Prescribing Power and Equitable Access to Care: Evidence from Pharmacists in Ontario, Canada*

Alex Hoagland† Guan Wang‡

January 16, 2025

Abstract

Allowing pharmacists to directly treat patients may increase equitable access to healthcare and improve patient outcomes, but may also raise concerns about effective training or lead patients to substitute away from regular physician-based care. We study the effects of a 2023 policy allowing pharmacists to prescribe for minor ailments in Ontario, Canada. We use Advan foot traffic data to measure how this policy affected visits to pharmacies, with particular emphasis on heterogeneity across neighborhoods and spillover effects on visits to other non-pharmacy medical facilities. Allowing pharmacists to prescribe led to a 16% increase in total visits to pharmacies, and a 3% increase in visits to other healthcare providers. These increases were concentrated in materially deprived neighborhoods and benefited non-minority, non-immigrant populations the most. We use the policy as exogenous variation to identify substitution elasticities between pharmacy visits and traffic to other medical facilities. Overall, 23% of increases in traffic to pharmacies spillover into increased use of outpatient-based care. Importantly, pharmacy traffic is a substitute for hospital-based care, potentially as patients rely on pharmacists to triage their conditions rather than emergency care. Our results suggest that pharmacy-based care may increase use of outpatient care for at-risk patient populations while reducing hospital burdens.

Keywords: Health spillovers, pharmacist scope of practice, health equity

JEL codes: I18, I11, I14

*We are grateful to Audrey Laporte, Boriana Miloucheva, and Adrian Rohit Dass for useful feedback. This study was supported by funding through the Partnerships for Research Evaluation Program (PEPR), in partnership with the Ontario Ministry of Health. This study was also supported by ICES, which is funded by an annual grant from the Ontario MOH and the Ministry of Long-Term Care (MLTC). The opinions and conclusions expressed or implied in this manuscript are those of the authors, and are not intended to represent the views of the Province of Ontario.

†University of Toronto. alexander.hoagland@utoronto.ca

‡University of Toronto. wang.guan@mail.utoronto.ca

1 Introduction

Promoting equitable access to health services and reducing health disparities requires reducing barriers to access for vulnerable populations (Hoagland and Kipping, 2024). In many developed health systems including Canada and the United States, vulnerable populations report limited access even to primary healthcare professionals such as general practice physicians (Riley, 2012). Differences in the care received across populations can be attributed to differences in physician reimbursement (Decker, 2012; Alexander and Schnell, 2024) or insurance coverage (Hoagland et al., 2024a,b). However, even in countries with universal insurance coverage and uniform reimbursement, disparities persist (Martin et al., 2018). These continued differences may result in reduced health for the most at-risk patients (Chandra et al., 2024).

In addition to institutional barriers such as insurance coverage and provider incentives, patients may also face individual barriers to accessing care, such as income and liquidity constraints in the US (Gross et al., 2022) or limited access to a family physician in Canada (Isabelle and Stabile, 2020). These barriers may be partially mitigated by expanding the supply of medical services. Pharmacists, in particular, are uniquely poised to be able to expand access to low-acuity health care for vulnerable populations through expanded prescribing powers (Wenger et al., 2016). Such expansions are becoming increasingly common in the United States, Canada, and other developed countries such as Australia and Ireland.

However, these expansions come with the potential tradeoff of introducing both supply- and demand-side ex-post moral hazard (Einav et al., 2013). On the supply side, pharmacists report feeling pressure to prescribe for patients in order to increase pharmacy profits (Tsergas, 2024). On the demand side, patients may demand higher levels of potentially inappropriate care through pharmacies (Baicker et al., 2015; Anderson et al., 2024). Collectively, these effects may lead to the over-utilization of low-value care while crowding out more high-return interactions with physicians.

In this paper, we assess how a 2023 reform expanding prescribing power for pharmacists in Ontario, Canada affected the flow and substitution across facilities for patients visiting medical institutions. We leverage novel data on patient mobility in a difference-in-differences framework to evaluate this policy's impact on visits to pharmacies as well as other healthcare institutions, including hospitals, primary care offices, and urgent care centers. In practice, evaluating the impact of policy on access to care faces the critical data limitation that claims are only visible in the data for patients who were successful in obtaining care. By using foot traffic data, we are able to assess the impact of the policy in real time, without waiting for administrative data to accumulate, and on the population of Ontario patients regardless of whether or not they received care. We are also not limited to studying certain sectors of the healthcare system, as is generally true when using claim-based or electronic health record (EHR)-based data.

Our results suggest that expanding pharmacist scope of practice (SOP) led to a strong and persistent increase in foot traffic to pharmacies. Immediately following the policy's implementation, foot traffic to pharmacies increased by an average of 16%. Importantly, this result differs across patient groups. We show that pharmacies in neighborhoods with the lowest levels of material resources, employment, and housing stability exhibit the largest uptake of pharmacists post-implementation; the most deprived regions exhibit a 25% increase in foot traffic. Interestingly, these increases are concentrated most in the regions with high material deprivation but low concentrations of visible racial minorities or new immigrants to Canada, suggesting that the policy generated the largest impact among disadvantaged non-minority Canadian citizens. Neighborhoods with high concentrations of immigrants or visible minorities experienced significant declines in foot traffic. We show these declines may be attributable to limited supply of pharmacies and patient substitution across pharmacies in these areas.

Increased traffic to pharmacies may impact demand for other healthcare services, potentially alleviating pressure on other parts of the healthcare system. We examine how foot traffic to other medical institutions changed following the policy's implementation, particularly across neighborhoods. Overall, we find positive complementarities between foot traffic to pharmacies and visits to medical facilities, suggesting that expanding pharmacist prescribing power led to increased visits to outpatient medical care centers. We observe a 9% reduction in traffic to hospitals and a 4% increase in traffic to outpatient care centers, resulting in an overall increase in the use of medical care. These results are particularly surprising given that outpatient care is not generally needed to treat these minor ailments, except to obtain prescriptions. The results suggest that pharmacists serve important roles in redirecting patients from hospital- to outpatient-based care, an important triaging role.

Finally, we leverage the SOP expansion as exogenous variation to directly estimate the elasticity of substitution for visits across types of medical facilities, in an instrumental variables framework. Importantly, this allows us to overcome a key limitation of the data: foot traffic data indicates only visits to a location, not the definitive receipt of care. However, using the policy's variation as an instrument identifies a local average treatment effect (LATE) specific to the subset of pharmacy visitors who were induced to visit as a result of the policy (e.g., to seek care from a pharmacist), and reduces measurement error in the data (Schennach, 2016). Using this approach, we find that the exogenous increase in traffic to pharmacies led to an overall increase in traffic to non-pharmacy medical institutions, driven by increases in use of outpatient care that swamped declines in visits to hospitals. Our estimates 22.8% of new pharmacy visits translated into outpatient care visits, with a 7.0% reduction in hospital visits.

Our work contributes to a rich literature on access to care and health equity (McIntyre and Mooney, 2007). In general, individuals with higher income have greater access to health care, and these inequities exacerbate health disparities. Closing the health gap caused by socioeconomic differences and improving population well-being remain critical concerns for policymakers (Finkelstein et al., 2022). In particular, our work highlights the continued role for policies aiming to improve equitable access even in publicly-funded healthcare systems with universal coverage, where the determinants of health disparities are less well understood (Propper, 2024; Cookson et al., 2016). We highlight that lowering the costs of receiving healthcare for minor ailments increased patient flows to both pharmacies and medical institutions, primarily for patients from under-served regions. However, we also highlight the need for an intersectional approach to studying health equity, as our results suggest distinct results for immigrant and non-immigrant populations (Anyosa and Anderson, 2024).

Our work also contributes to literature on moral and behavioral hazard in health care markets (Einav and Finkelstein, 2018; Baicker et al., 2015). In general, changing the cost of accessing care affects both the levels of care supplied and demanded, and may also influence the average quality of provided services. Policies expanding pharmacist scope of power have been shown to meaningfully influence demand for health services and health outcomes (Grossman et al., 2024). Our work highlights these issues in the context of publicly-funded health insurance systems where policies may affect the time cost of accessing care rather than monetary costs. We highlight that reducing these costs associated with care lead to overall complementarities in demand for healthcare from various sectors. These complementarities may increase patient adherence to primary care physicians while alleviating some of the burden on hospitals and emergency departments (Ouyang et al., 2022).

Finally, our work contributes to a broader literature on the spillover effects of economic policy in healthcare markets. Policies affecting aspects of healthcare markets typically generate spillover effects, making their welfare impacts difficult to ascertain (Hendren, 2016). Spillover effects may complicate the responses of patients or providers to prices for care (McCarthy and Raval, 2023), innovation (Hoagland, 2024a), or even a person's own health shock (Hoagland, 2024b; Fadlon et al., 2024). In this paper, we highlight the spillovers associated with expanding access to care through one channel on downstream care received through other channels. Understanding these substitution patterns is critical for evaluating the social welfare associated with expanding access to care through pharmacists.

