results underscore the potential for retail clinics to improve access to care even during normal business hours.

As previously noted, we consider average total list charges per ER visit as a proxy of severity. Figs. 9–11 show event study graphs of differences in average list charges across the near and far distance groups for primary care treatable conditions (Fig. 9); emergent, preventable conditions (Fig. 10); and emergent, non-preventable conditions (Fig. 11). While average list charges are very similar in the treatment and control groups prior to the opening (and after the closing) of a retail clinic for primary care treatable conditions, average list charges in the treatment areas are higher than those in the control areas when a retail clinic is open. This finding provides suggestive evidence that the simplest primary care treatable cases substitute away from ERs to retail clinics, leaving the more complicated cases in the ER.[35]

The list charge data are very noisy, which makes it difficult to identify the timing of trend breaks precisely. However, a comparison of Figs. 6 and 9 suggests that for primary care treatable conditions, the number of ER visits falls within six months of a clinic being open whereas average list charges only begin to rise after about six months. It is possible that it takes time for patients to learn to sort efficiently across providers; that is, people may need to gather experience being treated at a retail clinic before they learn that retail clinics are adequate for simple ailments and that ERs should be reserved for more complex conditions. The slow rise in list charges after a clinic opens is consistent with the asymmetric effects of retail clinic openings and closings discussed earlier.

Perhaps unsurprisingly, Fig. 10 provides little evidence of a change in the severity of influenza cases seen in the ER. 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 and visits the ER. 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, Fig. 11 shows that for placebo conditions like fractures and childbirth, average list charges are roughly the same in the treatment and control groups both before and after a retail clinic opens or closes.

Table 8 provides estimates of the effects of being near an open retail clinic on average total list charges for ER visits estimated in a regression similar to Eq. (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. There is therefore some, albeit weak, evidence that patients with less severe cases of these conditions substitute from ERs to retail clinics to receive treatment.[36]

7. Robustness

As previously noted, using a 2-mi distance band around a retail clinic as the treatment group is somewhat arbitrary. To explore the sensitivity of our results to this empirical choice, we examine how our estimates change when we define the treatment group as 0–0.5, 0.5–1, 1–1.5, or 1.5–2 mi from an open retail clinic for primary care treatable and emergent, preventable conditions in Figs. 12 and 13, respectively.[37] We hold the control group of 2–5 mi fixed for these analyses and provide our main estimates (treatment group of 0–2 mi) for comparison. In general, the estimates become smaller but more precise as one moves away from the clinic. This makes sense: the estimates become smaller because people further away from the clinic are less likely to be treated, and the estimates become more precise because bands further from the clinic cover a larger area (and therefore more people) than a circle with a radius of 0.5 mi. Reassuringly, the plots demonstrate that there are no significant effects once one is 1.5–2 mi away from a retail clinic (relative to the 2–5 mi distance band), so our main specification of 0–2 mi versus 2–5 mi accurately captures the effects.[38]

Qualified pharmacists in New Jersey have been able to administer vaccines to adults since 2004.[39] 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 period during which pharmacists were allowed to administer the flu vaccine to children

35 Evidence demonstrates that privately insured patients receive more intensive medical care for the same diagnosis (see, for example, Alexander and Currie, 2017; Card et al., 2009; Doyle, 2005). If retail clinics are more likely to attract patients without insurance or covered by Medicaid, then average total list charges per ER visit could also rise due to compositional changes in insurance type. However, Table A4 shows that retail clinics have no effect on the fraction of patients begin treated in the ER who are covered by private insurance.

36 Since the distribution of list charges is skewed to the right, Table 8 is based on data that trim the top 0.01% of charges. Table A2 shows estimates from regressions using untrimmed list charges. As an alternative approach to mitigating outliers, Table A3 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.

37 Analogous figures for emergent, non-preventable (placebo) conditions are shown in Fig. A5.

38 Table A5 shows results from a model that only considers people within 0–2 mi of a retail clinic and exploits openings and closings in a difference-in-difference framework. The point estimates are qualitatively similar but less precisely estimated than the main results shown in Table 4.

39 Unfortunately, our ER data do not go back far enough to look at the effects of allowing pharmacists to provide vaccinations on ER use.

