Public Health Measures Relevant to Retail Settings during the COVID-19 Pandemic

January 18, 2020

Key Messages

- There is limited evidence on the impact of specific measures for retail settings. The most evidence available is from population mobility studies and lockdowns involving retail closures or stay-at-home orders and suggests that greater mobility of the population (e.g., travelling to retail locations) is associated with greater risk of Coronavirus Disease 2019 (COVID-19) transmission.

- Some of the reported measures to reduce risks in retail settings are already in place in Ontario, including the use of curbside pickup and requirements for facemasks in indoor settings. Measures that may have additional impact once the timing for reopening of retail outlets is appropriate, include limiting the peak occupancy in a given space to reduce the risk of transmission, and restrictions on retail occupancy (lower than the current 50% occupancy) for stores with in-person shopping.

- Findings from the jurisdictional scan indicate that the scope of retail and mobility-related restrictions differed across jurisdictions examined. Some countries were restrictive in terms of both retail and mobility-related public health measures (e.g., England, France); some were restrictive in mobility-related measures but kept retail open (e.g., Italy); while others had restricted retail measures but did not restrict mobility (e.g., Belgium). Due to the range of public health measures implemented concurrently, it was not possible to determine the specific impact that retail settings had on COVID-19 epidemiology for these jurisdictions.

- While vaccine supplies and therapeutic treatment remain limited at this time, public participation with public health measures (e.g., social distancing) will continue to be our most effective approach to COVID-19 control. Evidence-based approaches to support public participation include clear and consistent communication; thus, re-opening of any setting warrants consideration for implications on communicating risk.

Background and Research Question

In the literature, lockdowns were proven effective and essential in decreasing the burden of COVID-19 during the first wave of the pandemic; however, there was mixed evidence with regards to the required stringency of lockdowns.[1] Discrepancies between jurisdictions might be explained by variation in the overall adherence and speed of uptake of public health measures by their respective populations.[1] This

may have been further influenced by behavioural or socio-cultural factors, including public communication.

To address the recent resurgence in COVID-19 cases, many countries have implemented lockdown measures similar to those employed in the first wave of the pandemic. An environmental scan of resurgence measures found that certain jurisdictions maintained consistent strict measures throughout the specified duration of their resurgence lockdown period, while others altered (relaxed or further restricted) measures during the course of their lockdown period.[2] Overall, epidemiological indicators such as hospitalizations, deaths, case incidence, and test percent positivity began to see impact two weeks after the initiation of the resurgence lockdown measures.[2] However, some jurisdictions continued to report higher incidences of these indicators than were observed at the beginning of their resurgence lockdown periods.

During resurgence, different governments have enacted different approaches to lockdown measures, as COVID-19 resurgence increasingly results in morbidity and mortality, as well as reduced health system capacity. Public Health Ontario (PHO) reviewed existing evidence on the effectiveness of specific public health measures within retail settings during the COVID-19 pandemic.

Methods

The methods comprised of two components: an evidence review focused on the effectiveness of retail and mobility-related public health measures; and a targeted grey literature scan of examples of retail and mobility-related measures implemented in select jurisdictions.

Evidence Review

A search was conducted by PHO Library Services on January 5, 2020 using the MEDLINE database. Search terms included but were not limited to: COVID-19, retail/business/shops, transmission/infections, restrictions/bans. The full search strategy is available upon request. English language peer-reviewed records that described public health measures against COVID-19 in retail settings in North America, Europe and the United Kingdom were included. Targeted searches were conducted to supplement evidence from the library search.

Jurisdictional Scan

Targeted searches of grey literature were conducted in to identify grey literature scan of examples of retail related public health measures in select jurisdictions.

