Opportunities for Reusables in Retail Settings During the COVID-19 Pandemic in Canada:

A Review of Guidance and Evidence

NATIONAL ZERO WASTE COUNCIL

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An Initiative of Metro Vancouver

The National Zero Waste Council, an initiative of Metro Vancouver, is leading Canada's transition to a circular economy by bringing together governments, businesses and NGOs to advance a waste prevention agenda that maximizes economic opportunities for the benefit of all Canadians.

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Preface

The National Zero Waste Council is pleased to present *Opportunities for Reusables in Retail Settings during the COVID-19 Pandemic in Canada: A review of guidance and evidence*, a body of research undertaken by the University of Toronto's Dalla Lana School of Public Health. The interest in this research emerged from uncertainty around the safety of using reusable products and services. Before the emergence of COVID-19 the use of refillable coffee mugs, reusable shopping bags, and containers at bulk food and zero waste retailers had been expanding, reflecting at least in part, public concern about the prevalence of single use items and the negative impact of plastic waste in freshwater and ocean ecosystems. This trend toward re-use, as opposed to single use, is consistent with waste prevention and the principles of the circular economy.

The COVID-19 pandemic introduced some caution around reusables in retail environments in particular, and has resulted in a diminished presence of reusables. In the early days of the pandemic, the source of transmission of the virus was not clearly established and because the risk to public health was high, most public health authorities adopted a precautionary approach to reduce potential risks to human health, including actions to reduce potential exposure to contaminated surfaces. Retailers also became more cautious about the use of reusables. In response to the mounting confusion and concern amongst consumers and retailers about the risks associated with reusables, the National Zero Waste Council sought to better understand the risk of reusables during the pandemic and the long-term implications for their viability in the retail settings.

The Council engaged a highly-qualified research team from the University of Toronto's Dalla Lana School of Public Health with expertise in epidemiology, environmental and occupational health, public health policy, and waste studies. The research team sought to address three questions:

- What is the guidance of Canadian public health authorities during the pandemic with respect to the use of reusables?
- What is the current scientific evidence on the transmission of the virus from contaminated surfaces?
- What do we know about impacts on consumer and retailer behaviours as a result of the pandemic?

Based on the review of the public health guidance and scientific evidence, the research team concluded that, with precautions in place, there continue to be opportunities for reusables in retail settings even during the COVID-19 pandemic. However, this evidence does not mean that retailers or consumers will readily return to prior behaviours with regards to reusables.

The science related to COVID-19 transmission is evolving; this report provides an analysis of the available science as of January 2021. As of the release of this report, June 2021, the available research findings of other organizations, including the Centers for Disease Control and the World Health Organization, are consistent with the findings of this study. As the US CDC states, "current evidence strongly suggests transmission from contaminated surfaces does not contribute substantially to new infections"[1].

Through the release of this report, the National Zero Waste Council hopes to contribute to a science-based understanding of the risks of using reusables during the COVID-19 pandemic and associated best practices for retailers and consumers committed to expanding the use of reusables in the years to come.

The research team also makes a very important and relevant observation. They acknowledge that the public health response to the use of reusables during the pandemic "largely ignored the unintended, long-term consequences of a return to single-use plastics for cups, bags and containers." As the knowledge of the environmental determinants of health expands, there may be opportunities to incorporate the consequences of expanded use of disposables in "the development and dissemination of public health guidance." The Council believes that this holistic view of the connections between public and ecological health are key to moving to a future without waste.

National Zero Waste Council
June 2021

1 US CDC scientific brief updated May 7, 2021 https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/sars-cov-2-transmission.html

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Contents

Main messages

- Our analysis of public health guidance and scientific evidence suggests that there continue to be many opportunities to use reusables in retail settings during the COVID-19 pandemic, albeit with added safety precautions to reduce the risk of potential transmission.
- Most public health guidance permitted or was modified to permit the continued use of reusables, with added safety precautions, such as good hand hygiene. The environmental implications of using disposables were expressly considered in only one guidance document.
- Exposure to the virus on contaminated surfaces (fomites) is possible. SARS-CoV-2, the virus responsible for the pandemic, can survive for days on various surfaces in the lab and has been detected on a variety of surfaces in the community. Theoretically, this *exposure* risk exists for both reusables and disposables.
- The evidence on the risk of *transmitting* SARS CoV-2 through contact with contaminated surfaces (fomites) continues to evolve and is not conclusive. Indirect transmission via surfaces is difficult to confirm because people who have contact with contaminated surfaces may also have had close contact with people who have COVID-19, enabling transmission through non-fomite routes. That said, we were unable to find any reported cases where fomite-only transmission was implicated.
- Where risk is high and scientific uncertainties are large, public health typically takes precautionary actions that are focused on reducing the immediate risks to human health. With infectious disease outbreaks, this often involves promoting hand washing and other actions to reduce exposure to contaminated surfaces.
- The public health system's response to emerging threats can and should evolve as more scientific information becomes available, and there is increased time to consider and balance the various harms involved in a policy choice, including those for the environment. The Canadian public health community has developed significant understanding of environmental and ecological threats to health, which can be leveraged in efforts to develop balanced and evidence-informed public health guidance.
- While each infectious disease outbreak will be unique, the authors suggest four actions to increase the opportunity for reusables during a pandemic:
    - Promote a comprehensive, balanced approach to assessing risks and highlight the unintended consequences of responses.
    - Increase the evidence to guide decisions on fomite transmission and reusables.
    - Advocate to change direction as new evidence becomes available and promote guidance that balances caution and reassurance in terms of fomite transmission risk as is warranted by the evidence.
    - Clarify public health jurisdiction for retailers and the public seeking advice on use of reusables and the safety precautions available to limit the risk of transmission during infectious disease outbreaks and pandemics.

Summary

Prior to the COVID-19 pandemic, Canadians were on a path towards increased use of reusables in the retail sector.(1) However, given the uncertainties surrounding transmission risk, particularly early in the pandemic, some retailers suspended the use of reusables, such as shopping bags and coffee cups, with the rationale that disposables could, at least theoretically, help to reduce spread through contaminated surfaces (fomites). The turn toward single-use items during the COVID-19 pandemic by consumers and retailers runs counter to Canada's national ambition to move toward "zero plastic waste," and achieve the public health benefits of pollution reduction.

This report identifies opportunities to help retailers decide if and how they can return to the use of reusable products and their associated service models in retail settings, given the disruptions of the COVID-19 pandemic. It includes three parts:

(i) an environmental scan of public health guidance[1]
(ii) a review of the science of surface transmission risk
(iii) a review of the social science literature on consumer and retail behaviours

The evidence reviewed for this report identified opportunities to support the continued use of reusables and little rationale for a return to disposables. In general, most Canadian jurisdictions allowed the continued use of reusable products, with added safety precautions such as good hand hygiene. The virus responsible for the COVID-19 pandemic can survive for days on various surfaces in the lab and has been detected on a variety of surfaces in the community. Regardless, in the community, evidence for the role of fomites in the actual spread of COVID-19 is evolving and not conclusive. Fomite-only transmission is a difficult route of transmission to confirm because those who have contact with contaminated surfaces may also have close contact with cases. Thus, while we were unable to locate any reported cases where a contaminated surface was implicated as the primary route of transmission, the risk of fomite transmission remains possible, even if low. That said, both disposable and reusable models involve some fomite-transmission risk. Added safety precautions can be considered to reduce the potential risks of transmission.

The public health system's response in situations with high risk and where scientific uncertainties are large is to take precautionary actions that focus on the immediate protection of human health. With infectious disease outbreaks, this typically involves the initial promotion of increased hand washing, where there may be few downsides to adoption. Public health authorities may also promote other actions to reduce exposure to contaminated surfaces, such as restrictions on the use of reusable products, which may yield negative unintended consequences. The early focus on the potential role of fomite transmission in the COVID-19 pandemic may have encouraged some restrictive public health guidance and contributed to the tendency for retailers to prefer disposables over reusables. Fortunately, public health can adapt its response as more scientific information becomes available. Thus, there is opportunity to

[1] The review focused on guidance from public health authorities, but also included guidance concerning the public from occupational health and safety agencies. For the latter, the review excluded guidance concerning work that did not involve interactions with the public, such as washing dishes, preparing food, or accepting deliveries.

reposition reusables as part of these adjustments, particularly where updates that respond to new evidence on transmission risk are coupled with a balanced consideration of all the harms involved in a policy choice, including short and long-term consequences for the environment.

The relevance of our specific findings to future pandemics is unknowable, as future pandemics may occur as a result of similar coronaviruses, or as a result of viruses that behave very differently. While fomites do not appear to play a key role in the transmission of SARS-CoV-2, they could play a larger, or smaller, role in the transmission of future viruses. However, the authors suggest four actions that may increase the opportunity for reusables during a future infectious disease outbreak or pandemic:

- Promote a comprehensive, balanced approach to assessing risks and highlight the unintended consequences of responses.
- Increase the evidence to guide decisions on fomite transmission and reusables.
- Advocate to change direction as new evidence becomes available and promote guidance that balances caution and reassurance in terms of fomite transmission risk as is warranted by the evidence.
- Clarify public health jurisdiction for retailers and the public seeking advice on use of reusables and the safety precautions available to limit the risk of transmission during infectious disease outbreaks and pandemics.

The following summarizes the detailed findings organized by the 10 research questions (RQ).

RQ1. What was the general stance across authorities for each type of reusable?
Most Canadian jurisdictions allowed the continued use of reusable products during the pandemic, with added safety precautions. Use of personal containers and cups was more often suspended than bags or bulk food services. Almost all guidance on masks emphasized reusability or how to make reusable masks. The international guidance that was consulted also recommended that the use of reusable products could continue with safety precautions.

RQ2. How authoritative was the guidance?
Almost all the guidance was advisory, though it differed in tone and wording.

RQ3. What, if any, were the marked changes in guidance over the course of the pandemic?
Ten per cent of documents had significant updates regarding reusables or mask use. Most of these changes became less restrictive; however, some guidelines added restrictions. Overall, most updates clarified the guidance and made it easier to understand, as well as emphasizing specific points made in earlier versions.

RQ4 What statements were made about transmission routes for SARS-CoV-2?
All guidance documents that included transmission risk statements said that the virus was transmitted by respiratory droplets and by fomites. Several indicated that transmission was mainly by droplets and that the risk of transmission by fomites was low. Most commented on the survival time of the virus on surfaces, with estimates ranging from a few hours to a few days.

Some public health statements were reassuring that fomite transmission risk could readily be mitigated by handwashing.

RQ5. How long does SARS-CoV-2, the virus that leads to COVID-19, survive on surfaces?
It has been established that the virus can be detected for days on various surfaces in laboratory settings, from less than one day on paper to 14 days (about 2 weeks) on masks. Laboratory evidence was focused on materials and not products. Overall, regardless of surface type, the virus tends to survive longer at lower temperatures (room temperature and lower) and at lower relative humidity (RH).

RQ6. Can SARS-CoV-2 be isolated from community settings, including reusables?
Overall, 7% of surface samples studied in the community were positive for SARS-CoV-2. However, the findings may have limited relevance to the retail setting, as samples were not exclusively collected from retail settings or from reusable products. Importantly, the method[2] used to detect whether the virus was present on community surfaces does not differentiate between viable and nonviable, or infectious and non-infectious virus.

RQ7. Is there evidence of indirect transmission of SARS-CoV-2?
Surface transmission of COVID-19 is theoretically possible, but there were no identified reports where transmission of COVID-19 via a contaminated surface was the only plausible route of exposure. It is difficult to isolate surface transmission when investigating cases, as most individuals with fomite exposure to COVID-19 were also in close contact with a case and therefore would be likely to have exposure through other transmission routes.

RQ8. What are the areas of continued uncertainty surrounding indirect transmission?
The challenges of isolating fomite transmission among cases with COVID-19 mean that we have no specific examples from which to draw inferences. For indirect transmission to occur, enough virus must survive to be “passed” to the next object/surface in the chain at each step of the transmission pathway.

RQ9. How has the pandemic affected attitudes or behaviours regarding the use of reusables in retail settings?
Retail organizations in Canada have responded to the pandemic by banning reusable bags, removing charges on plastic grocery bags, and pausing reusable container and cup programs. There has been no scholarly research on changes in consumer attitudes toward reusables, specifically, and very little on their use during the pandemic.

RQ10. What is known about the factors that can encourage or constrain the use of reusables by consumers or their encouragement by retailers?
Based on considerable evidence, primarily from models of “refill on the go", the key factors affecting consumer use of reusables include convenience, the need to plan ahead, pro-environmental attitudes, financial considerations, and the availability of stores that allow refills. Based on limited evidence on the retail side, reusables can be a marketing opportunity, while hygiene and safety of reusables can be a concern in launching a reusable program for cups, bags or containers.