The remainder of the paper proceeds as follows. Section 2 provides background on the policy change we study. Section 3 provides details on the data on which we rely and details of our empirical design. Section 4 documents the effect of expanding pharmacist prescribing power on foot traffic to pharmacies, as well as differences across neighborhoods and potential spillover effects on foot traffic to other health institutions. Section 5 leverages the SOP expansion in an instrumental variables framework to identify elasticities of substitution across medical facilities and pharmacies. Finally, Section 6 concludes.

2 Background

In recent decades, the role of pharmacists in providing healthcare has evolved significantly across Canada and the United States. Whereas historically, pharmacists were primarily responsible only for dispensing medication, filling prescriptions provided by physicians, and offering basic advice on medication use, recent policies have expanded pharmacists' scope of practice to initiating, modifying, or discontinuing medications for certain conditions and minor ailments. Currently, 18 states in the U.S. and all 10 provinces in Canada allow pharmacists to prescribe medication for minor ailments, with differing levels of authority and scope. These expansions have the potential to mitigate barriers to accessing timely care for patients seeking treatment for common, non-complex health issues while simultaneously relieving pressure on primary healthcare and hospital-based care.

Pharmacist prescribing authority varies across Canada, as regulations are deferred to individual provinces or territories. Initial programs piloting the role of pharmacists in treating minor ailments occurred in Quebec (2011) and Alberta (2007). In Ontario, legislation expanding pharmacist SOP took effect in January 2023. Due to this expansion, pharmacists were permitted to directly prescribe medications for 13 minor ailments. This was expanded to 19 total ailments in October 2023, by which point Ontario pharmacists had issued over 1 million assessments for these conditions. Appendix Table A1 lists the relevant ailments included in both parts of the expansion. To date, nearly every pharmacy in the province participates in this program.

While pharmacists have quickly taken up participation in the program, concerns about the effectiveness of pharmacist care and the prospective negative influences of moral hazard remain. For example, pharmacists may be particularly responsive to profit incentives, resulting in incentives to over-prescribe medications for patients (Tsergas, 2024). What's more, patients may substitute demand for health services away from physicians towards pharmacists, crowding out high-value preventive screenings and wellness visits.

3 Data and Empirical Framework

3.1 Data

Advan Foot Traffic Data. We used Advan foot traffic data between 2022 and 2024 to estimate the causal effect of the SOP expansion on visits to pharmacies and other healthcare institutions. Advan data uses mobile phone location and GPS data relative to tailored geofences to measure foot traffic, which is then anonymized and aggregated to the weekly level (Corporation, 2024). This data enables researchers to analyse patterns of visitors to healthcare institutions over time and geography. Foot traffic data is available for commercial points of interests (POI), including restaurants, stores, hotels, public buildings, and healthcare facilities; in our study, we limited attention to foot traffic to all facilities providing healthcare services and pharmacies. For each healthcare POI in the provinces of Alberta, British Columbia, Ontario, and Quebec, we observed total visits as well as unique visitors and their home locations for each week. We limited the sample to POIs open continuously from 2022 to 2024 to avoid any identification issues associated with pharmacy entry or exit during the sample period.[1]

Advan foot traffic data is subject to several limitations, including the rate at which POIs are visited over time by individuals with smart phones (that then transmit GPS location data). In particular, changes in the underlying panel of devices over time may introduce noise to the raw visit counts estimated in the data. To accommodate this, we normalize the measures of raw foot traffic using the mobile device sampling rate for each province-week, following Advan's micro-normalization methodology (Hou et al., 2024). Throughout, however, our results are robust to using only the raw visit and visitor counts, rather than relying on the weighting scheme.[2]

Appendix Figure A1 shows the distribution of normalized weekly visits in the sample.

[1]This excludes 2,677 (roughly 25%) of pharmacies across our full sample. Our results, however, are robust to including these pharmacies for the months in which they are open, as discussed below.

[2]Advan data also includes synthetic counting of visitors for roughly 2.5% of pharmacies in our sample. Our results are virtually unchanged if we ignore pharmacies affected by this during either 2022 or 2023.

The majority of pharmacies see between 500 and 5,000 total visitors in a given week. On average, Ontario pharmacists see higher levels of foot traffic than the other three provinces, as discussed below. Throughout, we report results for the total monthly visit count as the primary outcome. However, our results are robust to considering instead the number of unique visitors as opposed to aggregate visits.

We also use this data to examine foot traffic to other, non-pharmacy medical institutions, including hospitals and emergency departments, outpatient care centers (such as urgent care centers or family physician offices), and others. These are identified in the Advan data directly based on their North American Industry Classification System (NAICS) codes and verified based on location name, address, and website.

Ontario Marginalization Index. We linked Advan data to the 2021 Ontario Marginalization Index (ON-Marg) based on dissemination areas (Matheson et al., 2012). The ON-Marg is a publicly available data tool measuring distinct dimensions of marginalization based on demographic indicators including housing stability, material resources (including employment and education), age-based marginalization, and racialized and newcomer populations. We stratified POIs included in this study based on the quintile of estimated marginalization across each of the four distinct categories, with the first quintile representing the least marginalized and the fifth quintile the most marginalized.[3] Given that ON-Marg data is not available for our control provinces, we used the full set of control group data for each stratification, comparing the evolution of visit counts in each quintile of marginalization across all unaffected pharmacies in AB, BC, and QC.

3.2 Research Design

We evaluated the causal effect of expanding pharmacist prescribing powers in Ontario using a difference-in-differences framework, comparing foot traffic outcomes in Ontario before and after the expansion to pharmacies in Alberta (AB), British Columbia (BC) and Quebec (QC). AB and QC did not update or expand their pharmacists' SOP during the full study period, making them suitable comparators to Ontario in the analysis. BC introduced novel prescribing powers for pharmacists roughly 6 months after Ontario's 2023 reform; hence, their comparator data is used only through June 2023 in regressions.[4]

To accommodate potential heterogeneous and time-varying treatment effects—particularly for areas of different levels of marginalization in Ontario—we used a local projections dif-

[3]We are able to link approximately 90% of DAs in Ontario to ON-Marg scores. Some DAs with extremely low levels of population or household counts do not have ON-Marg scores, as Statistics Canada does not release census information for these areas to ensure data quality and privacy.

[4]Throughout, results are robust to excluding BC from the control group entirely.

ference in differences (LP-DID) estimator (Dube et al., 2023), a "stacked" regression-based framework to implement differences-in-differences with multiple time periods. Similar to a naïve difference-in-differences estimator, our LP-DID estimator recovers the average effect of the SOP expansion under the assumptions of no anticipation and parallel trends. In addition, the estimator is unaffected by potential bias arising from heterogeneous treatment effects (Roth et al., 2023). The LP-DID regression performs similarly to other approaches in this context, including weighted stacked DID regressions (Wing et al., 2024; Cengiz et al., 2019) and imputation estimators (Sun and Abraham, 2020; Callaway and Sant'Anna, 2021). Formally, for h periods pre- and post-treatment, we estimate the equation

$$y_{poi,t+h} - y_{poi,t-1} = \beta_h^{\text{LP-DID}} \Delta D_{poi,t} + \alpha_{poi} + \tau_t + \varepsilon_{poi,t}^h, \tag{1}$$

where the sample is restricted to newly treated ($\Delta D_{poi,t} = 1$) or clean controls ($\Delta D_{poi,t+h} = 0$). Outcomes include foot traffic to pharmacies and other medical institutions intervention volumes at the place of interest (*poi*) level, with periods separated into months t. We cluster standard errors at the province level, the level of the treatment.[5]

Throughout, the identifying assumption is that the timing of the SOP expansion is exogenous for those visiting pharmacies across provinces, in the sense that there are parallel trends and no anticipatory changes in traffic. These assumptions can be examined directly by assessing differential pre-trends in our dynamic specifications. Additionally, Appendix Figure A2 shows trends in total pharmacy visits across each of the four provinces, providing justification for the parallel trends assumption in the raw data. Several features of this data are immediately apparent: First, Ontario has much higher traffic than other provinces, due to its larger population relative to the other provinces. Second, there is some seasonality in pharmacy visits, with visits tending to increase in each of the provinces in the late fall and winter, as seasonal respiratory illnesses become more common. Both sets of these differences—across provinces and over time—are absorbed by the fixed effects in Equation 1. Importantly, prior to 2023, we do not observe differences across provinces in trends of pharmacy foot traffic. In contrast, following the expansion, we observe a large increase in foot traffic to Ontario pharmacies relative to control provinces, even in the raw data.[6]

[5] Effects were estimated using the LPDID package in Stata (Busch and Girardi, 2023).