Main Findings

Evidence Review

From the database search, we identified ten articles that explored the association between public health measures against COVID-19 and risk of infection in retail or business settings. There was limited evidence specifically on retail settings. The most evidence available at this time is from population mobility studies and lockdowns (involving retail closures), or stay-at-home orders. Two of the studies explored the risk of COVID-19 infection in different community or retail settings to identify risk alleviation strategies.[3,4] A further two studies explored strategies for reopening businesses.[5,6] The

remaining six studies looked at any association between population mobility and COVID-19 incidence;[7] or the impact on the incidence or growth rates of COVID-19 when public health measures were in place or relaxed.[8-12]

STUDIES EXPLORING RISK OF COVID-19 INFECTION IN COMMUNITY SETTINGS

- Benzell et al. conducted an assessment of the relative risk of COVID-19 transmission and social benefits of lockdown for 26 location types (6 million points of interest) using smartphone-based mobility data, survey results of 1,099 United States (US) residents, and economic data from the Census Statistics of US Business from January through March, 2020.[3] Data on the timing, duration and total number of visits, total number of visitors, home census tract of visitors are used to quantify the risk of transmission of a location based on the North American Industry Classification system code, location and area. Social benefit is assessed by importance identified by consumers, employment, payroll and receipts. Balancing the risk of transmission due to proximity and potential social benefit, the authors suggest tight restrictions should be applied to cafés, juice bars and dessert parlours; gyms; liquor and tobacco stores; sporting goods stores; and bookstores. Conversely, restrictions may be relatively loose for banks/ financial institutions; colleges and universities; dental offices. Similar observations were obtained for urban and rural areas. The authors noted that the assessment did not take into consideration that some venues require physical proximity more than others, e.g., dental offices, barber shops and salons where there is intense physical proximity; movie theatres, gyms, amusement parks where there is moderately high level of physical proximity. However, the authors suggest that the risk of transmission for some of these places may be reduced through curbside pickup and the use of masks. In addition, the assessment did not account for risks posed by "reckless" physical activities and superspreading events at some venues.

- In a case-control study by Fisher et al., out of 11 outpatient health care facilities in the US, symptomatic adults (18 years of age or older) were randomly selected (1 COVID-19 to 2 non–COVID-19) to explore community exposures associated with COVID-19 in July 2020.[4] Amongst patients who reported no previous contact with a known COVID-19 case, 89 (cases) were diagnosed with COVID-19 and 136 (controls) were symptomatic but tested negative for COVID-19. In the 14 days before symptom-onset, cases were more likely to report **dining at a restaurant** (adjusted odds ratio = 2.8; 95% confidence interval: 1.9–4.3) and **going to a bar or coffee shop** (adjusted odds ratio = 3.9; 95% confidence interval: 1.5–10.1). On the other hand, **no significant differences were identified between cases and controls for offices, salons, gym settings and shopping locations**. The authors noted that masks cannot be kept on in restaurant and bar settings whereas most other indoor community venues do not preclude mask use. Details are not available on the restaurant setting (indoor versus outdoor) and the service delivery methods at the coffee shop or bar. Concurrent exposures to a COVID-19 source not mentioned in the survey could not be ruled out either.

MODELLING STUDIES EXPLORING RE-OPENING STRATEGIES

- Previously summarized by PHO in an article synopsis, integrating mobility network data from ten large metropolitan areas in the US into the SEIR epidemiological model, Chang et al. compared the estimated risks of COVID-19 infection with full reopening of non-residential points of interest (POIs) frequented by people, with stringent reopening by restricting peak occupancy at certain POIs.[5,13] By analyzing COVID-19 incidence between March 1 and May 2, 2020 at each POI, the authors identified a **small number of non-retail POIs that were associated with most**

infections due to higher visit densities and/or longer duration of visits (e.g., full and limited service restaurants, gyms, hotels, cafés and religious organizations.) By **limiting peak occupancy levels** at each POI, **COVID-19 transmission can be more effectively reduced** than full reopening by spreading out the same number of visits over less busy times (e.g., capping the maximum occupancy at 20% for all POIs in the Chicago metro area reduce infection by over 80% while keeping almost 60% of overall visits).