[2] Real time polymerase chain reaction (RT-PCR)

Opportunities for reusables in retail settings during the COVID-19 pandemic in Canada: A review of guidance and evidence

Background

Introduction

In 2018, Canada charted a course to increase the use of reusables and reduce the use of disposables, such as plastic shopping bags and coffee cups, through the Canada-wide Strategy on Zero Plastic Waste.(1) However, with the rise of a new global coronavirus[3] disease late in 2019 (COVID-19 pandemic), some Canadian retail organizations, including grocery stores and restaurants, returned to the use of disposables in 2020, with the rationale that disposables could, at least theoretically, help to reduce the spread through contaminated surfaces (fomites) of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) responsible for the pandemic.(2)

This return to disposables highlighted the dilemma that exists between the desire to reduce the use of disposables given plastics' effects on the environment and potential impacts on human health,(3) with the general belief, reinforced by the plastics industry,(4) that disposables are a sanitary solution for reducing transmission risks of emerging pathogens. Thus, this research sought to clarify the opportunity and evidence for using reusables in retail settings in Canada during the pandemic.

Public health context in Canada

Within Canada, the response to emerging pathogens of public health importance is managed by a complex public health system, characterized by interlinked governance and shared responsibilities between one federal, 13 provincial/territorial governments, and Indigenous Peoples, all with some regulatory authority. Within each province/territory, the system may be structured differently.(5–7) For example, critical public health functions are integrated as part of health authorities that coordinate acute, community, home care and public health services under the auspices of regionally defined governance structures in some provinces (e.g., British Columbia, Alberta), while such functions are separately coordinated through regional public health units in others (e.g., Ontario); as well, the provinces of British Columbia, Ontario and Quebec have established provincial public health agencies with a mandate to provide scientific advice to government. In addition to differences in the organization of the public health function, individual medical officers, with public health powers under legislation, exist at federal, provincial/territorial, and, in some cases, regional levels. Medical officers of health are viewed as bringing a "scientific voice" to population health decision-making; they also have authority to "provide advice" or "recommend action". In addition to the array of actors with specific public health functions, separate groups, such as occupational health and safety regulators, may also have authority over spaces where public health regulations apply, for example in occupational settings that are also public spaces. Thus, a wide array of actors, some working within

[3] SARS-CoV-1, the virus that led to the SARS pandemic in 2003, and MERS-CoV, the virus that caused the Middle East Respiratory Syndrome, are also both coronaviruses.

collaborative networks and others acting independently, may inform public health policy with relevance to pandemic response in retail settings. These actors may describe requirements in legislation or through emergency orders that can be enforced, but can also provide guidance or guidelines that are recommended but lack clear avenues for enforcement.

Generally, the public health system's decision-making and response toward risk management is oriented to protect the public from immediate threats to health. Often, this follows the "precautionary principle,"(8) which involves taking action and promoting policies that protect human health and the environment in the face of uncertain risks, or when the time required to reach scientific certainty might entail harm.(8,9) For example, in the face of infectious disease risks, public health authorities will often recommend handwashing as a risk management strategy, even if its utility is uncertain, as it is unlikely to produce unintended harms.(10)

A precautionary approach is typically coupled with the "tailored/flexible principle". This means that decisions are revisited periodically, to determine whether a revised risk management approach is needed, as new or significant information emerges.(8) While the precautionary principle has limitations, it has been proposed that situations such as the COVID-19 pandemic illustrate its value, when faced with, "high risk and [when] the uncertainties are large and scientific".(11)

Reusables in Canada

Interestingly, the rise of disposables in Canadian retail settings has been historically intertwined with efforts to improve health. The first widespread disposable, the paper "Dixie Cup," was originally supported in 1907 as the "Health Kup" by US boards of health. The aim was to prevent the spread of infectious diseases such as cholera and diphtheria by replacing the communal metal cups commonly shared at that time to drink from public water pumps.(12) Eventually, the concept of single-use containers was paired with the use of plastics.

In recent decades, concerns have grown regarding the ubiquitous nature of plastic in the oceans and their impact on the environment and health. A recent report, published in October 2020 by Environment and Climate Change Canada, summarized the current state of the science. It identified that plastic pollution is present in aquatic ecosystems, terrestrial ecosystems, and air worldwide,(3) which causes physical harm to the environment and adversely affect habitats. The report also identified that, notwithstanding the limited evidence on the impacts on human health, action is needed to reduce plastics that end up in the environment, in accordance with the "precautionary principle".

Within Canada, there is a growing movement to shift to reusables and take action to reduce the production and use of single-use plastics. The City of Vancouver was the first major municipality to implement a ban on multiple single-use plastic items, including foam cups and take-out containers in January 2020, and plastic straws and single-use utensils in April 2020.(13) As of January 2021, three provinces (i.e., Newfoundland and Labrador, Nova Scotia and Prince Edward Island) and 68 municipalities, mostly in Quebec, (including Montreal) had single-use, plastic bag bans in effect.(14)

Despite the momentum to move forward on the reduction of disposables, the COVID-19 pandemic brought to light concerns about reusables, given the potential for surface transmission of viruses. The plastics industry used the pandemic as an opportunity to promote single-use plastic products as the most sanitary choice for consumption and transport of food.(4) At the

start of the pandemic, a number of retailers, municipalities and provinces in Canada paused or delayed their initiatives in support of reusables.(15) Some in the food industry quoted the precautionary principle as a reason to discontinue use of reusables,(2) although some returned to reusables in the summer with adapted strategies for their use.(16) Despite these reassurances, a national poll found that support for a ban on single-use plastics had declined from 70% about a year before the pandemic to 58% in July 2020.(17) The pandemic also had impacts at the policy level, with several jurisdictions delaying the introduction of bans on single use plastic bags. Vancouver's ban on disposable plastic bags was delayed and now comes into effect in 2022, along with fees on paper shopping bags, new reusable shopping bags, and single-use cups.(13)

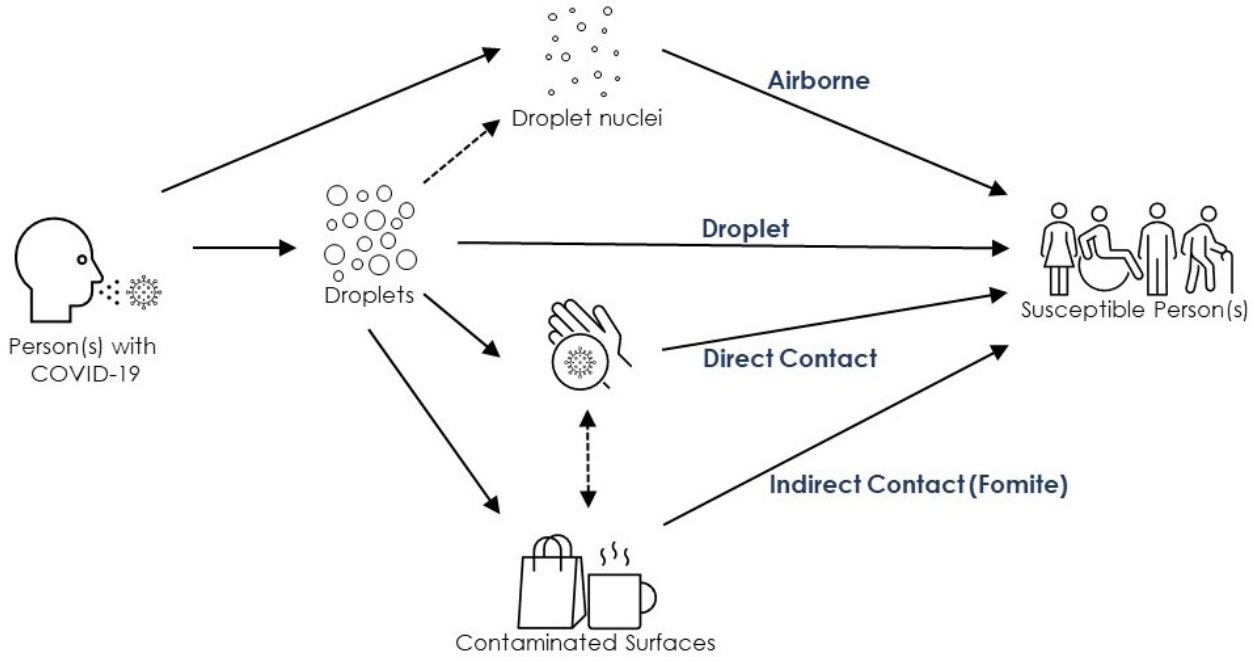
Yet, even in the pandemic, efforts to reduce single use plastic items persist. On June 22, 2020, 119 scientists living in 18 countries countered backward moves to disposables by signing a statement saying that reusable containers, including bags and cups, could be safe to use during the COVID-19 pandemic if they were properly washed. The statement argued that single-use plastic is not inherently safer than reusables and can create additional public health concerns once it is discarded.(18) As well, undeterred by COVID-19, Canada recently announced its intention to move forward on its effort to create a Canada-wide Strategy on Zero Plastic Waste, including a ban on six specific single-use plastic items (plastic checkout bags, straws, stir sticks, six-pack rings, cutlery, and food ware made from hard-to-recycle plastics) to come into effect in 2021.(19) Of note, the Canadian Public Health Association was among those that applauded the federal government's intention to ban single-use plastics.(20) This highlights the potential for public health to offer guidance that balances the many potential harms and benefits of any public health intervention.

Reusables and COVID-19 transmission

COVID-19 (coronavirus disease) is caused by the coronavirus SARS-CoV-2. The virus may be transmitted from person-to-person through several routes: airborne, droplet, direct contact and indirect contact (Figure 1). By definition, a contaminated surface serves as the intermediary, or link, between people in indirect contact. Indirect transmission is also called fomite transmission. Moves to reduce use of reusables during the COVID-19 pandemic may have been motivated by concerns about the risk of transmission via contaminated surfaces (i.e., fomite transmission).

The questions surrounding the use of reusable products and transmission arise because, in theory, reusable products may be handed back and forth between people, representing a risk of the transfer of virus on the reusable product that is greater than for the disposable product (Figure 2).

Indirect transmission requires several events to align under just the right environmental conditions. First, the virus must be transferred from an infectious person onto a surface, and then from the surface onto the mucous membranes of an uninfected person - a process that could include many steps (e.g., Figure 3). Not all the virus that is present at one step will be transferred in the next step; at each step, there is a loss of virions (the unit of virus) (i.e., the transfer efficiency is < 1.0). This transfer efficiency depends on many factors, including the amount of virus present initially, the duration of time elapsed between steps, and the environmental conditions.



Modified from Otter et al. (21)

Figure 1: Routes of transmission for infectious diseases

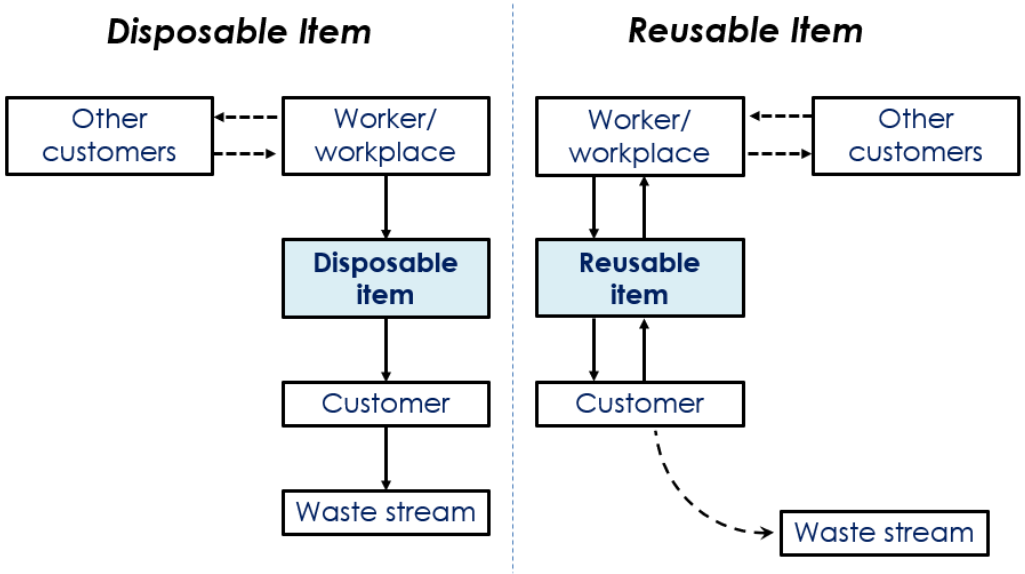


Figure 2: Potential pathways that disposable and reusable items may take as they move in retail settings

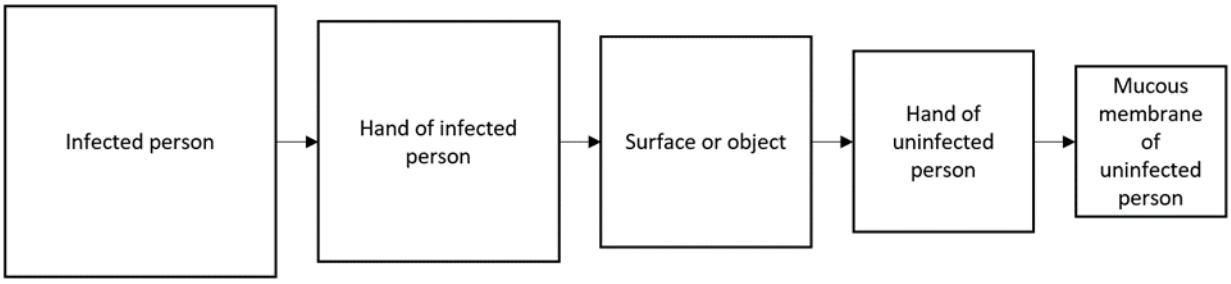


Figure 3: Simplified schematic of indirect transfer from infected person to uninfected person via a surface or object

Aim and research questions

Overall, the aim of this report was to better understand where opportunities may exist to minimize disruption of efforts that foster the use of reusables in retail settings during infectious disease outbreaks (such as COVID-19). The report sought to identify opportunities for using reusable products and associated service models in retail settings in Canada in the context of the COVID-19 pandemic. The report addresses ten research questions (RQ):

RQ1. What was the general stance on reusables across authorities for each type of reusable product or service?