[6] Spillovers in traffic across provinces may constitute one potential threat to our identification strategy. For example, patients living in Quebec may travel to Ontario to seek prescriptions from Ontario pharmacists. In general, this is unlikely to be true, as each province independently operates their own health insurance system, and hence patients run the risk of paying out-of-pocket for care received outside of the province in which they are insured. Additionally, the raw data does not suggest that these spillovers

Our estimator recovers the average treatment effect of the policy on foot traffic to pharmacies and other medical institutions. Interpreting these regression results therefore requires several caveats. First, foot traffic data relies on mobile phone and GPS data to estimate visits; while Advan normalizes their data to adjust for estimated visits by those without a smart phone, this data may not fully capture all visitors to a location. Our results are unchanged by whether or not we use the raw or normalized data, suggesting that this is not an issue in interpreting our results. Second, and more importantly, our results reflect the impact of the policy to *traffic* to a location, which does not equate to receiving healthcare services. For instance, it cannot distinguish between individuals visiting pharmacies seeking prescriptions from those visiting for other purchases. In Section 5, we use an IV framework to back out implied effects of true prescription seeking behavior on utilization of other medical care services.

3.3 Summary Statistics

Our data contained 95 measures of weekly foot traffic data for 7,758 pharmacies and 48,323 other medical institutions across the four Canadian provinces of interest. Table 1 provides summary statistics for our analytical sample across the four provinces. We link pharmacies to census data for the aggregated dissemination area[7] and report average characteristics of the geography they serve as well as foot traffic data from Advan.

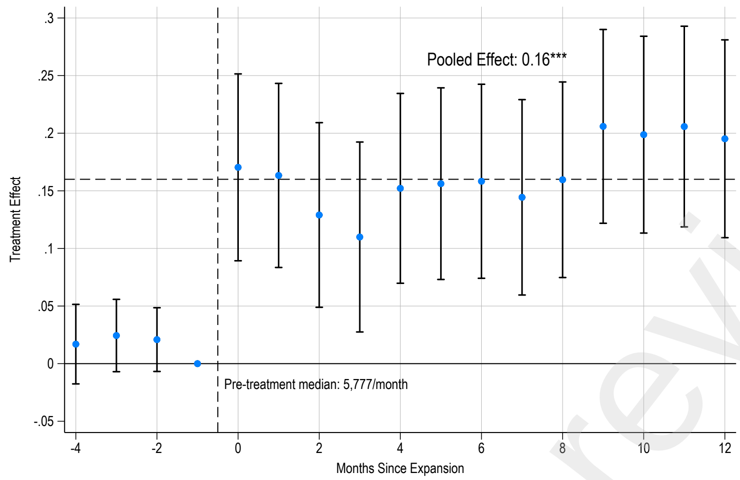
Overall, the results are consistent with the raw data presented in Appendix Figures A1 and A2. The level differences in pharmacy foot traffic across provinces is driven by Ontario reporting roughly three times as many pharmacies as the other provinces; visit counts are relatively consistent across Ontario, Alberta, and British Columbia. In addition, there are few differences across neighborhood demographics in the four provinces in terms of income, household makeup and ownership, education, and employment. Ontario has an overall higher fraction of immigrants than Alberta and Quebec, respectively; this is consistent with the overall census differences across provinces.

Table 1. Summary Statistics

	Province			
	ON	AB	BC	QC
Panel A: Foot Traffic				
Pharmacies	3,616	1,081	1,163	1,898
Normalized visitor count/pharmacy	4,077.03	4,354.80	4,845.66	2,565.23
	(229.186)	(430.407)	(616.240)	(162.034)
Raw visitor count/pharmacy	55.83	59.62	66.28	35.13
	(3.152)	(5.905)	(8.427)	(2.226)
Average time spent in pharmacy (minutes)	78.85	64.27	94.93	78.42
	(3.003)	(4.241)	(5.977)	(3.948)
Panel B: Other Demographics				
Age	42.31	40.08	43.71	43.65
	(6.136)	(11.794)	(13.134)	(10.149)
% Female	51.23%	50.12%	51.20%	50.75%
	(0.027)	(0.050)	(0.073)	(0.050)
Median income (individual)	$35,471	$39,137	$34,514	$33,492
	(107.0)	(184.1)	(165.5)	(134.1)
% Unemployed	12.88%	12.08%	8.74%	8.17%
	(5.459)	(8.950)	(5.594)	(6.551)
% With high school diploma or higher	70.41%	70.54%	71.57%	66.80%
	(0.100)	(0.208)	(0.204)	(0.177)
% Homeowners	58.92%	62.50%	57.85%	60.82%
	(15.757)	(34.820)	(30.408)	(20.660)
Household size	2.51	2.44	2.29	2.17
	(0.815)	(1.267)	(1.334)	(0.748)
% First-generation immigrants	30.32%	22.35%	29.11%	15.92%
	(0.305)	(0.393)	(0.476)	(0.342)

Notes: This table presents summary statistics for the analytical sample. Summary means and standard errors are calculated for 2022, the year prior to SOP expansion. Panel A summarizes Advan data for pharmacy and drug store POIs across each province, including the treatment province (ON) and control provinces (AB, BC, QC). POIs from Advan are linked to Statistics Canada data based on Aggregate Dissemination Areas (ADAs) for Panel B.

Figure 1. Effect of SOP Expansion on Foot Traffic to Pharmacies



Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. The outcome of interest is the natural logarithm of total visitors to pharmacies at the monthly level. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.

4 Event-Study Analysis

Figure 1 shows the estimated difference-in-differences results. Prior to the 2023 SOP expansion, the median (average) pharmacy received 5,777 (16,324) total visitors per month.[8] Following the policy's implementation, foot traffic increased by an average of 16%, corresponding to an increase of roughly 924 (2,612) patients for the median (average) pharmacy. This increase was persistent over time, indicating a shift in the consumption of pharmacy care following the expanded prescribing powers.[9]

Importantly, these effects differed based on the available resources of a local neighborhood. To see this, we stratified the main outcome across quintiles of marginalization to

are occurring. However, this violation would lead us to overstate the true treatment effect of the policy to the extent that foot traffic to Quebec pharmacies would decrease as Quebec patients visited Ontario pharmacies instead.

[7]Roughly equivalent to a US Census Subdivision.

[8]Appendix Figure A1 shows the distribution of monthly visitors across pharmacies in Ontario; note that this is a highly skewed distribution, with the bottom quintile of pharmacies receiving fewer than 575 visits monthly (e.g., in very rural Northern Ontario), and the top quintile receiving upwards 17,000 visits monthly (e.g., in urban regions such as Toronto).

[9]Appendix Figure A3 shows the robustness of our results to using raw counts rather than normalized data; if anything, this leads to a larger estimate of the treatment effect. Our results are also robust to including pharmacies which opened or closed during the sample period, as reported in Appendix Figure A4.

Table 2. Pooled Treatment Effects of SOP Expansion, by ON-Marg Quantiles

	Least Disadvantaged Q1	Q2	Q3	Q4	Most Disadvantaged Q5
Outcome: Log(Total Weekly Visitors to Pharmacies)					
Material Resources	0.01	0.02	0.07	0.09**	0.25***
	(0.043)	(0.047)	(0.042)	(0.036)	(0.032)
Age and Labor Force	-0.03	0.06	0.15***	0.20***	0.22***
	(0.037)	(0.040)	(0.042)	(0.046)	(0.033)
Household Dwellings	-0.19***	0.04	0.16***	0.25***	0.10***
	(0.057)	(0.051)	(0.048)	(0.035)	(0.029)
Racialized and Immigrant Populations	0.47***	0.26***	0.23***	0.05	-0.14***
	(0.048)	(0.037)	(0.038)	(0.034)	(0.036)
Pharmacy FEs	✓	✓	✓	✓	✓
Month of Year FEs	✓	✓	✓	✓	✓
N	119,488	117,932	117,445	116,279	119,862

Notes: Table presents pooled post-treatment estimates of the LP-DID treatment effects following the SOP expansion in January 2023. The outcome of interest is the natural logarithm of total visitors to pharmacies at the weekly level, averaged over a month. Standard errors are clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

assess how the policy may have differentially affected vulnerable patient groups.

Table 2 presents the results using the four unique dimensions of the ON-Marg data. For each dimension quintile, we report the pooled post-treatment effect from Equation 1. For three measures of marginalization—measured based on household dwellings, material resources, or age and labor force participation—we find a strong gradient through which expanding pharmacist scope of practice caused larger increases in pharmacy foot traffic in more marginalized regions. For example, pharmacies in the most materially deprived neighborhoods of Ontario saw increases in traffic as high as 25% following the SOP expansion, compared with relatively precise null changes for those in the least deprived neighborhoods. Similarly, pharmacies in the most deprived neighborhood measured by housing stability and quality saw increases of 25% and 10%; in contrast, foot traffic in the least deprived neighborhoods was estimated to decline by 19%.