- Nishi et al. explored two network strategies for reducing the effective reproduction number (R_{eff}) while sustaining economic activities. Firstly, the **dividing groups strategy** where a group is split into two subgroups in which members engage in the same economic activities as before but the subgroups remain distinct so that members in one subgroup did not interact with the other subgroup physically. Secondly, the **balancing groups strategy** where some number of people were redirected to a different location with the same functionality to equalize the number of people at each location, thereby reducing the total number of physical interactions between individuals at any location.[6] Inputting COVID-19 parameters to an agent-based SEIR model, the authors found that **R_{eff} dropped to 1.687 (95% quartile range [QR]: 1.645–1.728) with the balancing groups strategy; to 1.234 (95% QR: 1.160–1.325) with the dividing group strategy at 50-50 split; and to around 1.0 when combining both strategies without additional measures**.

POPULATION MOBILITY IN RELATION TO COMMUNITY SETTINGS

- Population mobility has emerged as a proxy for lockdown intervention adherence,[14] and retail settings may contribute to increased population mobility,[7] including across jurisdictions. For example, a study by the US Centers for Disease Prevention and Control (CDC) examined country level mobility data from six location categories and associated COVID-19 growth rates 11 days later. They found that retail and recreation, grocery and pharmacy, parks, transit stations, and workplaces had significant and positive correlations with COVID-19 growth rates; and a decrease in visits to these locations was associated with reduced COVID-19 cases 11 days later.[7] Additionally, they found that staying at home was associated with slowed COVID-19 growth rates.[7]

- Other authors used mathematical modelling to explore the relationship of population mobility and COVID-19 incidence. For example, using Ontario COVID-19 incidence data, Wu et al. showed that the control reproduction number estimate was reduced from 3.25 on March 21 to 2.84 on March 29 with the implementation of social distancing measures (e.g., closing all public schools as of March 14; closing all recreational programs and libraries, private schools, daycares, churches and other faith settings, dine-in bars and restaurants as of March 16; closing all non-essential workplaces as of March 25).[11] Courtemanche et al.'s event study model showed that when shelter-in-place, public school closure and bans on large social gatherings were in place, closing restaurant dining rooms and bars or entertainment centres and gyms led to significant (P<.05) further reduction in COVID-19 growth rates in the United States, from 4.4 percentage points after 1–5 days to 5.2 percentage points after 21 days or more.[9] Zhang et al.'s dynamic event modelling showed that shutdowns significantly reduced the COVID-19 growth rate in the US by 0.04, 0.07, 0.08 and 0.1 SD at 6–10 days, 11–15 days, 16–21 days and >21 days after, respectively.[12]

- Conversely, Aravindakshan, et al. applied population mobility data in Germany to a modified SEIR model and found that reopening retail outlets would increase COVID-19 incidence by 33.9% over a 90-day period.[8] In Zhang et al.'s model, reopening businesses in response to mounting

economic stress was followed by significant increases in COVID-19 incidence (0.11 standard deviations [SD] increase in COVID-19 growth rate) 21 days after implementation but mandatory public masking reduced the COVID-19 growth rate by 0.04, 0.04, 0.04 and 0.12 SD over the same periods.[12] In a before-and-after study in the US, Kaufman, et al. observed rebound in COVID-19 incidence and death toll after reopening of indoor dining in the US, but such increases were about 10 times lower in states that implemented public masking policies.[10]

Jurisdictional Scan

Retail and mobility-related restrictions that were implemented during COVID-19 resurgence differed across jurisdictions examined. Some countries were restrictive in terms of both retail and mobility-related public health measures (e.g., England, France), some were restrictive in mobility-related measures but kept retail open (e.g., Italy), while others had restricted retail measures but did not restrict mobility (e.g., Belgium). In the following paragraphs, we outline the approach to retail as well as other implemented measures, to provide contextual information.

For example, in England, all retail was closed except for essential business (e.g., food, gas and banking). Bars and restaurants were closed, but open for click and collect/drive-through/delivery.[2] Residents were asked to avoid all non-essential travel by private or public transport. Residents of England were required to stay at home and avoid travel in the United Kingdom or overseas, unless for work, education or other legally permitted reasons.