RQ2. How authoritative was the guidance?

RQ3. What, if any, were the marked changes in guidance over the course of the pandemic?

RQ4. What statements were made about transmission routes for SARS-CoV-2, particularly via surfaces?

RQ5. How long does SARS-CoV-2, the virus that leads to COVID-19, survive on surfaces?

RQ6. Can SARS-CoV-2 be isolated from community settings, including reusables?

RQ7. Is there evidence of indirect transmission of SARS-CoV-2 via contaminated surfaces?

RQ8. What are the areas of continued uncertainty surrounding transmission via contaminated surfaces?

RQ9. How has the pandemic affected attitudes or behaviours regarding the use of reusables in retail settings?

RQ10. What is known about the factors that can encourage or constrain the use of reusables by consumers or their encouragement by retailers?

The report is structured in three parts. Part 1 addresses questions one through four (RQ1–RQ4) with an environmental scan of public health guidance; Part 2 addresses questions five through eight (RQ5–RQ8) with results from a rapid review of the scientific research; Part 3 addresses the final two study questions (RQ9–RQ10) through a rapid review of social science research on reuse behaviour during and prior to the pandemic.

Approach

This report synthesizes findings and offers recommendations with relevance to retailers and the public. While the project was focused on the COVID-19 pandemic, the report - where possible - identified principles and actions that have more general relevance to the retail use of reusable products and associated service models in the context of infectious disease outbreaks. This report includes three parts:

(i) an environmental scan of public health guidance

(ii) a review of the scientific literature related to surface transmission

(iii) a review of the social science literature on consumer and retail behaviours

(i) ***The environmental scan of guidance*** assessed public health guidance provided by Canadian authorities, including federal government sources, provincial and territorial sources and several regional health authorities (e.g., local public health units) in Ontario and Quebec, as well as occupational health and safety agencies at the federal and provincial level (RQ1–RQ4). For guidance from occupational health and safety agencies, we only included guidance that spoke to the use of reusables by consumers. In Ontario, the eight regional public health units were selected that had authority over the 10 most populous cities in the province. Similarly, 10 regional health authorities in Quebec were scanned. In addition, two widely recognized international authorities were consulted, specifically the World Health Organization (WHO) and the U.S. Centers for Disease Control and Prevention (CDC) to assess whether Canadian guidance differed in any significant way from that offered by these authorities.

This scan includes reusable products and associated service models that have been affected by COVID-19, as well as reusable products made necessary by the pandemic:

- reusable bags
- reusable cups
- reusable containers (i.e., consumer refill, dispensary, or return)
- reusable masks[4]

The initial search of guidelines was conducted on the websites of the authorities of interest, starting at the federal level and then proceeding to the provincial and territorial governments and the selected regional public health authority websites. Due to time and resource limitations, we restricted our search to English-language publications, except for Quebec, where both English and French-language publications were reviewed.

[4] Glove use was excluded from the review since there is no commonly used reusable alternative to disposable gloves.

A preliminary selection of guideline documents was made based on their titles, with the key requirement being that the context was food premises (i.e., restaurants, grocery stores, farmer's markets), retail businesses or mask use for the general public. Once documents were identified, a keyword search was conducted within the document, using "disposable", "reusable", "bag", "mug", "container", "take-out", "bulk", "return", "face covering", and "face mask". This was to determine whether the documents met the requirement that the focus be on reusable products (i.e., bags, containers, mugs/cups, masks) or associated business models (i.e., customer return and bulk refill).

Excluded from this review were guidelines from industry associations, as they were not relevant public health authorities. That said, the exclusion of industry associations is unlikely to have reduced the total stock of relevant information, as these documents often simply referenced public health guidance or were not comprehensive. For example, the Retail Council of Canada had a webpage summarizing public health guidelines on bulk dispensing and reusable bags from only five provinces and did not mention reusable cups or containers.(22)

Recognizing the evolving understanding of the science of the spread of the SARS-CoV-2 virus, the temporality of the guidance was also addressed by noting any marked changes over the course of the pandemic, using the archive.org database.

(ii) ***A rapid review of the scientific literature in relation to the science of surface transmission risk*** was conducted to explore RQ5 and RQ6 (last search date: December 13, 2020). The peer-reviewed literature was searched using Web of Science to ensure broad inclusion of disciplinary publications, but the strategy was iterative. Search terms included the virus ("SARS-CoV-2") or disease ("COVID-19" or "Coronavirus") in combination with terms describing surfaces, including materials and objects. As the focus of this work was on retail practices implicated by the COVID-19 pandemic, the following products were considered in scope: reusable bags, reusable cups, reusable containers (i.e., consumer refill, dispensary, or return), and reusable masks. Surfaces included were paper, cardboard, metal, plastic. Specific product terms included were cups, bags, containers and masks. Generic terms for surfaces and reusables were also included. The search was limited to English-language publications. Titles of retrieved results were reviewed first, followed by the abstracts, to determine relevance. Relevant papers were reviewed, and data abstracted.

For laboratory studies[5] (RQ5), data were recorded on the virus investigated, the method used to apply the virus to the surface, the surface tests, the method used to assess virus survival, the study timelines, and the environmental conditions (temperature, relative humidity). For community studies (RQ6), data were abstracted on the study location (country), month/season of sample collection, the method used to detect the virus on the surface, whether samples were collected in locations where known cases were likely to be frequent, and the specific site of sampling. Community studies of surfaces or objects in health care settings were excluded as these were in an environment that was not considered comparable to the retail setting. In the

[5] Laboratory studies were controlled studies conducted in a laboratory, rather than a real-world setting. Generally, in these studies the investigators introduced SARS-CoV-2 virus onto a surface and studied how long the virus remained detectable on the surface under controlled conditions. Community studies were studies conducted in real-world settings. Generally, in these studies the investigators collected wipe or swab samples from surfaces in the community where conditions were not controlled, and they analyzed the sample to see whether SARS-CoV-2 was present.

health care environment, people with confirmed, and severe, COVID-19 are present; these people are likely to be sicker than people occupying retail settings. The interaction of people (patients and health care workers) with surfaces and objects is also likely to differ and persons occupying or working in these environments would have access to higher levels of protective equipment. An additional rapid review, though more informal, was conducted to locate information on fomite, or indirect, transmission in COVID-19 to address RQ7. This review was completed using grey and peer-reviewed literature; search terms included “fomite transmission”, “indirect transmission” and “COVID-19”.

(iii) ***The rapid review of scholarly literature on COVID and the use of reusables in retail settings*** (RQ9) used a similar search approach to that used for fomite transmission. The Web of Science data base was searched for English language publications containing the words “COVID-19” or “SARS-CoV-2” in combination with any of the following terms: reus*, returna*, bags, containers, or packaging. The asterisk stands for extensions, such as “able” or “ables” or “e” for “reus*”. Exclusions in the search included articles containing the terms masks, respira*, disease, and PPE. The titles and then the abstracts were reviewed for relevance to the search and the full body of the article checked further for both relevance and for the presence of findings based on primary data collection.

The scholarly literature search revealed only one source on how COVID-19 has affected retailer decisions regarding reusables and this source did not mention Canadian retail. Consequently, an additional search was made with Google using the search terms “Canada COVID” and “reusable” or “bags” or “single-use”. The only exclusion term used was “masks”. The search was successful in identifying numerous examples of restrictions imposed on reusables by retail businesses in Canada. The search was meant to be illustrative rather than comprehensive and captured only major brand initiatives because of inclusion of the keyword “Canada”.

The Web of Science search on consumer use of reusables during COVID-19 produced only one relevant scholarly article on consumer perspectives, so the search was extended to include the combination “COVID-19” and “pro-environmental behaviour”. A second data base, Google Scholar, was searched with those terms as well. These searches resulted in two more relevant articles.

A search for articles on factors that influence the use of reusables by consumers or adoption of reuse programs by retailers also used the Web of Science (RQ10). The search terms used were (“reusable*” or “refill*”) and (“behaviour” or “perceptions” or “consumer”” or retail”) and (“bags” or “containers” or “cups” or “packaging”). A second search was made using the term “plastic bag* behaviour” to see whether reusable bags were mentioned in articles on the single-use alternative. Only articles with findings based on primary data collection were included.

Findings

Part 1: Environmental scan of public health guidance

This section outlines the findings of an environmental scan of COVID-19 guidelines issued by public health authorities in Canada regarding the safety and appropriate use of reusable products, with a focus on retailers that sell food and beverages, such as grocery stores, restaurants, and coffee shops. This includes reusable products (reusable coffee cups, bags, containers) and bulk dispensing that have been affected by COVID-19 and reusable products made necessary by COVID-19 (face masks). The review explored the clarity and consistency of the guidelines regarding their ability to inform the measures needed for the safe use of reusable products and associated service models. It also identified the evidence (and the absence of evidence) used to determine best practices. Recognizing the evolving understanding of the science of the spread of the SARS-CoV-2 virus, the temporality of the guidance was also addressed by noting any marked changes over the course of the pandemic.

A total of 62 documents with relevant guidance were identified from two federal, 14 provincial/territorial, and seven regional health authorities, and one federal and two provincial occupational health and safety agencies in Canada. Any uncertainty about inclusion/exclusion of documents was discussed among the researchers in the team. All selected documents provided information, advice, or authoritative direction about reusables and/or face masks. Three jurisdictions, including Northwest Territories, Nova Scotia, and New Brunswick did not provide any guidance regarding reusables while Nunavut had no guidelines on either reusables or masks. The results and the tables found in each section report on the content of guidelines posted on websites as of November 29, 2020. All guidelines are labelled as “G” followed by a number that refers to the full document reference link found in Appendix A.

RQ1. What was the general stance across authorities for each type of reusable?

Almost all authorities advised that use of reusable bags could continue, but with an emphasis on added safety precautions for employees, such as asking customers to pack their own bags. Similarly, all but one authority advised that bulk food dispensing could continue but with new safety precautions for customers. Advice on the use of reusable containers was mixed. Most authorities recommended suspension of use, but half of the recommended suspensions were for farmers’ markets only. For other food and retail establishments, reusable containers were allowed but discouraged, or allowed with new safety precautions for employees, such as not allowing handling by employees. Regarding masks, none of the public health authorities recommended disposable masks over reusable masks or vice versa, except for the Government of Canada, which encouraged reusable masks by pointing out the negative environmental impact of disposable masks. The Government of Canada, Ottawa Public Health, Alberta and Prince Edward Island specifically mentioned reusability of masks.

The results are outlined in greater detail below, categorized into the sections, “Reusable Containers and Cups”, “Reusable Bags”, “Bulk Food Dispensing”, “Face Masks”, “Statements about the Transmission of SARS-CoV-2” and “Other Findings”, followed by a discussion section.

Reusable containers, cups and travel mugs

Two Canadian government agencies, four provinces, one territory and two regional public health authorities provided guidance on use of customer-provided reusable containers, cups or travel mugs. Guidance regarding reusable containers was mixed across jurisdictions in Canada, with some advising suspension and others allowing (but discouraging) their use or allowing with safety precautions (Table 1). A common precaution was restricting handling of the containers to customers only, with no handling by employees.