Interestingly, when examining the last dimension of marginalization based on racial inequality and new immigration flows, we find a gradient in the opposite direction. Specifically, among the most marginalized communities by this measure, the SOP expansion caused a 14% *decline* in pharmacy foot traffic; on the other hand, neighborhoods with the fewest immigrants and visible racial minorities experienced a nearly 50% increase in pharmacy foot traffic. This is consistent with previous findings using the ON-Marg data, which has highlighted nuanced correlations between the distinct dimensions of marginalization scores (Anyosa and Anderson, 2024). Using K-means clustering algorithms, this work presented a new way of clustering neighborhoods based on the ON-Marg data to accommodate these correlations: (1) Advantaged White Canadians, (2) Disadvantaged White Canadians, (3) Advantaged Visible Minorities and Immigrants, and (4) Disadvantaged Visible Minorities and Immigrants. Our analysis, in keeping with this methodology, suggests that the policy's effects were most pronounced among the "Disadvantaged White Canadians" group, but did not expand access to pharmacy care for the "Disadvantaged Visible Minorities and Immigrants" group.

4.1 Pharmacy Supply and Substitution Patterns

What drives differences in the SOP expansion's effects on pharmacy foot traffic across neighborhoods experiencing different types of marginalization? To assess this more directly, Appendix Figure A5 shows the estimated treatment effects of the policy stratified across the two conflicting dimensions of marginalization: resource-based marginalization and the proportion of visible minorities in a region. In keeping with the findings presented in Table 2, we find that the SOP expansion significantly increased traffic in materially-deprived but racially homogeneous neighborhoods, consistent with the group of "disadvantaged White Canadians." On the other hand, neighborhoods with high immigrant and visible minority populations experienced significant declines in foot traffic following the policy's expansion.

Understanding what leads to declines in foot traffic for this "Disadvantaged Visible Minorities and Immigrants" group is particularly relevant given that these individuals are significantly more likely to be unattached to a primary care physician (Ahmed et al., 2016). This means this group generally has more limited access to primary care services, further increasing the potential benefit of SOP expansions. There are several competing hypotheses to understand these effects. First, neighborhoods might have different levels of ex-ante access to pharmacies, as some regions may have fewer pharmacists available to take up the prescribing expansion. Second, this expansion may have led to substitution as visitors change which pharmacies they visit in order to receive prescriptions. Finally, broader cultural issues such as language barriers and gaps in institutional trust in the healthcare system may contribute to different effects for racial majority Canadians and visitors from other racial, ethnic, and immigrant groups. We consider these in turn.

First, accessing pharmacists for prescriptions may be more limited in marginalized regions of the province due to limited supply. For example, if there are fewer pharmacies per capita in areas with high populations of recently landed immigrants or visible minorities, then we would expect smaller increases in pharmacy foot traffic in these areas. Our data suggests that this may be the case: areas with a high proportion of non-minority Canadians typically have an average of 2.0–2.2 pharmacies per 1,000 residents, while DAs in the highest quintile of racialized marginalization contain an average of only 0.9 pharmacies per 1,000 population, a reduction by more than half. Importantly, these differences are even larger when considering the "Disadvantaged Visible Minorities and Immigrants" subpopulation. Neighborhoods that are materially deprived but do not have high immigrant or racial minority populations have an average of 3.3 pharmacies per 1,000 residents; on the other hand, materially deprived regions that are largely made up of non-native Canadians or racial minorities have about 46.7% as many pharmacies per capita, significantly reduced access to services.

On its own, differential availability of pharmacies across neighborhoods doesn't explain the significant declines in foot traffic reported in Table 2. However, if the policy induced patient substitution across pharmacies, communities with a more limited supply of pharmacies may experience reduced visit rates. For example, those who normally visited pharmacies in one community—for general purchases or to pick up prescriptions—may instead choose to visit pharmacies closer to their home once the opportunity to receive prescriptions becomes available.

While we cannot observe visitor's home neighborhoods directly, our data allows us to observe the median distance visitors traveled from their home to reach a pharmacy. By observing how these distances change as a result of the SOP expansion, we can identify these substitution effects. Overall, we observe significant declines in the median distance traveled to a pharmacy as a result of the policy, with distance traveled declining by 28.1% (Appendix Figure A6). This decline reflects both changes in the distance traveled by existing visitors—who may substitute to visiting pharmacies closer to their home—as well as differences between existing and new visitors to pharmacies. Here, our results suggest that the increases in foot traffic we observed due to the SOP expansion stemmed from visitors closer to a pharmacy's geographic location.

This overall decline, coupled with our foot traffic estimates presented in Table 2, provides insight into substitution patterns across pharmacies. Appendix Table A2 summarizes these results. We observe negative effects on distance traveled across all neighborhoods regardless of material deprivation, indicating that post-expansion, the increased traffic came from visitors relatively close to each pharmacy. However, when examining neighborhoods based on racial and immigrant-based disadvantage, a second story emerges. Along this dimension, the least marginalized (majority White Canadian) neighborhoods saw an increase in foot traffic but no change in distance traveled. But for pharmacies in the most marginalized neighborhoods, for whom we also saw declines in foot traffic, median travel to the pharmacy declined. These effects together suggest that the declines in foot traffic for marginalized regions may be driven by visitors who live further away from these locations, presumably as they substitute their visits to a pharmacy closer to home. This leaves the pharmacies in this region to serve fewer patients who reside closer to the pharmacy than the average visitor prior to the policy's expansion.

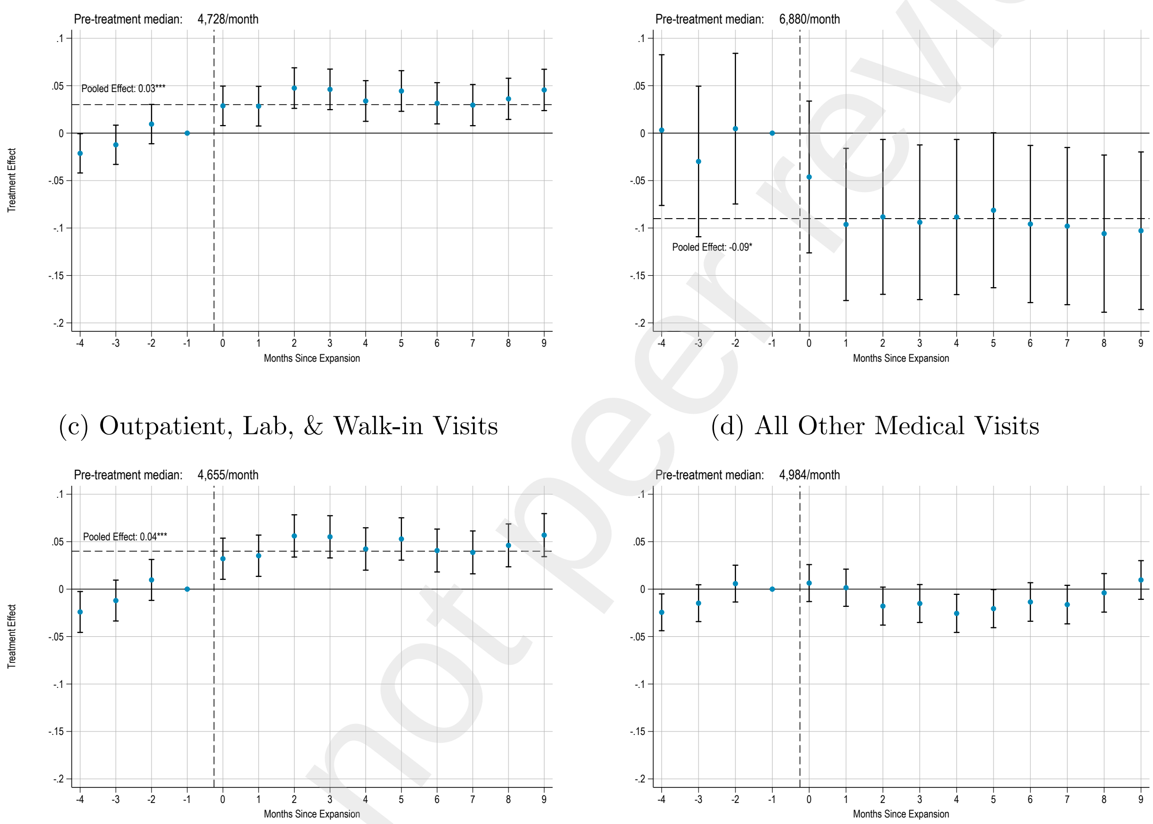
Taken together, these results suggest that the SOP expansion meaningfully affected not only who visited pharmacies but which pharmacies they visited to seek out prescriptions. However, our main effects may also be the result of additional factors that affect pharmacy demand differently for different patient groups. Information about the policy and what prescriptions a pharmacist could provide may not have been adequately disseminated to some groups, particularly for immigrants without majority language (e.g., English or French) speaking skills. Importantly, these groups may also have reduced trust in the healthcare system (Hoagland and Kipping, 2024); hence, even if they were informed about the policy appropriately, patients from historically marginalized groups may not demand care from pharmacists in the same way patients from majority race and ethnic groups would. Absent data on individual home regions or specific pharmacy enrollment in the SOP expansion, we cannot separate the effect of patient substitution and supply constraints from these more institutional barriers to access. However, taken together, these factors may have generated declines in travel to pharmacies for these patient groups.