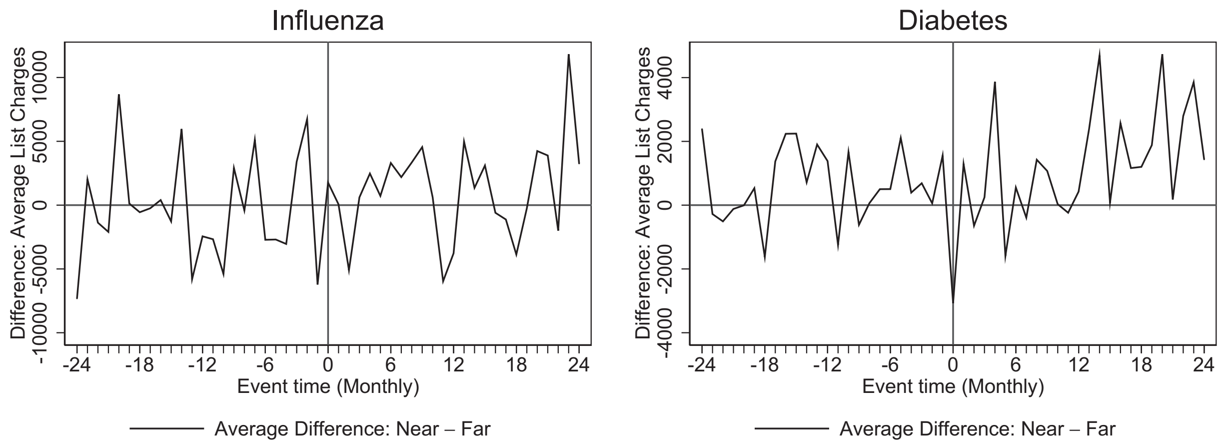

Fig. 10. Emergent, preventable conditions: average total list charges in event time. Notes: Each figure displays output from a regression of average total list charges per ER visit at the retail clinic–distance band–month level on an indicator for near, event time indicators, near ∗ event time indicators, and month-by-year and retail clinic fixed effects. We plot the sum of each near ∗ event time coefficient and the main effect of near, which represents the regression-adjusted average difference in average total list charges per ER visit between the near and far distance groups. Observations are weighted by population and the panel is balanced. Hospital visits with list charges at or above the 99.99th percentile across all ER visits for a given condition are excluded. The near (far) group includes block groups that are 0–2 (2–5) miles from a retail clinic. An event is defined as either a clinic opening or closing; clinic closings are treated inversely to clinic openings.

or to dropping the last eight months of our sample. Furthermore, since we find large effects of retail clinics on ER visits due to influenza among 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. As discussed above, urgent care centers differ from retail clinics in that they are staffed, run, and often owned by doctors, and price levels tend to be similar to doctor's offices (Mehrotra et al., 2009). They also compete more directly with ERs in that they often 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.