In the guidelines for food businesses, recommendations from the British Columbia Centre for Disease Control (BCCDC) regarding take-away containers (G7) were somewhat confusing. The guidelines stated that hand hygiene can minimize risk from handling or touching containers, but also stated that customer-provided containers should not be allowed. They then referred to exceptions that were outlined in other sections of the document, namely reusable beverage containers, and personal containers for take-away food and bulk purchases. In those sections, the BCCDC advised that personal cups and containers might be accepted (depending on store policy) but should be properly cleaned and sanitized, and not handled by the employees. The BCCDC specifically set out options for the safe use of reusable items to minimize the risk of transmission, but left it to the discretion of individual businesses about whether to allow their use, stating: "BCCDC and health authorities respect the right of retail stores to make policy that works for them and their employees". Businesses were also required to "document store policy for accepting reusable containers… in the COVID-19 safety plan".

Table 1: Reusable containers guidance during COVID-19 pandemic by jurisdiction

Guideline	CAN	BC	SK	ON	QC	NL	YT
Suspend	~~4~~, 5**	~~6~~, ~~7~~ 8(F)	51(F)	19(F)*(L)		57(F)	36, 40 41(F) 42
Allow but discourage			48, 50				
Allow with safety precautions							
• Not to be handled by employees	1(D)	7(D)		14, 16(F)*(T)	33(D)		
• Proper employee hand hygiene		7(D)					
• If containers are cleaned and sanitized		7(D)					

* *Regional public health unit, (M)=Middlesex-London, (T)=Toronto.*
** *Canadian Centre for Occupational Health and Safety.*
(F) Farmers' markets.
(D) At the discretion of the store.
~~XX~~: Superseded version of a guideline or no longer online.
Note: Guideline numbers are referred to as G1, G2 etc. in the text and by number only in the table.

In its guidelines for farmers' markets, BCCDC (G8) called for the suspension of personal container use. This is in line with guidelines by Quebec (G33), Yukon (G39, G40, G41, G42), Saskatchewan (G48, G50), and Newfoundland and Labrador (G52), as well as Middlesex-London (G19), which recommended not allowing the use of customer-supplied cups and

containers, or at least discouraging their use. However, some of these same jurisdictions allowed the use of reusable bags and bulk refills. For example, Newfoundland and Labrador guidelines for retail establishments (G56) allowed the use of reusable bags but stated that vendors should not allow personal containers at public markets (G57).

Interestingly, authorities such as those from British Columbia (G8) and Saskatchewan (G51) did not allow personal containers in farmers' markets, while BCCDC allowed them in restaurants (G7) and Saskatchewan allowed but discouraged them (G48, G50). Saskatchewan guidelines for grocery stores (G48) and restaurants (G50) stated, "customers should be encouraged not to use their own containers", while in the guidelines for public and farmers' markets, the wording was more authoritative stating: "customers must not use or provide their own containers" (G51), which included both containers and personal cups.

One difficulty in assessing the guidance on containers, cups and mugs was variation in how the 'container' category was defined. Some guidance documents included cups, mugs and even bags in their definition of containers, some distinguished containers from cups and mugs, while some were simply unclear about whether containers included cups and mugs. For example, BCCDC (G7) stated that stores should have their own policy for "accepting reusable containers such as grocery bags, coffee mugs, and customer owned food containers". Saskatchewan (G51) defined containers as being inclusive of cups when they stated, "Customers must not use or provide their own containers, including reusable cups and containers". Only three authorities clearly identified guidance applicable to reusable cups and mugs separate from that for containers, and in all three cases, the guidance recommended suspension. The recommendations came from the Canadian Centre for Occupational Health and Safety (G5), Quebec (G32) and Saskatchewan (G51); the last was guidance for farmers' markets only. Saskatchewan's guidance on restaurants (G50) did not mention reusable cups but discouraged use of customer-provided containers for take-out orders, not specifying whether cups were included as a type of container. Interestingly, although Quebec guidance called for suspending use of reusable cups, it allowed customer-provided reusable bags and boxes if customers packed their own (G33). BCCDC guidance for food premises (G7) was unique, as it also distinguished between two uses of personal beverage cups, stating that self-service with a reusable cup was "different from handing a customer's cup to an employee to fill for them". While customers filling their own cups posed no risk to the employee, if employees filled the beverage cups on behalf of customers, any risk could be minimized with frequent hand washing.

Reusable bags

The Canadian Centre for Occupational Health and Safety (G5) was the only agency in Canada to recommend suspension of the use of customer-provided reusable bags, while both the BCCDC (G7) and the Middlesex-London Health Unit (G19) recommended that retailers consider suspension, at their own discretion (Table 2). As in the previous sections, the Government of Canada guidelines (G1) initially recommended suspending the use of reusable bags but later advised that they could be used with added safety precautions to limit the contact between employees and customers.

Table 2: Reusable bags guidance during COVID-19 pandemic by jurisdiction

Guideline	CAN	BC	AB	SK	MB	ON	QC	PE	NL	YT
Suspend	~~1~~, 5**	~~6~~ 7(D)				19*(D)(M)				
Allow but discouraged				48 50 51		26*(W)				
Allow with safety precautions										
• Not to be placed on check-out counter	1	~~6~~	28	48	46			62		
• Not to be handled by employees/To be packed by the consumer	1	7(D)	28		45 46	14, 16*(T) 17*(T) 19*(D)(M) 23*(Y) 26*(W)	32 33 34	62	56	40
• Customers to regularly wash their bags					45, 42	21*(O)	36*(M)			
• Employees to practice proper hand hygiene if packed or touched		7(D)	28			21*(O)				
• Still encourage providing single-use bags	1			48 5 51	46	17*(T) 26*(W)				

* *Regional public health unit: (L)=Middlesex-London, (M)=Montreal, (O)=Ottawa, (T)=Toronto, (Y)=York Region, (W)=Windsor-Essex.*
** *Canadian Centre for Occupational Health and Safety*
(D) At the discretion of the store.
~~XX~~: Superseded version of a guideline or no longer online.
Note: Guideline numbers are referred to as G1, G2 etc. in the text and by number only in the table.

The conditions recommended for the safe use of reusable bags typically included not placing them on the checkout counters, asking customers to bag their own purchases, encouraging customers to wash their bags regularly, and for employees to wash their hands if they touched customer bags. Ottawa Public Health guidelines (G21) elaborated further, explaining that the use of reusable bags does not increase the risk of transmission; it was the only authority to state that it "has not recommended that single-use bags are necessary".

On the other hand, the Government of Canada guidelines (G1), as well as those by Manitoba (G46), Saskatchewan (G48, G50, G51) and Toronto Public Health (G17) recommended giving out single-use bags. For example, Saskatchewan guidelines for farmers' markets (G51) state, "Vendors are encouraged to provide clean carry-out bags for purchased food and grocery products". On a similar note, Windsor-Essex discouraged businesses from accepting customer-provided "multi-use" bags (G26).

Bulk food dispensing

The environmental scan identified 12 guidance documents on bulk food dispensing from eight jurisdictions. Only British Columbia provided guidance on the use of customer-provided reusable

containers for bulk food dispensing, while the others made no distinction between reusable containers and retailer-provided single-use plastic bags (Table 3). BCCDC guidelines for food businesses (G7) posed the question, “Should customers bring their own containers for… bulk items?” and stated that if reusable containers for bulk items were accepted, employees should “wash their hands after handling the reusable items received from customers” and high-touch areas should be frequently sanitized. Despite the absence of specific guidance for reusable containers, it is worth examining restrictions placed on bulk dispensing during the pandemic because buying in bulk can reduce both packaging waste and food waste.

Saskatchewan was the only jurisdiction in Canada that recommended suspension of bulk dispensing unconditionally, and that was solely for farmers’ markets, not other retailers. In their guidelines for essential retailers, the Government of Canada (G1) recommended not selling bulk items, unless they utilized gravity feed bins, or where trained staff dispensed the bulk items. Other provincial and regional authorities provided guidance consistent with that of the federal government and recommended using gravity feed bins and having staff dispense the items. BCCDC (G7, G8), British Columbia regional health authorities (G12), and the provincial authorities of Manitoba (G46) and Saskatchewan (G48) added conditions for safe use, highlighting the need for frequent disinfection of the bulk dispensers and recommended providing customers with opportunities to wash or sanitize their hands near the bulk station. BCCDC (G7, G8) also recommended signage about hand hygiene near the bulk stations. Conversely, although Saskatchewan allowed sales from bulk dispensers in grocery stores (G48), it recommended the suspension of the sale of self-serve bulk products in its guidelines for public and farmers’ markets (G51).

Table 3: Bulk food dispensing guidance during COVID-19 pandemic by jurisdiction

Guideline	CAN	BC	AB	SK	MB	ON	NL	YT
Suspend				51(F)				
Suspend self-service of bulk perishable food. (e.g., salad bars, olive bars etc.). Allow bulk dry foods.						17*	56	
Allow with safety precautions								
• Gravity-feed bins	1			48	46	17*		
• Staff dispensing	1			48	46	17*		40
• Make pre-packaged options available		7 8	28			17*		
• Frequent disinfection of bulk dispenser and utensils		7 8 12*	28	48	46	17*		
• Hand washing or sanitization facilities near station		7 8 12*	28		46			
• Signs about hand hygiene and physical distancing		7 8						
• With adequate tools for dispensing		7						

* *Regional public health unit.*
(F) Farmers’ markets.
Note: Guideline numbers are referred to as G1, G2 etc. in the text and by number only in the table.

BCCDC stated that there was a “theoretical risk” of spreading COVID-19 from surfaces when customers share common items like scoops (G7). However, their guidelines suggested that safety precautions such as hand sanitizing stations or frequent disinfection of the bulk areas could mitigate this risk of transmission. It recommended the availability of adequate tools, such as tongs, to safely dispense bulk items (G7), and frequent sanitizing of the bins, and the utensils, but not necessarily between each use. Saskatchewan guidelines for grocery stores (G48) advised wiping down bulk bins after each use. Several health authorities also recommended pre-packaging bulk items, if feasible, rather than using bulk food dispensers.

Face masks

The pandemic has made face masks a necessary part of daily lives, adding a new product to the list of reusable items affected by the pandemic. The environmental scan did not identify any jurisdictions that specifically recommend the use of disposable masks over reusable masks. Most Canadian health authorities recommended non-medical masks for the general population but medical masks for those over 65 years of age or individuals with compromised immune systems. The distinction between medical and non-medical masks is that medical masks (surgical and procedure masks) are regulated and tested to meet performance standards.(23)

Even though non-medical masks can be disposable or reusable, many guidelines do not distinguish between the two types. For example, Northwest Territories guidelines (G43) mention that, “wearing a non-medical mask” can be a preventative step, and Saskatchewan guidelines (G49) state, “wearing a non-medical mask (e.g., cloth or other materials) … is an additional measure people may take”. Several other jurisdictions specifically mention cloth masks, which may be considered reusable masks. Public Health Ontario (G13) guidelines state, “Non-medical masks, e.g., cloth masks, are preferred for source control due to current shortages in medical masks” but do not explicitly refer to their reusability.

On the other hand, many jurisdictions specifically referred to homemade masks, and many authorities included or referred to instructions for making homemade masks. The New Brunswick (G59) and Quebec (G31) guidelines suggested making masks from common materials found at home, although they did not provide instructions for making them. Guidelines by Ottawa Public Health (G22), the Government of Canada (G2), Alberta (G20) and Prince Edward Island (G60) explicitly mentioned the reusability of cloth masks, while New Brunswick (G59) and Quebec (G31) implied reusability through encouraging frequent washing of the masks. The Government of Canada guidelines (G2) were the only ones that highlighted the environmental benefits of choosing reusable over disposable masks. In its most recent update (November 3, 2020), the guidelines (G2) pointed out that most disposable masks are made of non-recyclable plastic and that reusable masks therefore help reduce the environmental impact of masks. The environmental benefits were not mentioned on the site prior to that date.

Other guideline findings

Guidelines for food premises and restaurants were consistent across jurisdictions in their recommendation to replace table-top items such as condiments with single-use (i.e., single serving) sachets (16 references). However, some of the guidelines, such as those of Newfoundland and Labrador (G55), also mentioned that single-use sachets were only necessary if items on the table could not be sanitized between each customer.

BCCDC guidelines for food businesses (G7) discussed bottled water dispensing sites in grocery stores, recommending that customers should fill their own containers. To ensure safety, the guidance recommended signs that "describe requirements for physical distancing" and "hygienic practices," availability of hand sanitizer and/or disinfectant wipes for use prior to dispensing water, and frequent disinfection of "high-touch surfaces".