4.2 Spillover Effects

While expanding prescribing power for pharmacists meaningfully increased overall foot traffic (with potential substitution effects across pharmacies), it may also have affected visits to other types of healthcare institutions. We assess these effects by examining traffic to all non-pharmacy medical institutions, as well as specific changes in visits to hospitals (for either inpatient or outpatient care), emergency departments, and other outpatient care centers.

Figure 2 presents the results. In aggregate, expanding prescribing power to pharmacists resulted in a 3% increase in total non-pharmacy visits to medical institutions. This

Figure 2. Effect of SOP Expansion on Foot Traffic to Medical Institutions



(a) All Non-Pharmacy Medical Visits

(b) Hospital & Emergency Visits

(c) Outpatient, Lab, & Walk-in Visits

(d) All Other Medical Visits

Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. The outcome of interest in each panel is the natural logarithm of total visitors to non-pharmacy medical institutions, including all institutions, hospitals (including emergency departments and ambulatory surgical centers), outpatient clinics (including diagnostic labs, walk-in clinics, and urgent care centers), and all other medical visits (including skilled nursing facilities and dental care, among others). Visits are measured at the monthly level. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.

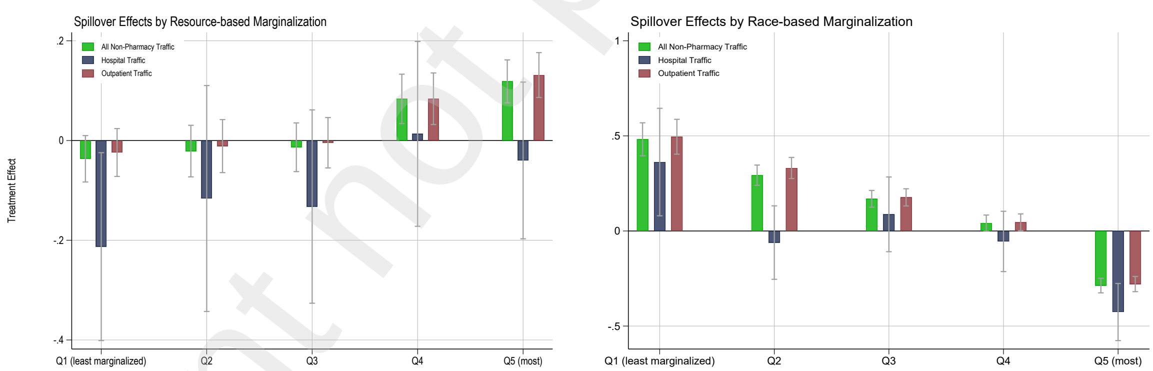
result is the combination of two competing effects: first, we observe an increase of 4% in visits to outpatient facilities (including walk-in clinics and urgent care centers).[10] On the other hand, the SOP expansion also led to a substantial, albeit noisy, decline in foot traffic to hospitals and emergency departments. We observe this traffic fall by 9%, with a p-value of 0.08.

Taken together, these results suggest a combined redirection of patients from inpatient triaging (e.g., through an ED) to seeking care in an outpatient setting. These complementarities are particularly surprising, given that outpatient care is not generally needed to treat these minor ailments (except for visits specifically to obtain prescriptions). The results suggest that pharmacists may serve a role in directing patients who need care appropriately to either an outpatient provider such as a family physician, or to an inpatient setting when care is more urgently required. Interestingly, this triaging resulted in an overall *increase* in foot traffic to non-pharmacy medical institutions.

Neighborhood Heterogeneity. The effects presented in Figure 2 also vary considerably across neighborhoods based on their available resources. Figure 3 presents these results.

Figure 3. Effect on Foot Traffic to Medical Institutions, by Marginalization

(a) Resource-based Marginalization (b) Race- and Immigrant-based Marginalization



Notes: This figure plots estimates of pooled LP-DID post-treatment effects of the SOP expansion in January 2023. The outcome of interest in each panel is the natural logarithm of total visitors to non-pharmacy medical institutions, including all institutions, hospitals (including emergency departments and ambulatory surgical centers), and outpatient clinics (including diagnostic labs, walk-in clinics, and urgent care centers). Data is stratified by quintile of neighborhood marginalization. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.

[10] When we restricted our sample only to institutions that we could identify as walk-in clinics or urgent care centers with certainty, we did not observe significant changes to foot traffic, most likely due to significantly reduced statistical power. See Figure 2, panel (d).

Overall, three results stand out. First, there is a clear positive correlation between increased foot traffic to pharmacies and overall visits to other medical institutions. Traffic to medical facilities also increased in the same neighborhoods where pharmacies saw large increases in their own foot traffic after the SOP expansion (Table 2).

Second, these increases are almost entirely driven by increases in outpatient care visits, including visits to family physicians and urgent care centers. These increases are largest in the most materially-deprived regions as well as regions with the highest proportion of disadvantaged non-minority Canadians, consistent with the results presented above. In fact, for the least racially diverse communities, foot traffic to outpatient care centers increases by roughly 50% as a result of the policy.

Finally, the effect of pharmacist prescribing on foot traffic to hospitals exhibits a more nuanced pattern. Among high-income neighborhoods, we observe large declines in hospital-based traffic on the order of 20%. This suggests that for these neighborhoods, pharmacies may be successfully redirecting patients away from the ED, particularly for low-acuity patients. Interestingly, this is also true for highly racially-diverse neighborhoods; however, these neighborhoods do not see a corresponding increase in use of outpatient care.

5 Implied Elasticities of Seeking Medical Care

A natural question, given the spillover effects observed in Figure 2, is to what extent changes in pharmacy foot traffic cause increased visits to non-pharmacy medical institutions. This is a natural policy question when considering expanding the prescribing power of pharmacists. On the one hand, pharmacists may be able to effectively triage patients, helping some patients to substitute from ED-based care to outpatient care and effectively reducing waiting times for more acutely serious medical events in the hospital. On the other hand, pharmacist prescriptions may give patients a less costly way to seek care, reducing overall demand for other types of medical care. Physician labor groups and other mainstream healthcare professionals have argued that expanding pharmacist SOP would lead to this result, at the expense of overall patient health.

On its own, our data does not identify actual substitution in the rate of seeking care across these facilities, given that it only measures traffic to and from locations. However, the 2023 policy change provides a source of exogenous variation which meaningfully identifies a group of compliers who *do* visit pharmacies in order to try and receive prescriptions. We therefore use this policy change as an instrumental variable to identify the elasticity of traffic to medical institutions with respect to pharmacy visits. That is, we estimate the following specification:

$$\log(\text{Medical Traffic}_{DA,t}) = \beta_0 + \beta_1 \log(\text{Pharmacy Traffic}_{DA,t}) + \gamma \vec{X} + \alpha_{DA} + \tau_t + \varepsilon_{DA,t}, \quad (2)$$

where DA indicates a dissemination area and t is measured in either weeks or months. Isolating the elasticity from pharmacy foot traffic to non-pharmacy traffic requires exogenous variation changing pharmacy traffic independently from other patient flows; we therefore use a binary indicator for if a DA was affected by the policy at time t as an instrument for $\log(\text{Pharmacy Traffic}_{DA,t})$, using the methodology of de Chaisemartin et al. (2024). Unsurprisingly given the evidence above, this policy change is a strong instrument for changes in pharmacy traffic, with a first-stage F statistic around 790.[11] The regression adjusts for DA and time fixed effects, as well as controls included in the vector $\vec{X}$. In our preferred specification, $\vec{X}$ includes the number of pharmacies and other medical institutions in each DA-week.

Table 3 shows the results. Consistent with Figure 2, we find exogenously increasing traffic to pharmacies leads to increases in visits to outpatient-based medical institutions. This results in an overall increase in foot traffic to other medical institutions. Our estimates suggest that nearly one-quarter of increases in pharmacy traffic as a result of the SOP expansion policy translated into visits to medical facilities; for each 1% increase in pharmacy traffic, foot traffic to all other facilities increased by 0.23%. On the other hand, increasing traffic to pharmacies *reduced* visits to hospitals and EDs, suggesting a substitution between the two. This could arise either because patients traveled directly to a pharmacy instead of to an ED when seeking acute care, or because pharmacists were able to mitigate patients' symptoms through prescribing until they were able to receive outpatient-based care, when otherwise they would have needed inpatient or emergency care while waiting to see a clinician. Finally, the reduced costs of accessing healthcare through pharmacies may lead individuals to consume more outpatient care as they learn about the value of that care.