Similarly, in France, non-essential retailers were closed except for deliveries and curbside pickup. Financial support was provided to closed businesses.[2] Essential stores were required to remove any items considered non-essential for sale to prevent unfair competition. Bars and restaurants were closed for in-person dining; however, take-out was available. Nightclubs were also closed. With regards to population mobility, residents were only permitted to leave their home under specific circumstances and with an exemption certificate. These circumstances generally included work commutes, school (for self or dependents), or training commutes; purchase of essential goods for business or residential purposes; essential medical appointments; support for vulnerable persons, children or family; support for persons with a disability; individual outdoor exercise within 1 km of residence for only 1 hour (includes walks with members of household or for pets); judicial or administrative summons and public service appointments; requests for administrative authority. Travel to an overseas territory required a negative COVID-19 PCR test within the last 72 hours. Travel to different parts of France was prohibited.

In contrast, in Italy, retailers remained open. Bars and restaurants; however, closed at 6:00 p.m. nationally.[2] Residents were advised not to leave home except for essential reasons (e.g., work, health emergencies).

In Belgium, non-essential retailers were closed except for deliveries and curbside pickup. In the Brussels region, all stores closed by 8:00 p.m.[2] Flea markets and Christmas markets were prohibited. Essential stores required to remove any items considered non-essential from sale to prevent unfair competition. Bars and restaurants closed for in-person dining; however, take-out was available until 10:00 p.m. Additionally, alcohol sales were prohibited after 8:00 p.m. and nightclubs were closed. With regard to population mobility, only one person (and a minor) were allowed to perform errands. Travel within Belgium was not restricted and hotels remained open.

Due to the range of public health measures implemented concurrently for these jurisdictions, it was not possible to determine the specific impact that retail closure had on COVID-19 epidemiology. For more information on retail and mobility-related public health restrictions, see Appendix A.

Discussion and Conclusions

In a time of high community transmission with serious concerns with critical care system capacity, health system capacity overall, and increasing health impacts on the population, lockdown interventions and a stay-at-home order have been implemented to reduce COVID-19 case growth and reproductive rates in Ontario.[2]

While there is limited evidence on the impact of specific measures for retail settings, evidence from population mobility studies and lockdowns (involving retail closures) or stay-at-home orders suggests that greater mobility of the population (e.g., traveling to retail locations) is associated with greater risk of COVID-19 transmission. For example, retail and recreation, grocery and pharmacy, were positively correlated with COVID-19 growth rates; and a decrease in visits to these locations was associated with reduced COVID-19.[7,9,11,12] However, the risk of transmission appears to vary across different types of retail settings with visitor/population densities, duration of visits, and feasibility of keeping masks on. As data on the adherence to personal protective measures (e.g., cough etiquette, keeping physical distance, not touching one's face, wearing mask) are not available in most of the literature reviewed here, caution should be exercised in interpreting the risk findings reported above.

Measures that may be effective for the safer reopening of retail outlets include: limiting the peak occupancy in a given space to reduce the risk of transmission;[5,6,8] curbside pickup;[3] and the use of masks,[3,4,10,12] all of which are already in place in Ontario grey regions. Further restrictions on retail occupancy (lower than the current 50% occupancy) for stores with in-person shopping may have additional impact.[5]

It is important to note, that the transmission of COVID-19 in outdoor settings has been much less common compared to indoor settings.[15,16] A systematic review by Leclerc et al. found that many examples of SARS-CoV-2 clusters were linked to a wide range of mostly indoor settings.[17,18] Similarly, Bulfone et al., found that the odds of indoor COVID-19 transmission was over 18 times higher compared to outdoors (18.7 times; 95% CI 6.0, 57.9). These studies suggest that outdoor retail settings may be safer than indoor retail settings.[19]

While it is acknowledged that retail settings may be more brief interactions than at other types of settings such as faith-based organizations, social gatherings or restaurants,[20] in periods of high community transmission, there is a need to reduce as many contacts within communities as possible. In addition, it is important to acknowledge as part of managing a public health emergency, that the context reflects characteristics of complex systems.[21,22] As such, interconnectedness and the concept of an open system renders lower transmission jurisdictions vulnerable with their connections to higher transmission regions. Cross-jurisdictional travel is important to consider in relation to risks for increased mobility and potential increased COVID-19 transmission. Further, while vaccine supplies and therapeutic treatment remain limited for several months,[23] it is important to note that public participation with public health measures (e.g., social distancing) will continue to be our most effective approach to COVID-19 control.[11] Evidence-based approaches to support public participation include clear and consistent communication.[24] Consistency of messages related to staying-at-home and limiting non-essential trips are expected to be supported by closure of non-essential retail and subsequent expected reduction in population mobility.