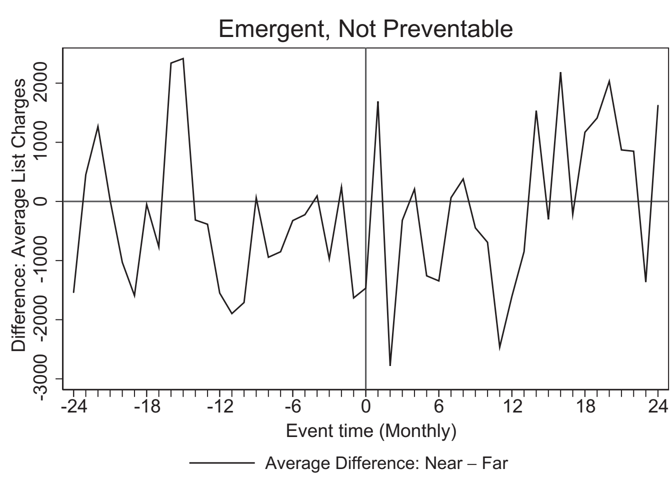

Fig. 11. Emergent, non-preventable conditions (placebo): average total list charges in event time. Notes: The above figure displays output from a regression of average total list charges per ER visit at the retail clinic–distance band–month level on an indicator for near, event time indicators, near ∗ event time indicators, and month-by-year and retail clinic fixed effects. We plot the sum of each near ∗ event time coefficient and the main effect of near, which represents the regression-adjusted average difference in average total list charges per ER visit between the near and far distance groups. Observations are weighted by population and the panel is balanced. Hospital visits with list charges at or above the 99.99th percentile across all ER visits for a given condition are excluded. The near (far) group includes block groups that are 0–2 (2–5) miles from a retail clinic. An event is defined as either a clinic opening or closing; clinic closings are treated inversely to clinic openings. "Emergent, not preventable" includes ER visits for fractures, births, and poisonings.

The key issue for our analysis is whether patients who live 0–2 mi from a retail clinic are also more likely to live closer to an urgent care center than those who live 2–5 mi away. 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 (the locations of both urgent care centers and retail clinics are plotted in Fig. A3). Furthermore, if urgent care centers were opening in similar locations to retail clinics at similar times, we would find "effects" of retail clinics on fractures and poisonings (which can be treated in urgent care centers but not retail clinics), which we do not. We therefore do not believe that the presence of urgent care centers biases our results of the impacts of retail clinics.

8. Discussion

Our study shows that retail clinics reduce ER visits both for minor conditions and for conditions like influenza and diabetes that are preventable with adequate primary care. These findings suggest that retail clinics, with their transparent prices and convenient access, have the potential to be welfare-improving. Indeed, if Fig. 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 doctors' 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 Fig. 1) are likely to also be socially beneficial.

One 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; making consumption cheaper and easier should increase the size of this distortion. It is also possible that retail clinics will cause

Table 8
Effects of retail clinics on average total list charges per ER visit.

	Primary care treatable					
	(1)	(2)	(3)	(4)	(5)	(6)
	UTI	Conjunctivitis	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	1220.547	3899.715	1788.249	1829.747	2667.661
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		Placebo: emergent, not preventable		
	(1)	(2)	(3)	(4)	(5)
	Influenza	Diabetes	Fracture	Poisoning	Births
Open	−214.543	−388.686	−347.490	27.087	91.058
	(997.012)	(362.217)	(340.134)	(429.094)	(464.000)
Near	−2119.802	−427.187	−457.786	−625.744	−266.211
	(1315.987)	(414.853)	(318.818)	(427.497)	(221.921)
Open * Near	1827.985	764.090	467.331	886.099	389.109
	(1246.891)	(642.152)	(455.722)	(624.454)	(379.694)
Mean per 100k	7996.014	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

Notes: Observations are at the retail clinic–distance band–week level and are population weighted. The dependent variable in each regression is the average total list charges per ER visit 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-by-year and retail clinic fixed effects; additional controls include population density, fraction black, a quadratic in median household income, and the age structure at the retail clinic–distance band level and distance to the nearest hospital at the retail clinic–year level. The near (far) group includes block groups that are 0–2 (2–5) mi from a retail clinic. "UTI" denotes urinary tract infections; "URTI" denotes upper respiratory tract infections. Standard errors are clustered by retail clinic.

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

changes in the market for care that will affect the prices of traditional doctors' offices and ERs.

Nevertheless, we can use our results to provide back-of-the-envelope estimates of some of the costs and benefits of retail clinics on the health care 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 A6 and A7. 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 median costs for influenza and diabetes. Finally, because list prices overstate the actually amount paid, we use an approximate cost-to-charge ratio drawn from Medicare of one-third to deflate the estimated cost savings.

Combining these assumptions about costs 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 $15,223 per week per 100,000 people with convenient access to a clinic. This implies annual cost savings of $791,581 per 100,000, or $7.92 per person. Of this amount, $7.24 is accounted for by reductions in costs from ER visits due to influenza and diabetes, with over $7 coming from diabetes alone.

This is likely an underestimate of the cost savings attributable to retail clinics for three reasons.[40] First, we only consider two 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 may 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 effects 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.[41] Third, as discussed above, to the extent that there is error in drawing the boundary between "near" and "far" areas, the estimated effects of residing near an open retail clinic will be attenuated.