[11] In addition to being a strong instrument, the policy change also likely satisfies the remaining conditions for a valid instrumental variable. In particular, the policy would only have effects on visits to other medical institutions through the channel of affecting patient choices to visit the pharmacy for care. Additionally, the policy change is uncorrelated with other drivers of visits to medical institutions or pharmacies, including the measurement error inherent in using foot traffic data to infer actual care utilization. Finally, the policy likely satisfies the monotonicity requirements of an IV, as the SOP expansion represented an extensive margin change in prescribing powers. Hence, it is not possible for the expansion to have induced some patients *not* to seek care at a pharmacy who otherwise would have, as no such options existed for patients.

Table 3. Implied Foot Traffic Elasticities to Non-Pharmacy Medical Facilities

	Implied Elasticities of Log(Traffic to Medical Facilities)		
	All Non-Pharmacy Traffic	Inpatient Visits	Outpatient Visits
Log(Pharmacy Foot Traffic)	0.228***	-0.070***	0.203***
	(0.0266)	(0.0147)	(0.0262)
First-stage F Statistic	789.94	789.94	789.94
DA FEs	✓	✓	✓
Week of Year FEs	✓	✓	✓
N	396,030	396,030	396,030

Notes: Table presents 2SLS regression estimates identifying the elasticity of travel to medical facilities following changes in travel to pharmacies. The specification is estimated following Equation 2. Coefficients represent approximate percentage changes in foot traffic per unit change in foot traffic to pharmacies. Standard errors are clustered at the province level, and the F-statistic from the first stage regression of log(traffic to pharmacies) on the policy change indicator is reported for each column. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Interpreting these results in an IV setting is particularly useful given the local average treatment effect (LATE) implied by the policy. The results in Table 3 yield estimates of how foot traffic to pharmacies affected visits to non-pharmacy medical care precisely for patients who were induced by the SOP expansion policy to visit a pharmacy, presumably to seek care from a pharmacist. Hence, this framework allows us to use foot traffic data to isolate changes in traffic related to the policy in order to infer how patient flows to other healthcare institutions would be affected. Our estimates hence provide an informative estimate of the moral hazard and substitution effects of seeking healthcare as a result of expanding pharmacist prescribing powers.

6 Conclusion

This paper uses foot traffic data to study patient flows to pharmacies and other medical institutions after provincial policy expanded the prescribing power of pharmacists to treat minor ailments in Ontario. The results illustrate that this policy led to increased visits to pharmacies, particularly in materially deprived regions of the province; in contrast, these effects were not observed in communities with a high proportion of visible minorities or immigrants. In part, these differences can be explained by the limited supply of pharmacies in marginalized neighborhoods and visitor substitution across pharmacies as prescriptions become more readily available.

We also identify how these changes spillover into patient visits to other medical institutions, including visits to hospitals and emergency departments as well as outpatient clinics, laboratories, and urgent care centers. The results quantify the way in which increasing access to care at one point in the healthcare system (pharmacies) may generate competing substitution effects changing where patients seek care as their health event progresses. We highlight how these spillover effects differ across types of medical facilities and neighborhoods, and then use the policy as exogenous variation to identify the elasticities of substitution for foot traffic. We find complementarities between pharmacy visits and outpatient care, with roughly one-quarter of an increase in pharmacy traffic passed on to outpatient visits. More importantly, seeking care at a pharmacy is a substitute for hospital-based care.

All of these results suggest that expanding the scope of practice of pharmacists may increase access to care for some populations, particularly disadvantaged non-minority populations within Canada. This increased access may allow patients to be better connected to some parts of the healthcare system, such as with their family physician, rather than relying on emergency departments to treat ailments. One potential policy response to connect immigrant populations to outpatient care in the same way may be to increase knowledge of the policy in minority neighborhoods, particularly crossing language barriers (e.g., in advertising) to do so.

Expanding prescribing authority for pharmacists reflects a growing emphasis on interdisciplinary collaboration within healthcare, using comparative advantages across healthcare professionals to improve patient outcomes. Doing so may reduce barriers to accessing care while simultaneously having positive impacts on wait times for hospital care for more acute health events.

Finally, this paper's results speak to a broader discussion of moral and behavioral hazard in seeking care for patients, on both the supply-side (driven by pharmacists writing prescriptions) and the demand-side (driven by patients seeking more care as its marginal cost declines). Counter to expected thought, our results do not suggest that patients are replacing their family physician with their pharmacist, nor do they indicate that physicians may be over-treating patients in ways that are harmful to them. As policies seeking to improve equitable access to care continue to leverage frontline healthcare workers and adjacent professionals, the complementarities and substitution patterns we highlight shed important light on the potential benefits and tradeoffs of promoting equitable access to care while successfully directing patients to appropriate sources of medical expertise.

References

Ahmed, Salim, Nusrat S Shommu, Nahid Rumana, Gary RS Barron, Sonja Wicklum, and Tanvir C Turin, "Barriers to access of primary healthcare by immigrant populations in Canada: a literature review," *Journal of immigrant and minority health*, 2016, *18*, 1522–1540.

Alexander, Diane and Molly Schnell, "The Impacts of Physician Payments on Patient Access, Use, and Health," *American Economic Journal: Applied Economics*, July 2024, *16* (3), 142–177.

Anderson, David M., Alex Hoagland, and Ed Zhu, "Medical Bill Shock and Imperfect Moral Hazard," *Journal of Public Economics*, 2024, *236*, 105152.

Anyosa, Renzo Calderon and Geoffrey Anderson, "Exploring Intersectionality of Race and Newcomer Status with Material and Social Deprivation in Ontario Census Data: A Comparative Analysis of the ON-MARG Deprivation Index and Machine-Learning Derived Demographic Clusters," November 2024.

Baicker, Katherine, Sendhil Mullainathan, and Joshua Schwartzstein, "Behavioral Hazard in Health Insurance," *The Quarterly Journal of Economics*, 2015, *130* (4), 1623–1667.

Busch, Alexander and Daniele Girardi, "Lpdid: Stata Module Implementing Local Projections Difference-in-Differences (Lp-Did) Estimator," 2023. Working Paper, Boston College Department of Economics.

Callaway, Brantly and Pedro H. C. Sant'Anna, "Difference-in-Differences with Multiple Time Periods," *Journal of Econometrics*, December 2021, *225* (2), 200–230.

Cengiz, Doruk, Arindrajit Dube, Attila Lindner, and Ben Zipperer, "The Effect of Minimum Wages on Low-Wage Jobs," *The Quarterly Journal of Economics*, 2019, *134* (3), 1405–1454.

Chandra, Amitabh, Pragya Kakani, and Adam Sacarny, "Hospital Allocation and Racial Disparities in Health Care," *The Review of Economics and Statistics*, July 2024, *106* (4), 924–937.

Cookson, Richard, Carol Propper, Miqdad Asaria, and Rosalind Raine, "Socio-Economic Inequalities in Health Care in England," *Fiscal Studies*, September 2016, *37* (3-4), 371–403.

Corporation, Advan Research, "Weekly Patterns Data," 2024.

de Chaisemartin, Clément, Xavier D'Haultfoeuille, Félix Pasquier, Doulo Sow, and Gonzalo Vazquez-Bare, "Difference-in-Differences Estimators for Treatments Continuously Distributed at Every Period," July 2024.

Decker, Sandra L., "In 2011 Nearly One-Third Of Physicians Said They Would Not Accept New Medicaid Patients, But Rising Fees May Help," *Health Affairs*, August 2012, *31* (8), 1673–1679.

Dube, Arindrajit, Daniele Girardi, Oscar Jorda, and Alan Taylor, "A Local Projections Approach to Difference-in-Differences Event Studies," *Federal Reserve Bank of San Francisco, Working Paper Series*, April 2023, *2023*, 01–56.

Einav, Liran, Amy Finkelstein, Stephen P. Ryan, Paul Schrimpf, and Mark R. Cullen, "Selection on Moral Hazard in Health Insurance," *American Economic Review*, 2013, *103* (1), 178–219.

_ **and** _ , "Moral Hazard in Health Insurance: What We Know and How We Know It," *Journal of the European Economic Association*, 2018, *16* (4), 957–982.

Fadlon, Itzik, Tal Gross, Alex Hoagland, and Timothy J. Layton, "The Protective Effects of a Healthy Spouse: Medicare as the Family Member of Last Resort," 2024.

Finkelstein, Daniel M., Jessica F. Harding, Diane Paulsell, Brittany English, Gina R. Hijjawi, and Jennifer Ng'andu, "Economic Well-Being And Health: The Role of Income Support Programs in Promoting Health And Advancing Health Equity," *Health Affairs*, December 2022, *41* (12), 1700–1706.