There was limited guidance by authorities about accepting returns for recycling. BCCDC and the Institut national de santé publique du Québec stated that returnable containers would be accepted. WorkSafe BC (G10) recommended measures to ensure physical distancing and that employees practice hand hygiene following the task. On the other hand, the Government of Northwest Territories (G44) ordered the closure of bottle depots at the beginning of the pandemic and that order was still in effect as of November 2020. In the early weeks of the pandemic, Ontario's Beer Store, the private sector organization responsible for accepting beer, wine and liquor bottle returns, suspended its return program, a decision based on the need to ensure availability of personal protective equipment for its staff, not public health guidelines. The Beer Store resumed accepting cans and bottles at a limited number of stores starting on April 6, 2020,(24) and gradually expanded the number of stores accepting returns from that point forward.

Where the two international public health agencies that were consulted offered guidance on reusables, that guidance was aligned with Canadian guidelines. The WHO guidance recommended advising "consumers to clean their shopping bags before every use" and implementing "appropriate hygiene and sanitation protocols" for the use of reusable containers.(25) The U.S. CDC guidance for restaurants and bars recommended replacing shared items such as condiments with single-use substitutes, using disposable food service items such as utensils, if feasible and desirable, and avoiding "food and beverage containers or utensils brought in by customers".(26) The guidelines also advised employees in grocery and food retail stores to clean their hands after touching "objects that have been handled by customers, such as reusable grocery bags". The CDC mentioned requirements for "cloth masks," which implies reusability of recommended masks, though it was not explicitly stated.(26)

RQ2. How authoritative was the guidance?

Almost all the guidance was advisory, though it differed in tone and wording, ranging from strong, authoritative wording such as, "suspend" and "must," to more suggestive terms, such as "consider" or "can be used". Nonetheless, several guidelines left it to the discretion of businesses to decide on whether to continue accepting personal items or selling bulk goods. Except for Public Health Orders, including British Columbia's Order of the Provincial Health Officer for vending markets (G11) and Northwest Territories' Public Health Order regarding bottle returns (G44), documents reviewed were not regulatory.

RQ3. What, if any, were the marked changes in guidance over the course of the pandemic?

During the pandemic, public health advice has been updated regularly and guidance regarding reusable items has changed on occasion. One of the goals of this report was to highlight these changes. However, the environmental scan faced limitations in accessing older versions of public health guidelines, since in most cases the updated versions replaced the older versions, which were not archived. Several jurisdictions did not include the dates that guidelines were published or updated. The difficulty in determining if there were earlier versions limited the

comprehensiveness of the temporal analysis. Six updated documents containing eight significant changes in advice on reusables and/or masks were identified using archive.org. One of those documents, from BCCDC (G6), was no longer available online as of November 28, 2020. Of the eight changes, one was more supportive of customer-provided packaging in general (including reusable containers, reusable bags, and reusable boxes), one was more supportive of reusable bags, two were more supportive of bulk dispensing, one was more supportive of reusable masks, one was less supportive, and one was more supportive of reusable containers, and one introduced guidance about bulk dispensing where there had previously been none. Appendix A contains links to the most recent versions of all guidance documents as of December 13, 2020.

The precautionary principle can be seen in earlier guidelines. For example, the earlier version (March 28, 2020) of BCCDC's guidelines for retail food and grocery stores (G6) stated that "customers should not use their own containers, reusable bags or boxes." The updated version (G6), effective from April 25, 2020, said "do not allow customers to use their own containers for take-out foods" but did not mention prohibiting reusable bags or boxes.

Similarly, the earliest versions (April 16, May 22, 2020) of the Government of Canada's advice to essential retailers (G1) offered a negative message about customer-provided packaging, stating that "no customer packaging (e.g., containers, reusable bags, or boxes) are to be brought in or used or placed on checkout counters", while the updated version, first posted May 30, 2020, said that stores should inform customers that "customer packaging (e.g. containers, reusable bags, or boxes) will not be handled by workers", but says nothing about prohibiting this type of packaging.

The Government of Canada's change in guidance in this document (G1) is also an example of how a confusing early message was sometimes clarified in an update. The first part of the message about customer-provided packaging says that it cannot be brought into the store, but then seems to allow it in stores by going on to say that customer packaging cannot be used or placed on checkout counters. The update provides a clearer and less restrictive message about handling precautions for customer-provided packaging.

Two updates by Ottawa Public Health provided more support for reusables than earlier versions of their guidelines. The newer guidelines (August 20, 2020) for grocery shopping (G21) added that reusable bags do not increase the risk of transmission of SARS-CoV-2 if employees practice proper hand hygiene. The earlier version said nothing about transmission risks. In both the updated (July 15, 2020) and older (June 16, 2020) versions of Ottawa Public Health's guidelines on shopping etiquette (G22) residents were advised to wear a cloth mask when shopping, but the later version excluded advice on how to safely dispose of single-use masks, thus placing full emphasis on the reusable cloth mask message. The Government of Canada also provided more support for reusable masks, as noted in a previous section, when its guidelines on masks (G2) were updated (November 3, 2020) to include environmental considerations for choosing reusable over disposable masks.

In contrast to the above examples, a few authorities increased restrictions on reusables over time. For example, the update (June 29, 2020) to the BCCDC guidelines for farmers' markets (G8) added a line stating "customers of farmers' markets must not use their own containers" whereas there had been no statement about reusables in the earlier version (March 27, 2020).

Although guidance within the same jurisdiction was generally consistent in allowing or recommending suspension of specific types of reusables, there were two exceptions. One, noted earlier, was for guidance on containers at farmers' markets versus restaurants and grocery stores in Saskatchewan and the second was national guidance on customer-provided packaging. In its guidance for retail, the Canadian Centre for Occupational Health and Safety recommended suspension of reusable bags, reusable cups, and travel mugs on April 15, 2020 (G5) and has not changed that guidance since then. In contrast, the guidance for essential retailers from the Government of Canada stated in mid-April that no customer packaging, including containers, reusable bags, or boxes, should be brought into a store. But by the end of May, it had changed that guidance to allow customer packaging as long as it was not handled by workers (G1). The guidance remains in effect.

RQ4. What statements were made about transmission routes for SARS-CoV-2?

The environmental scan identified 14 public health guideline documents from eight jurisdictions that provided statements regarding the risk of transmission, including language implicating person-to-person contact, close contact and indirect transmission (fomites) (see Table 4 and Appendix B). Person-to-person transmission and close contact could encompass direct contact, droplet and airborne routes of transmission (Figure 1).

For example, Ontario (G14) guidelines stated, "COVID-19 can be spread at the workplace in two main ways: person to person, by people who are in close contact; by surfaces or objects, when people touch their face with contaminated hands". This statement identifies the fomite route of transmission but refers to "close contact" rather than specific routes of direct transmission that may occur between people. Ontario also did not distinguish the level of risk between routes of transmission or whether the virus can survive on surfaces for any length of time.

In contrast, several authorities commented on the level of risk specifically associated with fomite transmission. For example, BCCDC (G7) stated, "Although the COVID-19 virus may remain on surfaces from hours to days, this risk of spread is probably low". The Government of Quebec (G33) stated that even though contracting COVID-19 from touching surfaces is a possibility, "this is not the primary means of transmission", and Ottawa Public Health (G21) noted that the virus "could be picked up from a contaminated surface" but classified it as "lower risk".

Five authorities provided guidance on the length of survival of the virus on surfaces. Most stated that it could survive up to several days, but Toronto Public Health (G18) said that it could only survive for several hours, referring specifically to plastic and metal surfaces. Similarly, Ottawa Public Health (G21) specified that "no living coronavirus remains after one day" on cardboard and paper. Quebec provided the most specific information about survival, stating that the virus could last on surfaces from two hours to nine days, and noted that survival depends on environmental conditions such as temperature and humidity. Most guidelines strongly recommended frequent disinfection and proper hand hygiene to mitigate the potential risk of fomite transmission. For example, Ottawa Public Health (G21) stated that the risk of transmission from contaminated surfaces "can easily be dealt with by washing your hands".

Table 4: Statements about the transmission of SARS-CoV-2

	… contact with respiratory droplets	Surface survival	Risk of surface transmission	Additional comments about transmission
Canada	Spread by... (1)	Hours to days (7)		"There are currently no confirmed cases of COVID-19 being spread through food or food packaging." (3)
BC	Spread by... (9, 10, 11, 12), Mainly spread by ... (7)		Spread by touching (10,11), probably low (7), theoretical risk when touching shared equipment or utensils (7), some spread may be occurring from touching take-away containers (7)	"The risk of surface transmission is increased when many people contact same [sic] surface, and when those contacts happen in short intervals of time" (10) "COVID-19 is not transmitted through viral particles floating in the air and is not something that can enter the body through the skin." (12)
Saskat-chewan		Several days (50)		
Ontario			Spread by touching (14)	"COVID-19 can be spread …person to person, by people who are in close contact…" (14)
Toronto		Several hours on plastic, metal (15)	Possible (15)	
Ottawa	Mainly spread by... (21)	Hours to days (21)		"Coronaviruses generally die off fairly rapidly on surfaces that they have contaminated. While potentially surviving for a few days under ideal conditions on smooth surfaces, on cardboard and paper, no living coronavirus remains after one day." (21) "There is currently no evidence that people have become infected with COVID-19 through items bought at a grocery store" (21)
Quebec		Two hours to nine days (33)	Possible (33), not primary means of transmission (33)	"Many viruses from the coronavirus family can survive on surfaces for a duration ranging anywhere from two hours up to nine days, depending on the type of surface and the environmental conditions (temperature, humidity, etc.)". (33)
Yukon	Spread by... (42)		Spread by touching (42)	

The guidance provided by international sources consulted for this review (i.e., WHO and CDC) was similar to that found among Canadian jurisdictions. Regarding routes of transmission, the WHO guidelines for food businesses from April 2020, stated that "the primary transmission route is through person-to-person contact and through direct contact with respiratory droplets".(25) Another WHO website from May 2020 for food businesses, mentioned fomite transmission, stating that little was known about how the virus survives outside the human body and referred

to a technical report from the European Centre for Disease Control and Prevention (27,28) that summarized fomite research as of March 2020. CDC guidance for grocery and food retail employees from November 2020 stated that SARS-CoV-2 was thought to spread mainly through respiratory droplets and that it might be possible to contact COVID-19 by touching a surface.(29) CDC noted that fomites were not thought to be the main way the virus spreads, but that much was still unknown about transmission. In another guidance document on food safety from August 2020, the CDC stated that "the risk of infection by the virus from food products, food packaging, or bags is thought to be very low" and no cases had been identified where the transmission route was "touching food, food packaging, or shopping bags".(30)

Part 2: Rapid review of science related to surface transmission

Transmission of COVID-19 via reusables would require the virus (SARS-CoV-2) to survive on the reusable item long enough to be transferred to other surfaces or body parts. In order to begin to assess the risk of surface (i.e., fomite) transmission with reusables we examined the scientific literature describing the survival and presence of SARS-CoV-2 on surfaces and objects.

RQ5. How long does SARS-CoV-2, the virus that leads to COVID-19, survive on surfaces?

For research question five, studies were included if they contained quantitative data on the survival time for SARS-CoV-2 on a surface that was relevant to the use of reusable or disposable items in retail settings. 147 studies were identified in the initial search, of which 14 were deemed relevant; all were experimental studies conducted in a controlled laboratory setting. Though these laboratory studies are not likely to reflect conditions in the real world where surfaces are touched, cleaned, and otherwise disrupted regularly, these types of studies provide important baseline information about the virus under controlled conditions. In these studies, a known concentration of virus is placed on a surface in replicate[6], then at intervals, these replicates are removed from the surface and the amount of remaining virus is quantified. All the located studies, except one, 31) used the Tissue Culture Infectious Dose 50 assay, or TCID50, to quantify the viable infectious virions. The outcome of interest for the purposes of this review was the duration (days) until the TCID50 fell below the limit of detection (LOD).

Overall, a variety of surfaces were studied in relation to the survival of SARS-CoV-2 (Appendix C). The surfaces studied can broadly be categorized as plastics, cloth, money, various metals, glass, paper, personal protective equipment (protective clothing, gloves, masks). The surfaces were studied under a variety of relevant temperatures (4-40°C) and relative humidity (20-85%) conditions (Appendix C). A detailed narrative of the studies included can be found in Appendix D.