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.[42] Our results suggest that over half of this increased spending ($7.24) is offset by reductions in ER visits for the two preventable conditions we consider. Are these costs savings enough to overcome the costs of increased use? While we cannot provide a definitive answer to this

[40] Spetz 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 that NPs are allowed to provide.

[41] Around 1% of influenza and 9% of diabetes-related ER visits result in patients being discharged to skilled nursing facilities.

[42] 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. Notably, we find that reductions in ER visits for sprains and strains result in the largest cost savings among the primary care treatable conditions that we consider.

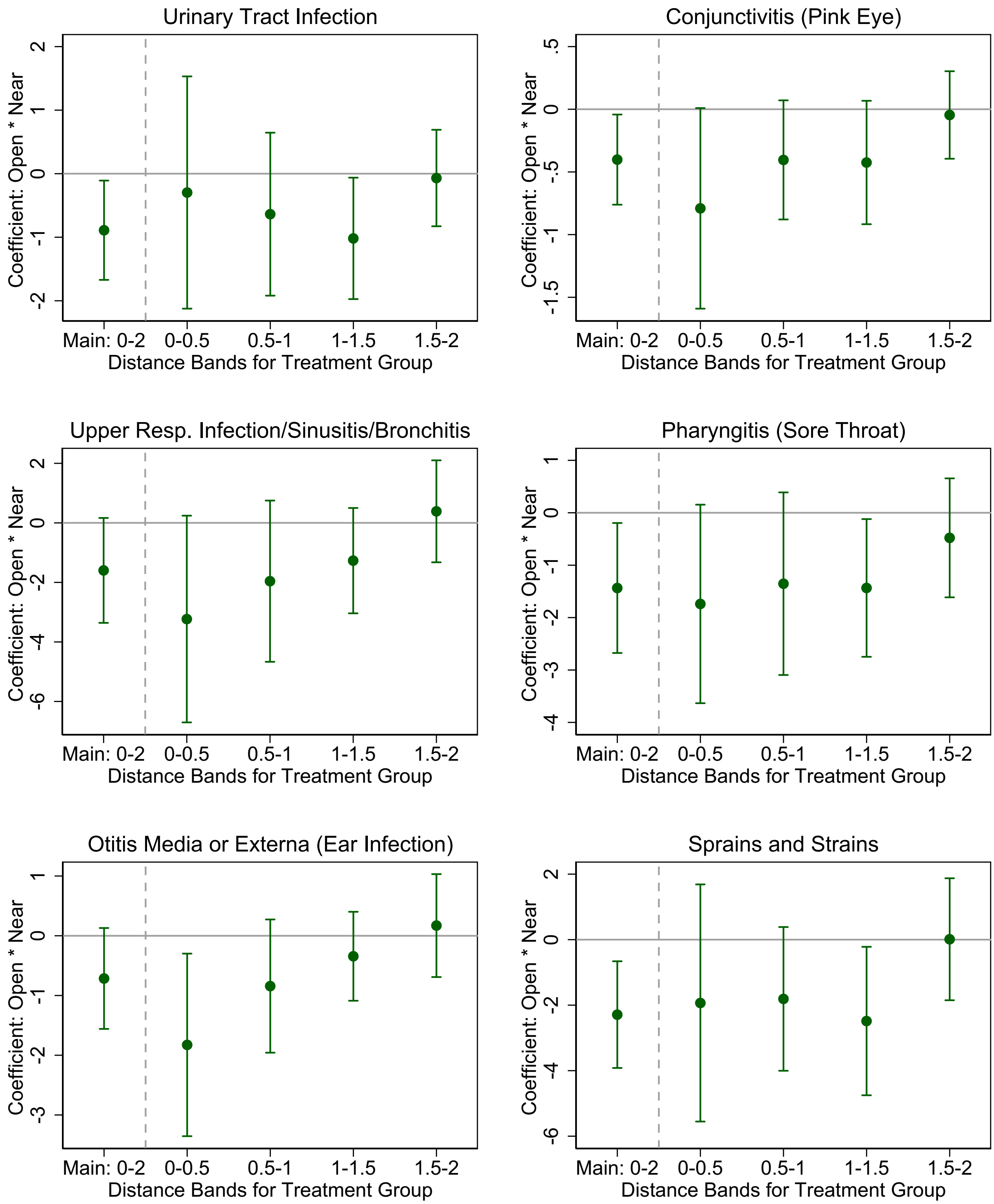

Fig. 12. Primary care treatable conditions: varying distance bands. Notes: Each coefficient and corresponding 95% confidence interval is from a separate regression. All regressions are identical to our main specification except that we vary the distance band used to define the "near" group (0–0.5, 0.5–1, 1–1.5, and 1.5–2 mi) holding fixed the "far" group at 2–5 mi from a retail clinic. Recall that we define the near group as 0–2 mi from a retail clinic in our main specification.

question, the fact that retail clinics appear to improve preventive care and thereby prevent disease suggests that retail clinics may well be welfare-enhancing. To the extent that preventing sickness is socially beneficial, even when illness does not result in an interaction with the health care system, such considerations may swing the balance of welfare calculations in favor of policies promoting retail clinics.