Gross, Tal, Timothy J. Layton, and Daniel Prinz, "The Liquidity Sensitivity of Healthcare Consumption: Evidence from Social Security Payments," *American Economic Review: Insights*, 2022, *4* (2), 175–190.

Grossman, Daniel, Arijit Ray, and Allyssa Wadsworth, "The pharmacist will see you now: Pharmacist prescribed contraceptives and fertility rates," *Journal of Health Economics*, 2024, p. 102942.

Hendren, Nathaniel, "The Policy Elasticity," *Tax Policy and the Economy*, January 2016, *30* (1), 51–89.

Hoagland, Alex, "Innovations and Inequities in Access to Medical Services," 2024.

_ , "An Ounce of Prevention or a Pound of Cure? The Value of Health Risk Information," *Working Paper*, 2024.

_ **and Sarah Kipping**, "Challenges in Promoting Health Equity and Reducing Disparities in Access across New and Established Technologies," *Canadian Journal of Cardiology*, 2024.

_ **, Olivia Yu, and Michal Hornỳ**, "Inequities in Unexpected Cost-Sharing for Preventive Care in the United States," *American Journal of Preventive Medicine*, 2024.

_ , _ , and _ , "Social Determinants of Health and Insurance Claim Denials for Preventive Care," *JAMA Network Open*, 2024, *7* (9), e2433316–e2433316.

Hou, Young, Christopher Poliquin, Mariko Sakakibara, and Marco Testoni, "Using Smartphone Location Data for Strategy Research," *Available at SSRN 4796679*, 2024.

Isabelle, Maripier and Mark Stabile, "Local Inequality and Departures from Publicly Provided Health Care in Canada," *Health Economics*, 2020, *29* (9), 1031–1047.

Martin, Danielle, Ashley P. Miller, Amélie Quesnel-Vallée, Nadine R. Caron, Bilkis Vissandjée, and Gregory P. Marchildon, "Canada's Universal Health-Care System: Achieving Its Potential," *The Lancet*, 2018, *391* (10131), 1718–1735.

Matheson, Flora I, James R Dunn, Katherine LW Smith, Rahim Moineddin, and Richard H Glazier, "Development of the Canadian Marginalization Index: a new tool for the study of inequality," *Canadian Journal of Public Health/Revue Canadienne de Sante'e Publique*, 2012, pp. S12–S16.

McCarthy, Ian M. and Mehul V. Raval, "Price Spillovers and Specialization in Health Care: The Case of Children's Hospitals," *Health Economics*, 2023, *32* (10), 2408–2423.

McIntyre, Di and Gavin Mooney, *The Economics of Health Equity.* 2007.

Ouyang, Huiyin, Junyan Wang, Zhankun Sun, and Eddy Lang, "The impact of emergency department crowding on admission decisions and patient outcomes," *The American journal of emergency medicine*, 2022, *51*, 163–168.

Propper, Carol, "Socio-Economic Inequality in the Distribution of Health Care in the UK," *Oxford Open Economics*, 2024, *3* (Supplement_1), i577–i581.

Riley, Wayne J, "Health disparities: gaps in access, quality and affordability of medical care," *Transactions of the American Clinical and Climatological Association*, 2012, *123*, 167.

Roth, Jonathan, Pedro H. C. Sant'Anna, Alyssa Bilinski, and John Poe, "What's Trending in Difference-in-Differences? A Synthesis of the Recent Econometrics Literature - ScienceDirect," *Journal of Econometrics*, 2023, *235* (2), 2218–2244.

Schennach, Susanne M., "Recent Advances in the Measurement Error Literature," *Annual Review of Economics*, 2016, *8*, 341–377.

Sun, Liyang and Sarah Abraham, "Estimating Dynamic Treatment Effects in Event Studies with Heterogeneous Treatment Effects," *Journal of Econometrics*, 2020, p. 53.

Tsergas, Nick, "Pharmacists Say Power to Prescribe Often Comes with Pressure to Prescribe, and Generate Profits," *Toronto Star*, November 2024.

Wenger, Lisa M., Meagen Rosenthal, Jane Pearson Sharpe, and Nancy Waite, "Confronting Inequities: A Scoping Review of the Literature on Pharmacist Practice and Health-Related Disparities," *Research in Social and Administrative Pharmacy*, March 2016, *12* (2), 175–217.

Wing, Coady, Seth M. Freedman, and Alex Hollingsworth, "Stacked Difference-in-Differences," Technical Report, National Bureau of Economic Research 2024.

A Appendix Tables and Figures

Expansion Date	Ailments
January 1, 2023	- Allergic Rhinitis - Candidal Stomatitis (Oral Thrush) - Conjunctivitis (Bacterial, Allergic, Viral) - Dermatitis (Atopic, Eczema, Allergic, Contact) - Dysmenorrhea - Gastroesophageal Reflux Disease (GERD) - Hemorrhoids - Herpes Labialis (Cold Sores) - Impetigo - Insect Bites/Urticaria - Musculoskeletal Sprains and Strains - Tick Bites - Uncomplicated Urinary Tract Infections
October 1, 2023	- Acne (Mild) - Aphthous Ulcers (Canker Sores) - Diaper Dermatitis - Nausea and Vomiting in Pregnancy - Pinworms and Threadworms - Vulvovaginal Candidiasis (Yeast Infections)

Appendix Table A1. Minor Ailments Affected by 2023 Ontario SOP Expansions

Notes: Table lists the minor ailments pharmacists can prescribe for in Ontario as of January 1 and October 1, 2023.

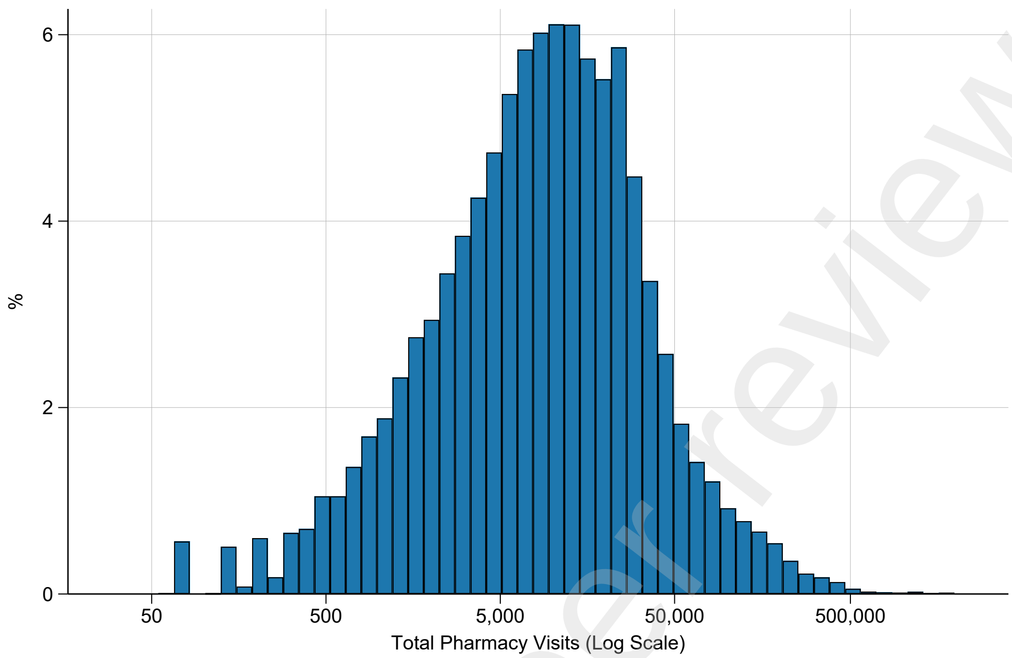
	Least Disadvantaged			Most Disadvantaged	
	Q1	Q2	Q3	Q4	Q5
Outcome: Median Distance Traveled to Pharmacies (km)					
Material Resources	-5.01***	-2.33*	-2.37*	-1.31	-3.82***
	(1.204)	(1.119)	(1.160)	(1.029)	(0.890)
Age and Labor Force	-5.46***	-1.99	-1.59	-0.53	-3.51***
	(0.981)	(1.091)	(1.150)	(1.229)	(0.929)
Household Dwellings	-0.87	-0.44	-2.63*	-1.16	-5.01***
	(1.598)	(1.463)	(1.279)	(0.961)	(0.779)
Racialized and Immigrant Populations	2.51	-1.25	-1.17	-3.63***	-6.77***
	(1.378)	(1.124)	(1.082)	(0.971)	(0.908)
Pharmacy FEs	✓	✓	✓	✓	✓
Month of Year FEs	✓	✓	✓	✓	✓
N	119,488	117,932	117,445	116,279	119,862