Though not tested statistically, the virus survived the shortest on paper, followed by gloves, metals and plastics. The virus survived the longest on protective clothing and masks (Table 5). Overall, regardless of surface type, the literature reviewed indicates that SARS-CoV2 tends to survive longer at lower temperatures (room temperature and lower) (Figure 4). In studies conducted at RH < 50% the virus also seemed to have longer survival times (Figure 5). When

[6] Replicates are multiple experimental runs with identical laboratory conditions

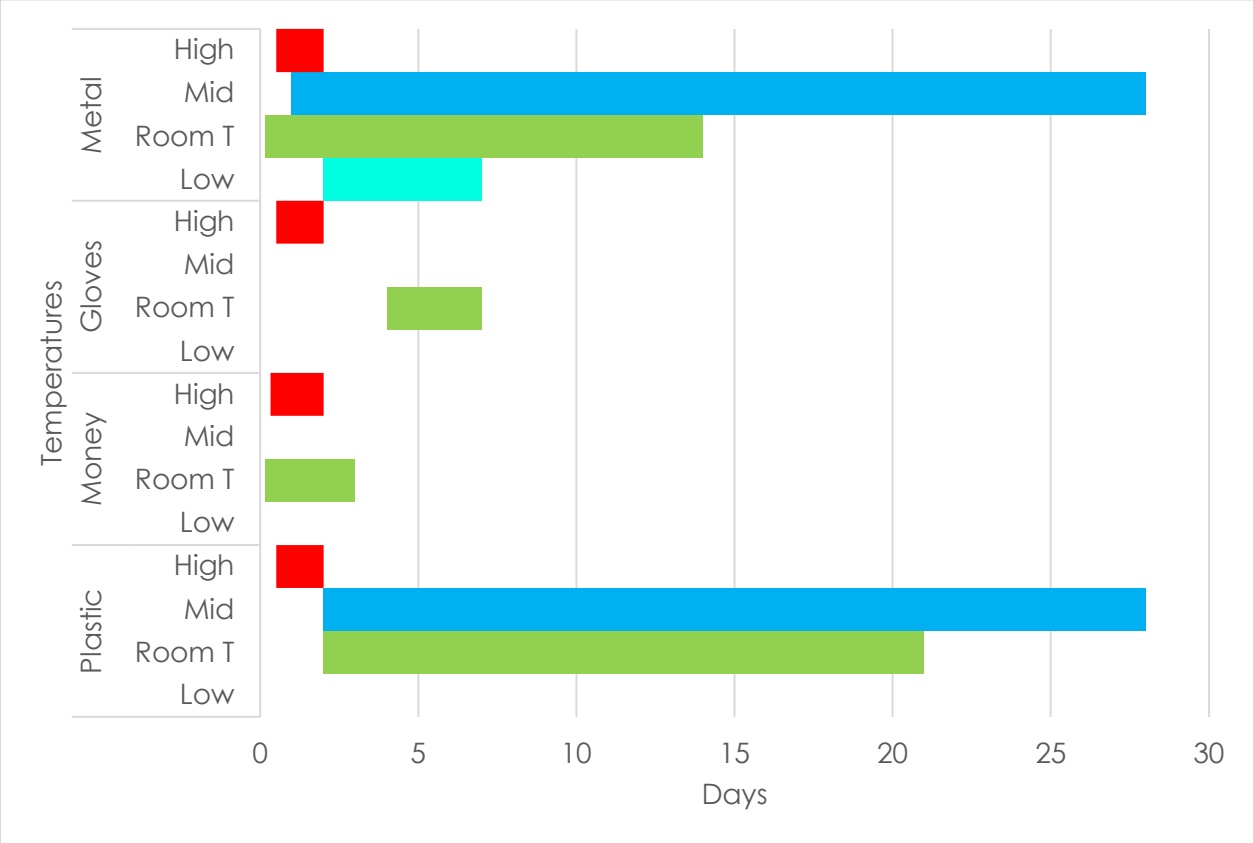
more virus was applied to a surface (higher concentration or titer) the virus survived longer; this could have implications when considering how a surface is contaminated (e.g., through hand contact or coughing) (Appendix E).

In these laboratory studies several factors in the study design could impact the duration of time over which the virus was detectable, for example the concentration of virus in the starting inoculation and the volume of the starting inoculation.(32) Time until the virus was not detected was the outcome summarized; however, a finding of non-detection does not necessarily mean there was no virus present, just that any amount still present could not be distinguished from zero. In some cases, the experiment did not reach a point where the virus could not be detected; in these cases, the last time point reported for viral detection was used (e.g., (32);(33)). In these cases, the virus survival time was likely underestimated. The laboratory studies were completed under undisturbed conditions and therefore results are not reflective of survival under normal cleaning and disinfection practices, where survival would be expected to be shorter.

Table 5: Summary of survival time by surface studied using broad categories* sorted from shortest to longest.

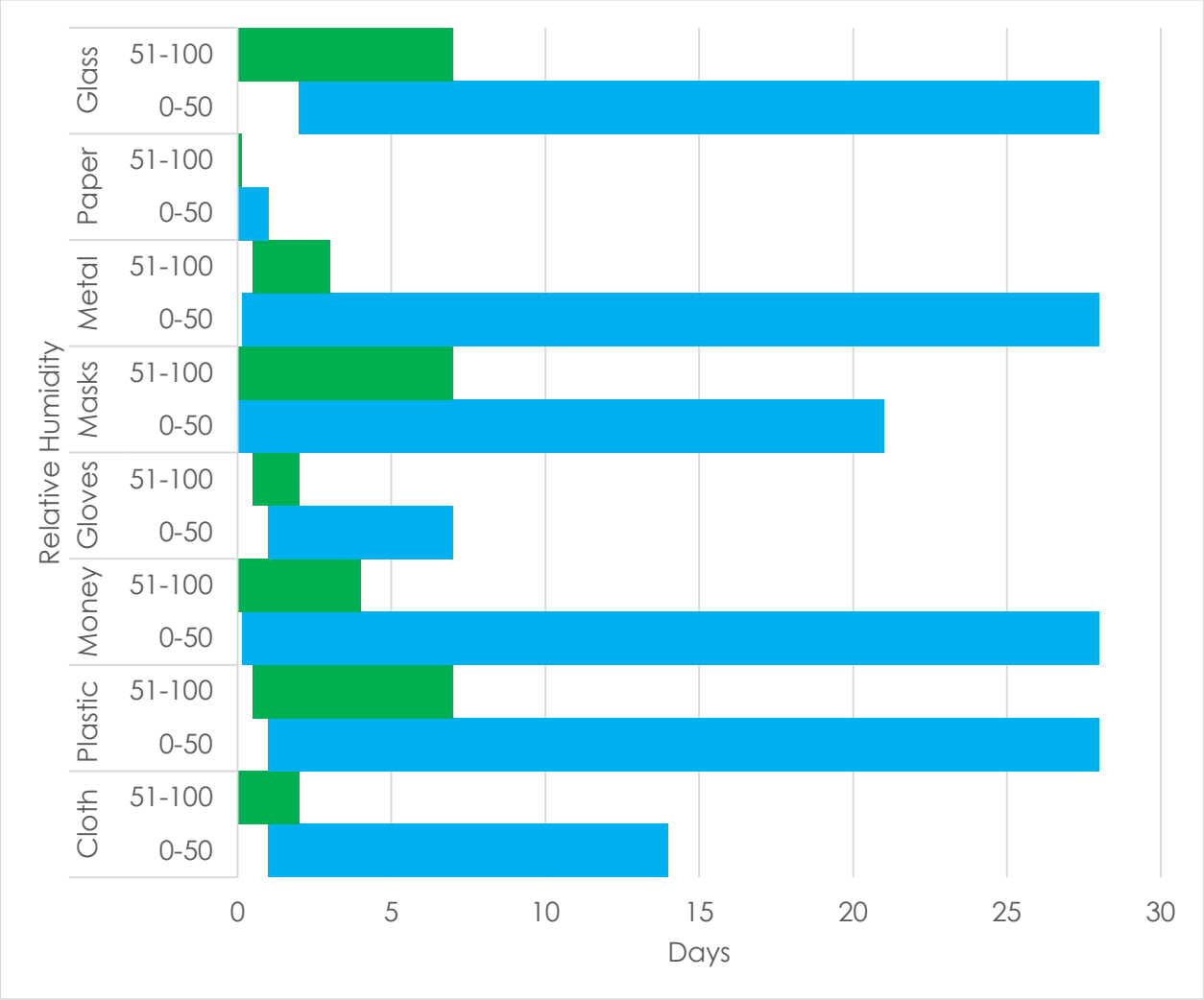
Surface studied	# Studies	Avg. survival time in days (range)
Paper	4	0.42 (0.12-1)
Cloth	3	3 (1-14)
Gloves	3	4.2 (0.5-7)
Metals	11	4.7 (0.17-28)
Plastics	8	5.2 (0.5-28)
Skin	1	6.1 (0.33-14)
Money	5	7.7 (0.17-28)
Glass	3	8.2 (2-28)
Protective Clothing	3	12.1 (0.17-21)
Masks	4	14 (7-21)

**See Appendix E for detailed results by surface.*



Notes: Left limit of box = minimum; Right limit of box = maximum.
Temperature conditions: Low = <20°C; Room T = 20 - <24°C; Mid = 24 - <35°C; High = 35°C and above.
Only surfaces where data were located for a range of temperature values is included.

Figure 4: Graphical presentation of the range (min – max) of days until SARS-CoV-2 was not detected on various surfaces, stratified by temperature conditions.



Notes:

Left limit of box = minimum; Right limit of box = maximum.
Relative humidity: RH>50% ("high"); RH ≤ 50% ("low").
Only surfaces where data was located for a range of RH values are included.

Figure 5: Graphical presentation showing range (min – max) of days until SARS-CoV-2 was not detected on various surfaces, stratified by relative humidity

RQ6. Can SARS-CoV-2 be isolated from community settings, including reusables?

For research question six, studies were included if they reported data on the detection of SARS-CoV-2 on a surface in a community setting. The aim was to determine if SARS-CoV-2 was being detected in community settings, and if so, what types of surfaces was it found on. In total 221 studies were identified in the initial search; after review, only six were deemed relevant. Most excluded studies were related to surface testing in health care settings.

The six included studies represented four countries (Brazil, China, Spain, USA) and two cruise ships (Japan, Greece).(34–39) All studies collected surface wipe samples using swabs, except Fernández-de-Mera et al.(36) where a dry sponge method was used. All studies analyzed the surface samples using real time polymerase chain reaction (RT-PCR).

The studies represented almost 2000 surface samples from a variety of locations. Overall, 7% of community surface samples were positive for SARS-CoV-2. In total, 615 (25%) samples were collected from specific objects while 1872 (75%) samples were described only as a place or space with scant information on the specific sample location (Table 6 and Appendix F).

Table 6: Summary of positivity by surface sample collected from community locations

	Location not associated with any known cases			Location associated with known cases			Overall		
Surface	# samples	# pos	% pos	# samples	# pos	% pos	# samples	# pos	% pos
Objects	337	43	13%	278	42	15%	615	85	14%
Places	725	31	4%	1147	68	6%	1872	99	5%
Overall	1062	74	7%	1425	110	8%	2487	184	7%

Surface samples collected in locations associated with known cases (e.g., cruise ship outbreaks) did not seem to be more likely to be positive for SARS-CoV-2 than samples collected where there was no known case associated. Samples collected from specific objects were more often positive for SARS-CoV-2 that those described only as a broad place or space (Table 6).

In most reports there were either details lacking on the individual surfaces sampled (because data were grouped for reporting) or there were few surfaces described that would be relevant to reusables or the retail setting. Findings that may be relevant include selected results from Harvey et al. (37) where SARS-CoV-2 was detected on trash cans (25%), crosswalk buttons (10%) and gas pumps (3%). Yamagishi et al. (35) sampled surfaces on a cruise ship with an outbreak, before infection occurred but while some passengers were still aboard. Results from the cabins without confirmed cases showed SARS-CoV-2 on many surfaces including pillows (38%), phones (46%), tables (21%), tv remotes (23%), light switches (8%) and doorknobs (8%). The prevalence of positive surface testing in the rooms with no known case did not differ significantly from the prevalence of positive surface samples from the rooms with confirmed cases. This could reflect widespread contamination on the vessel, or the presence of pre- or asymptomatic cases in the “non case” rooms; the authors were not able to make this determination. In a similar study from Greece, Mouchtouri et al. (34) reported on a small number of samples but found detectable SARS-CoV-2 on a light switch, a bar counter (where passengers were being served) and on the handle of a flour scoop in the food preparation areas.

An interesting study that did not meet the inclusion criteria because it was conducted in a health care setting was done by Liu et al. (32) who tested chopsticks for SARS-CoV-2 after use by five COVID-19 patients. SARS-CoV-2 virus was detected on all five sets of chopsticks. The authors concluded that these results suggest there is a potential for transmission on utensils used by people with COVID-19 in the health care setting.