Our results leave open the question of mechanisms, though they do provide some suggestive evidence. The asymmetric effects of openings and closings suggest that primary care is quite sensitive to ease of access. Even consumers who know, for example, that they should have a flu shot or an appointment for routine diabetes care may be more likely to do so when access is easy.

Finally, our results may be seen through the lens of debates about the benefits of increasing competition in the U.S. health care market (Gaynor and Town, 2011). Policy makers have long sought to increase competition in health care markets. For example, a joint commission

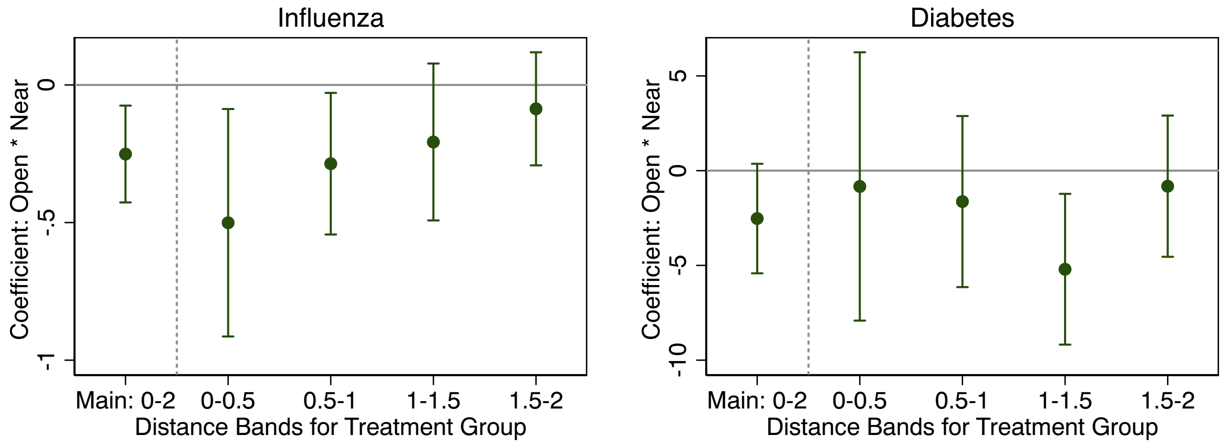

Fig. 13. Emergent, preventable conditions: varying distance bands. Notes: Each coefficient and corresponding 95% confidence interval is from a separate regression. All regressions are identical to our main specification except that we vary the distance band used to define the "near" group (0–0.5, 0.5–1, 1–1.5, and 1.5–2 mi) holding fixed the "far" group at 2–5 mi from a retail clinic. Recall that we define the near group as 0–2 mi from a retail clinic in our main specification.

of the Federal Trade Commission and the Department of Justice recommended adopting measures to increase competition including increasing transparency in pricing and lowering barriers to entry into primary care for allied health professions (FTC and DOJ, 2004). Expanded scope of practice laws that allow NPs to practice outside a doctor's office have played a key role in the rise of retail clinics (Carthon et al., 2017). In turn, retail clinics have been leaders in promoting price transparency. If retail clinics have indeed had positive effects on social welfare, then perhaps other measures to increase competition in the health care market will do so as well.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpubeco.2019.104050.

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