Notes: Table presents pooled post-treatment estimates of the LP-DID treatment effects following the SOP expansion in January 2023. The outcome of interest is the median distance traveled to reach a pharmacy in a month (from a visitor's home), measured in kilometers. Standard errors are clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

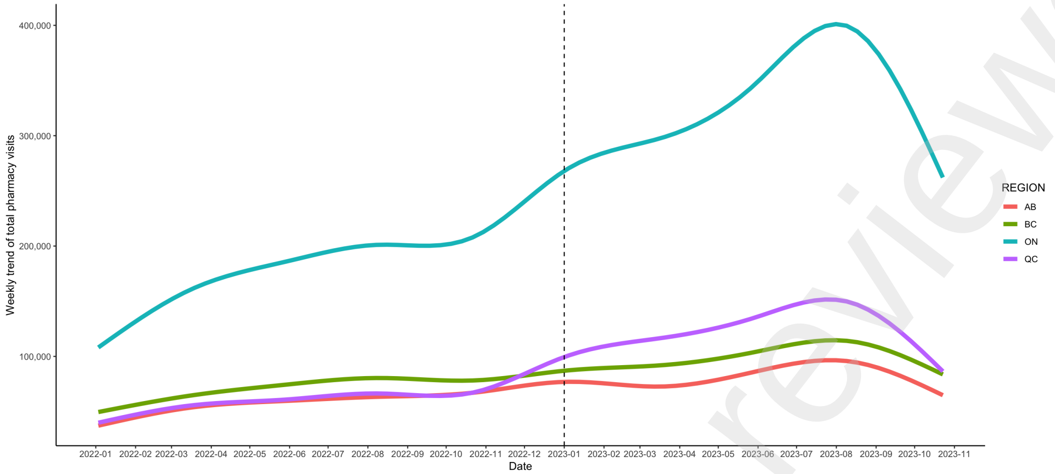
Appendix Table A2. Effects of SOP Expansion on Distance Traveled to Pharmacies, by ON-Marg Quantiles

Appendix Figure A1. Distribution of Monthly Total Visits for Pharmacies, All Provinces



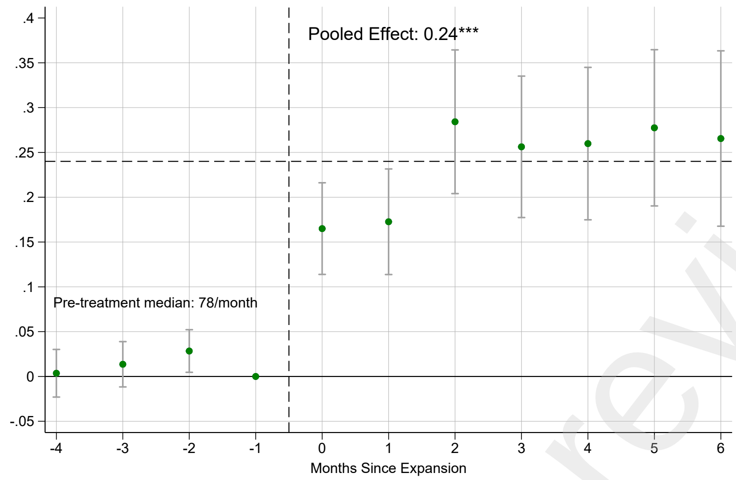
Notes: This figure plots the distribution of total monthly pharmacy visits across all pharmacy-weeks in the four provinces of our analytical sample.

Appendix Figure A2. Raw Underlying Trends in Foot Traffic to Pharmacies around SOP Expansion



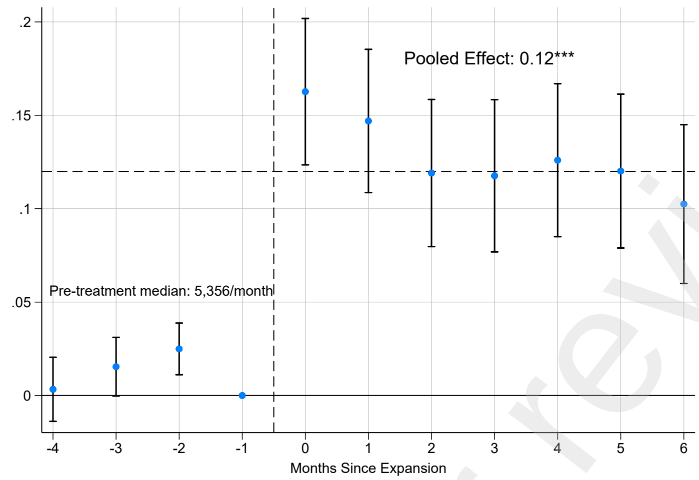
Notes: This figure plots weekly averages of the total visitors to pharmacies at the weekly level, for the weeks around the SOP expansion in January 2023. Trends are stratified by province.

Appendix Figure A3. Effect of SOP Expansion on Raw Foot Traffic Counts to Pharmacies



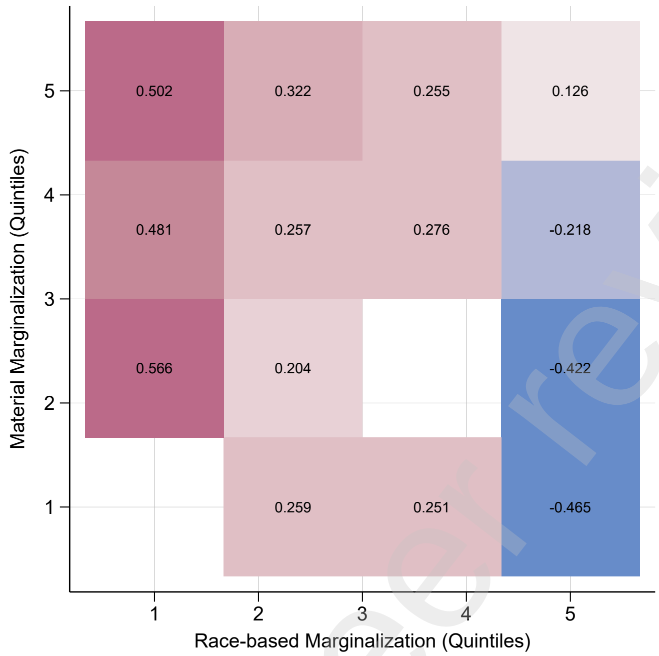
Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. The outcome of interest is the natural logarithm of total visitors to pharmacies at the monthly level. Here, outcome is measured using only raw counts, not normalized to estimate actual visits. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.

Appendix Figure A4. Estimated Treatment Effects Using Pharmacies that Entered and Exited During Sample Period



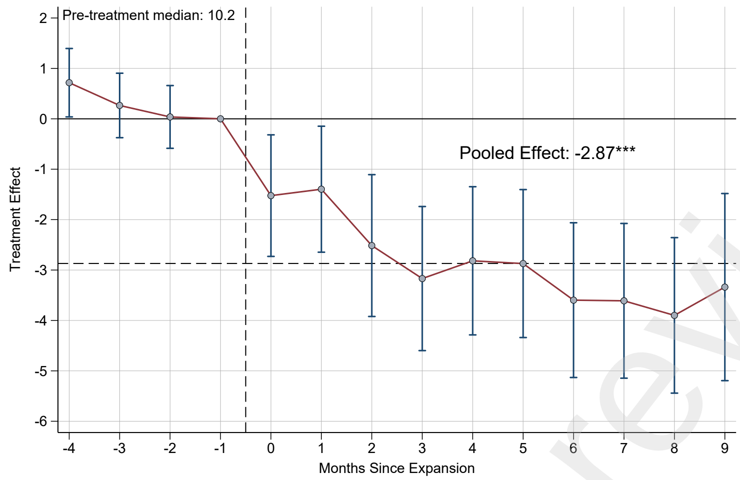
Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. The outcome of interest is the natural logarithm of total visitors to pharmacies at the monthly level. Here, all pharmacies that enter the panel at any point are included in estimation, even if the pharmacy opened or closed during the analytical period. Compare with Figure 1. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.

Appendix Figure A5. Effect of SOP Expansion on Pharmacy Foot Traffic, by Material- and Race-Based Marginalization



Notes: This figure plots estimates of pooled post-treatment LP-DID effects of the SOP expansion by Ontario neighborhoods grouped according to both their material-based marginalization and marginalization based on racialized and newcomer populations. The outcome of interest is the natural logarithm of total visitors to pharmacies at the monthly level. Here, outcome is measured using only raw counts, not normalized to estimate actual visits. Only estimates significant at the 95-percent confidence level are shown in the heatmap. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects, and standard errors clustered at the province level.

Appendix Figure A6. Effect of SOP Expansion on Median Distance Traveled Pharmacies



Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. The outcome of interest is the median distance visitors to pharmacies traveled, measured in kilometers and averaged over a month. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.