All community studies located used RT-PCR to detect whether the virus was present on surfaces. A limitation of RT-PCR is that it detects genetic material (viral RNA) and does not differentiate between viable and nonviable, or infectious and non-infectious, virus.(40,41) Culture methods are needed to determine whether the viral material is viable and infectious, but these methods can be challenging with the low amount of viral RNA retrieved from swab and wipe samples.(40) In the case of other viruses, (e.g., SARS-CoV, MERS, influenza, Ebola, and Zika virus) viral RNA can be detected for extended periods of time even after infectivity is lost.(41)

Another methodological limitation of the identified community studies was the low recovery rates for SARS-CoV-2. The recovery rate refers to how efficiently the wipe or swab picks up the virus and is calculated in the lab using a known amount of virus. Harvey et al. (37) reported that they achieved recoveries of 16% for metal surfaces and 38% for plastic surfaces, which is low for analytical methods. This suggests that the presence of the virus may have been underestimated. The location and size of sampling also differed among the community studies, which hampers the comparison between studies and across surfaces.

RQ7. Is there evidence of indirect transmission of SARS-CoV-2?

No published reports of COVID-19 cases were identified where transmission via a contaminated surface was implicated as the only plausible route of exposure. Meyerowitz et al. (42) conclude that "there is currently no conclusive evidence for fomite or direct contact transmission of SARS-CoV-2 in humans."(p.72) In the context of the laboratory exposures summarized in RQ5, Atkinson & Petersen (41) propose that it is "possible" that the risk of infection from contaminated surfaces is very low or absent due to the small amounts of virus that are expected to be present.

Among public health organizations there are a variety of statements on public facing sites. The World Health Organization (WHO) states plainly that there have been no cases where fomite transmission has been "directly demonstrated".(43) The European Centre for Disease Prevention and Control similarly states that it is possible but has not been documented.(28)

Indirect, or fomite, transmission of COVID-19 remains theoretically possible, but it does not appear to have been observed as the sole route of transmission in the case of COVID-19. That said, it is difficult to isolate the fomite (indirect) route of transmission when investigating cases, as most individuals with fomite exposure to COVID-19 were likely also in close contact with a case and had exposure through the droplet and direct transmission routes.(43) It is possible that fomite transmission has occurred with COVID-19 in the context of close contact, but in these cases, it would be impossible to differentiate the contribution of fomite transmission from the direct and droplet routes of transmission present in these situations.

RQ8. What are the areas of continued uncertainty surrounding indirect transmission?

The challenges of isolating fomite transmission among cases with COVID-19 means that we have no specific examples from which to draw inferences. Figure 3 shows a schematic of how fomite (indirect) transmission may occur. There are many other pathways possible, with more or fewer steps. An example transmission pathway with a small number of steps would be the contamination of a surface by a cough or sneeze, followed by a young child or infant directly contacting the contaminated surface/object with their mouth or other mucous membranes. Proposed pathways of fomite transmission can involve more steps. For indirect transmission to occur, at each step enough virus must survive to be "passed" to the next object/surface in the

chain. The more steps in the chain, the less likely transmission is to be successful, the fewer the steps, the more likely the transmission.

To accurately model the likelihood of indirect transmission, all the following information would be needed:

- proposed pathway of transmission
- viral concentration in the initial contaminating substance (e.g., saliva)
- method of surface contamination (e.g., cough, sneeze, hand transfer)
- amount of contamination on each surface at each step in the pathway
- transfer efficiency for each step in the pathway
- infectious dose needed for infection to occur in a previously healthy person

Assumptions could be made to undertake this modeling, but without underlying data there is considerable risk of over- or under-estimating the likelihood, with little ability to describe the direction and magnitude of the error.

Part 3: Rapid review of social science literature on consumer and retail behaviour

RQ9. How has the pandemic affected attitudes or behaviours regarding the use of reusables in retail settings?

Retailers' response

Retailers have responded in several ways during the pandemic to consumer and employee concerns about the safety and hygiene of using reusable products, namely reusable bags, containers and cups. Some stores banned reusable bags and in at least one case, a store continued to do so after government advisories allowed their use.(44) Among major brands, Loblaws stopped charging for its plastic grocery bags (45) and in Prince Edward Island, where plastic bags have been banned since 2019, grocers could waive the 15-cent fee on paper bags,(46) thus encouraging greater use of the single-use option. IGA grocery stores in Quebec paused a program that had been in effect since 2019, which allowed customers to bring their own containers for refill.(47) Bulk Barn also paused its reusable container program,(48) while Starbucks, Second Cup and Tim Hortons suspended their reusable cup programs.(49)

These suspensions occurred in early to mid-March 2020, before public health authorities started releasing the first COVID-19 guidance documents for retailers in late March (e.g., G6) to mid-April (e.g., G1). Bulk Barn stated that the pause on reusable containers was "out of an abundance of caution due to COVID-19 uncertainties" and that it was "appropriate at this point to be extra vigilant".(48) Starbucks had a similar message about caution, stating that the suspension of reusable cups was part of "precautionary steps".(50) Customer, employee and store owner concerns were also mentioned as reasons for suspensions. IGA suspended its reusable container program "to meet the demands of our consumers",(47) while Tim Hortons pointed to feedback from restaurant owners and guests in its suspension notice,(48) and Starbucks referred to customer and employee safety.(50)

The measures taken by retail organizations in Canada to restrict reusable products were similar to those taken in other countries. Bove and Benoit (51) reviewed global trade publications, magazine articles and newsletters to search for messages and actions that retailers have used during the pandemic to address safety and hygiene fears in stores. They found 53 practices, of which three were for reusable products, namely the banning of reusable bags, suspension of reusable programs for cups or bowls, and replacement of multi-use boxes with disposable packaging of deliveries.

The range of actions taken by retailers in Canada, and the range of government advisories reviewed for this study, affect reuse practices that fall under only two of four general types of business-to-consumer reuse models conceptualized by the Ellen MacArthur Foundation.(52) The two models are “refill on the go” and “return on the go”. With refill on the go, consumers bring their reusable products (e.g., containers, cups, bags, boxes) to the store or other refill facility (e.g., water fountains) for refill and clean the products themselves when they are empty. With return on the go, consumers return reusable products (e.g., refillable beer bottles) to the store, which is then responsible for cleaning and refill.

The two other reuse models are “refill at home” and “return from home”. With the former, consumers purchase refill products (e.g., personal care, home care) online or in-store and refill their reusable containers at home. The lack of specific retail action or public health advice for this practice is not surprising, since it is already covered by actions and advice provided for general shopping routines (e.g., wearing masks, physical distancing, hand hygiene). With return to home, a business picks up empty reusable packaging, which can include delivery packaging, from the home, cleans the packaging and reuses or refills it. Although an example of return to home was mentioned in an international review,(51) no examples of restrictions on practices of this type of reuse model were found in Canada. This may be because the return from home model has not yet been widely adopted in Canada. For example, Loblaws postponed a scheduled 2020 rollout of a return from home packaging system due to the pandemic.(53)

Consumers’ response

We found no research studies to date that specifically address how consumers feel about the use of reusable versus single-use products during the pandemic. However, a national survey in Canada and one in the US have asked questions about use of single-use food and delivery packaging during the pandemic and perceptions of its safety. In the Canadian survey, conducted in July 2020, most respondents reported that there had been no change in their purchase of food packaged in single-use plastics during the pandemic.(17) Among the approximately one-third who reported an increase in purchases, the top reasons cited were “increased take-out and home delivery” and “increased safety concerns”. The definition of increased safety concerns was not provided; however, it could have been interpreted by respondents as including safety concerns from using reusable products such as reusable bags rather than single-use plastic bags. During the early part of the first wave of the pandemic, Byrd et al. (54) asked US consumers about their perceptions of the risks of contracting COVID-19 from restaurant single-use take-out and delivery packaging. They found that about one-quarter were not concerned about single-use food packaging, half were moderately concerned, and one-quarter were very concerned. Although the focus among retailers and public health authorities during the pandemic has been to take measures to restrict reusable packaging and products because of

virus transmission concerns, this study suggests many consumers have transmission fears about the alternative, namely single-use packaging.

In their review of waste management issues and global challenges created by the pandemic, Sharma et al. (55) point to the substantial increase in plastic packaging that has resulted because of consumer concerns about safety and hygiene. They speculate that:

> "Reframing plastic as protection against contamination in the minds of consumers could break their sustainable behavioral patterns which in turn would promote normalization of single-use plastics again".

To date, there has been very little research on the extent of consumer behavior change in using reusables during the pandemic and none on whether behavior changes that occurred as a result of shifts in retail practices during the pandemic are likely to perpetuate once the pandemic is over. Prior to the pandemic, much research (e.g., (56)) had been conducted on the factors that encourage pro-environmental behavior but none on what can reverse pro-environmental behavior to less environmentally friendly behaviour. Researchers have studied how to break "bad" habitual behaviour in consumers and create new better behavior (e.g., (57)) but there appears to be little that examines the impact of an enforced pause on pro-environmental habitual behavior, such as the experience with reusable products during the pandemic. Research on the impact of transit disruptions may have some relevance since it considers decisions to switch from environmentally friendly public transit to less environmentally friendly car travel (e.g., (58)). However, the factors affecting those decisions, such as cost and scheduling constraints, are very different from those for reusable product use.

The literature on disasters is another area where research on pro-environmental behavior change might be relevant for understanding the impacts of the pandemic on reuse practices. Although there are no examples in the literature of how disasters lead to a switch away from pro-environmental behavior, there are two examples that illustrate a shift towards pro-environmental behaviour. The first is the Christchurch earthquake, where disruption to the city's water supply system led to increased water conservation efforts by residents.(59) However, when the water supply system was restored, water consumption by households returned to normal levels. The second example is the change in outdoor domestic water consumption habits that occurred during a 2006 drought in south-east England.(60) During the drought, a ban on watering of gardens reduced water consumption and led some households to reflect on their overall levels of water consumption. However, when the drought ended and the ban was lifted, practices of watering and water consumption returned to normal. Both examples find that pro-environmental behavior stimulated by a disruption does not endure after the disruption ends. It is not clear whether the findings regarding the bounce-back nature of the behavior would also apply to a disruption that discourages pro-environmental behavior. Other than the travel behaviour literature noted above, there appears to be no research to date on disruptions that lead to a shift away from pro-environmental behavior, such as a decrease in use of reusables, and whether or how long the behavior change lasts after the disruption is over.

There have been two studies on the impact of the pandemic on pro-environmental behaviours that include reuse practices. Urban and Kohlova (61) analyzed the effects of the COVID-19 pandemic on 50 pro-environmental behaviours (including using reusable bags and buying

products in refillable or returnable packaging) and found no evidence that the pandemic had a uniform effect on pro-environmental behaviours, with respondents practicing some slightly more frequently and some slightly less frequently. Lucarelli et al. (62) developed and applied a theoretical framework known as the "theory of planned behaviour" to examine climate change-related pro-environmental behavior before and during the first wave of the pandemic. Behavior was measured by combining six pro-environmental behaviours (including one on waste reduction) into a single scale. They found no change in either intentions to undertake pro-environmental behavior or demonstrated pro-environmental behavior during the pandemic. Unfortunately, the applicability of these findings to reuse behaviours in the Canadian context is questionable since neither study explained whether retailers or government had imposed restrictions on reusables during the period of study. In the case of Lucarelli et al.,(62) the waste reduction question that they used was very broad and may or may not have been interpreted by respondents to include reusable products.

RQ10. What is known about the factors that can encourage or constrain the use of reusables by consumers or their encouragement by retailers?

Reuse and refill systems have emerged as a solution to increasing public concern over plastic pollution in the environment.(63) However, moving to zero packaging on a larger scale requires changing consumer behaviour, as well as practices across the supply chain.(64) Research to date has found several factors that influence reuse behavior for consumers or encourage (or discourage) adoption of reuse models by retailers. Interventions to change consumer behaviour have ranged from large scale policy changes directed at single-use items to small scale experiments testing various ways to encourage use of reusables.

Factors influencing reuse by consumers

Among factors that inhibit the use of reusable containers, cups and bags (see Table G.1 in Appendix G), one of the main barriers that consumers have reported is the inconvenience of using these compared to disposable products. In a study that included various schemes of both "return on the go" and "refill on the go," respondents reported that it was inconvenient to have to finish a bottle and clean it prior to refilling it and to store the empties.(65) The task of shopping in the refill context also requires consumers to plan to bring the necessary containers.(64) Similarly, Bashir et al. (66) found that consumers reported that refill in store is inconvenient because it requires a significant change in habits. Having refill and reuse models that incorporate convenience, such as "return from home," where reusable packaging is picked up by the business or a third party, can further promote reusable products.