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Appendix A: Jurisdictional Scan

The following table illustrates differing retail and mobility-related public health measures/approaches across various jurisdictions. For retail-related measures in additional jurisdictions, see (DENTON, 2020).[25]

Table 1: COVID-19 Resurgence Retail and Mobility-Related Lockdown Measures across Select Jurisdictions

Jurisdiction	Retail-related public health measures	Population mobility-related public health measures
England, United Kingdom (UK)	All retail closed except for essential business (e.g., food, gas, and banking). Bars and restaurants closed, but open for click and collect/drive through/delivery.	Avoid all non-essential travel by private or public transport. Residents of England must stay at home and avoid travel in the UK or overseas, unless for work, education or other legally permitted reasons.
Wales, United Kingdom	Non-essential businesses were closed (except food markets). Bars, pubs, and restaurants closed.	Not reported.
Northern Ireland, United Kingdom	The retail sector was permitted to stay open at this time with the exception of close contact services such as hairdressers and beauticians. Off-licenses and supermarkets were not permitted to sell alcohol after 8:00 p.m. Bars and restaurants were closed except for deliveries and takeaways for food, with the existing closing time of 11:00 p.m. remaining.	Not reported.
Belgium	Closure of non-essential retail except for deliveries and curbside pickup. In the Brussels region, all stores closed by 8:00 p.m. Flea markets and Christmas markets are prohibited. Essential stores must remove any items considered non-essential from	Only one person (and a minor) may perform errands. Travel within Belgium is not restricted. Hotels remained open.

Jurisdiction	Retail-related public health measures	Population mobility-related public health measures
	sale to prevent unfair competition. Bars and restaurants closed for in-person dining; take-out available until 10:00 p.m.; alcohol sales prohibited after 8:00 p.m. Nightclubs closed	
France (Metropolitan France and Martinique)	Closure of non-essential retail except for deliveries and curbside pickup. Financial support provided to closed businesses. Essential stores must remove any items considered non-essential from sale to prevent unfair competition. Bars and restaurants closed for in-person dining. Take-out available. Nightclubs closed.	Only permitted to leave household under specific circumstances and with an exemption certificate. These circumstances generally are work commutes, school (for self or dependents) or training commutes; purchase of essential goods for business or residential purpose; essential medical appointments; support for vulnerable persons, children or family; support for persons with a disability; individual outdoor exercise within 1 km of residence for only 1 hour (includes walks with members of household or for pets); judicial or administrative summons and public service appointments; requests for administrative authority. Travel to an Overseas Territory requires a negative PCR test less than 72 hours old. Travel to different parts of France are prohibited.
Spain	Nationwide bars and restaurants cannot serve after 10:00 p.m. local time. Information on other retailer not available.	Prohibition on non-essential travel and movement between regions, applies to entire country except Canary Islands.
Italy	Retailers remained open. Bars and restaurants closed at 6:00 p.m. nationally.	Residents advised not to leave home except for essential reasons (e.g., work, health emergencies).
Israel	Businesses open to the public were closed (e.g., including commerce), with the exception of	Residents ordered to stay within 500 meters of their home with exceptions (e.g., work, buying medications, medical treatment, funeral, prayer).

Jurisdiction	Retail-related public health measures	Population mobility-related public health measures
	essential stores (e.g., food stores, pharmacies). Bars and restaurants were closed.	
Australia (Metropolitan Melbourne and Regional Victoria)	Retail closed, except for essential services. Bar and restaurants closed.	Maximum 5 km distance from home for shopping.

Source: ([PHO, Dec 2020](PHO, Dec 2020))[26]

Citation

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