It is often reported in the literature that forgetting one's reusable items is a common reason for choosing disposable products in retail settings.(67,68) This underlines the importance of habits in using reusable containers, bags, and cups, since refill on the go models require consumers to carry the reusable products with them. Those that have developed strong habits reported having their reusable cups with them more often when purchasing hot drinks.(69)

Financial considerations are also a factor in decisions about reusables. Dunn et al. (70) assessed consumer willingness-to-pay for continuing to use plastic bags and willingness to accept switching to reusable bags. They found that consumers are more likely to switch to using

reusable bags when there is a tax on plastic bags than when there is a subsidy for reusable bags.

The environmental context is also an important consideration, as researchers have found that consumers may feel a certain degree of discomfort depending on their perception of the context facilitating or inhibiting the use of reusable items.(71) Several other studies have concluded that social norms play a critical role in influencing reuse behaviour, (e.g., (72); (66)), with respondents reporting feeling "fear of people's perception" when taking plastic bags at the checkout counter.((73), p. 51) The availability of single-use options in the retail environment may also inhibit reusables,(71) as it may signal that it is the norm. These findings point to the need to make the retail environment supportive of reuse practices.

Interventions to change reuse behavior

Understanding the attitudes and perceptions that influence consumer reuse behaviour is important for developing interventions to change that behaviour. All the studies presented here (see Table G.2, in Appendix G) draw on some element of the behaviour influences identified in the previous section and have quantified the effect size of an intervention on reusables or single-use alternatives. The most widely studied intervention has been the imposition of a tax, fee or ban on single-use plastic bags. In a review of plastic bag charges found in various national and municipal jurisdictions, Nielsen et al. (74) found that they have been highly effective in reducing plastic bag use, achieving reductions of 80% to more than 90%. Even more effective, many jurisdictions have banned plastic bags and introduced fees on paper bags to further encourage a shift to reusable bags.(75) Other interventions to encourage reusables include prompts, environmental messaging, peer pressure, social norm messaging, distribution of free reusable products, discounted refills with reusables, and charges on single-use alternatives for cups or containers. None of these interventions have had such a dramatic impact on reusables as the plastic bag charges and bans, with effects sizes for adoption of the relevant reusable practice generally ranging around 5% or less. However, as noted by Poortinga and Whitaker,(76) using interventions in combination rather than on their own can produce significant improvements in customer use of reusables, even if individual intervention effects are small.

Factors influencing reuse by retailers

The research to understand retailers' perspective on whether to accept and facilitate the use of reusable items is limited (see Table G.3 in Appendix G). A common finding was that hygiene and food safety concerns, namely cross contamination, were a concern for retailers in reuse models where consumers used their personal containers to purchase take-out food.(64) On the other hand, in "return on the go" or "return from home" models, retailers need facilities to wash and sanitize the containers, or need to hire a third party, which may pose an added cost for the businesses.(77) Retailers that procure reusable packaging from their suppliers may benefit from cost savings due to the ability to buy lower cost products,(64) and cost savings from reduced waste and transportation costs.(65) Promotion of environmental benefits or a company logo on a reusable item may also provide marketing opportunities to retailers.(65)

Discussion

Questions about the safety of reusables relative to disposables were raised during the COVID-19 pandemic, given concerns about the potential for increased risk of transmission. These concerns jeopardized ongoing efforts to increase the use of reusables and reduce the use of disposables in retail settings across Canada.

We are still amid the COVID-19 pandemic and new knowledge is being gained daily. The science of SARS-CoV-2 is rapidly evolving and expanding, as is the SARS-CoV-2 virus itself. As the evidence changes, so too may our understanding of transmission risks and the importance of surface transmission.

Based on this review of the public health guidance and scientific evidence there continue to be many opportunities to use reusables in retail settings, with added safety precautions during the COVID-19 pandemic, and few scientific reasons to prohibit the use of reusables during the pandemic.

Public health authorities suggested some restrictions but these were not major impediments to the continued use of reusable products and service models in retail settings. Federal, provincial, and regional public health authorities across Canada were generally in agreement on the feasibility of the safe use of reusable products, with additional safety modifications implemented to limit the contact among customers as well as between customers and employees. Nevertheless, some jurisdictions, such as Saskatchewan, were more restrictive, and were in favour of discouraging the use of reusable bags. Recommendations varied somewhat by product type; in particular, there was comparably less support by public health authorities for the use of reusable containers, with most guidelines recommending against it, particularly in farmers' markets, and fewer ways were offered to ensure their safe use. Guidelines for bulk items provided the most comprehensive list of safety precautions, with most jurisdictions allowing it with modifications. This was interesting, as arguably, bulk shopping creates more contact than the use of reusable containers in a restaurant setting or reusable bags in grocery stores and other retailers.

Overall, the safety precautions offered in the guidelines had a common theme of limiting contact and minimizing the risk of transmission of the COVID-19 virus. Accordingly, the advice for reusable bags and containers recommended that employees not handle customers' personal items, and practice proper hand hygiene in the event they do handle or touch these items. In the case of bulk items and customer refill, where avoiding contact is more challenging, guidelines recommended that customers be encouraged to sanitize their hands before use, that bulk bins be sanitized frequently or between each use, that utensils for scooping be changed frequently or between each use, and that employees practice hand hygiene.

It is difficult to identify the causal routes of transmission in many cases of COVID-19. In the scientific literature, there was a lack of scientific evidence specific to transmission of COVID-19 via reusable products. Studies indicated that the virus survived for days on materials relevant to reusables in the laboratory and was detected on materials and objects in community settings. However, the methods used in the community studies could not determine whether the virus was still viable, and thus infectious. There is a gap in knowledge between information on potential exposures and actual transmission. We were unable to locate any reported cases where

transmission via a contaminated surface (fomite) was implicated as the sole causative route of transmission. Fomite transmission is difficult to confirm because those who have contact with contaminated surfaces also, often, have close contact with cases that could result in transmission through other routes. Overall, current evidence indicates that the risk from fomite transmission in the community setting is low. However, transmission via contaminated surfaces remains possible. The risk is low, but it is not zero. Most of the public health guidance documents that commented on fomite transmission also stated that the risk of surface transmission was low, while others simply acknowledged fomites as a transmission source. Adherence to the public health guidelines to promote infection prevention and control, including cleaning, disinfection and hand washing, among others, can reduce the risk of fomite transmission by breaking the transmission chain.

That said, public health guidance and current understanding of transmission may not be the primary driver of the return to single-use plastics, given risk intolerance by retail and food service firms. For example, some businesses in this sector took action to suspend accepting reusable products even before public health guidance about reusables became available, citing the need for caution and health and safety concerns for employees, customers and store owners. Unfortunately, this study is limited in that it did not include expert interviews of industry leaders or a detailed review of industry actions related to using reusables to determine their use of public health guidance and emerging fomite transmission evidence. The focus of this report, and much of the ongoing discussion around the use of reusables during the pandemic, centers on the retail setting. To date, there has been little research on the extent of consumer behavior changes in using reusables during the pandemic and none on whether behavior changes that occurred as a result of changes in retail practices during the pandemic are likely to persist once the pandemic is over.

The review of the literature on reuse behaviour identified several research gaps that limit our understanding of the impact of the pandemic on use of reusables. The gaps include how the pandemic has affected consumer use of different types of reusables, what concerns have prompted changes in usage, whether usage has recovered, and what factors influenced retailers in their decisions to restrict and then release restrictions on reusables. One area of study that is leading the way on understanding how the pandemic has affected waste-related behavior is the field of food studies. Several scholarly studies have already been published showing that the pandemic has led to perceived reductions in household food wastage and to changes in food consumption habits.(78–81) Similar research on reuse could offer insight into how pro-environmental behaviour changes can be maintained and expanded after the pandemic as well as how future disruptions might affect consumer and retailer responses.

The relevance of the findings summarized here to future pandemics cannot be determined. Many viruses infect humans. The virus most like SARS-CoV-2 is SARS-CoV-1, the virus responsible for the SARS pandemic in 2003. Only one paper located directly compared SARS-CoV-1 and SARS-CoV-2 in terms of their survival on surfaces. Van Doremalen et al. (31) found that SARS-CoV-1 and SARS-CoV-2 survive for similar lengths of time on plastic and stainless steel. The half-life of SARS-CoV-2 was longer than SARS-CoV-1 on cardboard, but shorter on copper. The authors concluded that, under laboratory conditions, the survival of SARS-CoV-2 was similar to that of SARS-CoV-1.

Rabenau et al. (82) compared the survival of SARS-CoV-1 to another human coronavirus, HCov-229E, on polystyrene plastic petri dishes. Their results suggest that SARS-CoV1 can survive longer than HCov-229E (9 days vs. 3 days). Given the conclusion of van Doremalen et al.,(31) a similar result would be hypothesized for a comparison between SARS-CoV-2 and HCov-229E.

Future pandemics may occur as a result of similar coronaviruses, or as a result of a virus that behaves very differently. Contaminated surfaces could play a larger role in the transmission of future viruses, even though they do not appear to play a key role in the transmission of SARS-CoV-2.

Despite public health's increasing engagement in environmental issues and the acknowledgement that our growing use of plastics is an emerging public health issue, the public health response to the use of reusables in retail settings during the pandemic has largely ignored the unintended, long-term consequences of a return to single-use plastics for cups, bags and containers. Growing public health interest in the environmental and ecological determinants of health suggest the opportunity for growing public health attention to these countervailing - if unintended – consequences of infection prevention and control actions in the development and dissemination of public health guidance.

Conclusion

Our review of the guidance and evidence for reusables in retail settings during the COVID-19 pandemic highlighted the existence of an evolving evidence base. To date, the evidence of fomite-only transmission of COVID-19 is limited. With usual precautions, the risk of fomite transmission can be minimized. Key to such an approach is the role of evidence and the consideration of all the harms involved in a policy choice, including unintended harms to the environment and the potential long-term health consequences. Public health guidance on the use of reusables has been cautious, though has generally become more permissive over time. Given this, the authors suggest four actions that may increase the opportunity for reusables during the current or a future infectious disease outbreak or pandemic:

- Promote a comprehensive, balanced approach to assessing risks and highlight the unintended consequences of responses.
- Increase the evidence to guide decisions on fomite transmission and reusables.
- Advocate to change direction as new evidence becomes available and promote guidance that balances caution and reassurance in terms of fomite transmission risk as is warranted by the evidence.
- Clarify public health jurisdiction for retailers and the public seeking advice on use of reusables and the safety precautions available to limit the risk of transmission during infectious disease outbreaks and pandemics.

References

1. Government of Canada. Zero plastic waste: Canada's actions - Canada.ca [Internet]. 2020 [cited 2021 Jan 28]. Available from: https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/zero-plastic-waste/canada-action.html

2. CTV News. Companies pause use of reusable cups, containers over COVID-19 concerns | CTV News [Internet]. 2020 [cited 2021 Jan 28]. Available from: https://winnipeg.ctvnews.ca/companies-pause-use-of-reusable-cups-containers-over-covid-19-concerns-1.4841617

3. Health Canada E and CC. Science assessment of plastic pollution [Internet]. Her Majesty the Queen in Right of Canada; 2020 Oct [cited 2021 Jan 28]. Available from: https://www.canada.ca/content/dam/eccc/documents/pdf/pded/plastic-pollution/Science-assessment-plastic-pollution.pdf

4. Plastics Industry Association. Letter to the US Department of Health and Human Services [Internet]. 2020 [cited 2021 Jan 28]. Available from: https://www.politico.com/states/f/?id=00000171-0d87-d270-a773-6fdfcc4d0000

5. National Collaborating Centre for Healthy Public Policy. Structural Profile of Public Health in Canada [Internet]. [cited 2021 Jan 29]. Available from: http://www.ncchpp.ca/en/structuralprofile.aspx

6. Rachlis MM. CPHA Webinar: Canada's Public Health System [Internet]. 2016 [cited 2021 Jan 29]. Available from: https://www.cpha.ca/canadas-public-health-system

7. Public Health Ontario. Finding your way on the public health information highway during COVID-19 | Public Health Ontario [Internet]. 2021 [cited 2021 Jan 29]. Available from: https://www.publichealthontario.ca/en/about/blog/2020/public-health-information-highway-during-covid-19

8. Health Canada. Health Canada Decision-Making Framework for Identifying, Assessing, and Managing Health Risks - August 1, 2000 - Canada.ca [Internet]. 2000 [cited 2021 Jan 28]. Available from: https://www.canada.ca/en/health-canada/corporate/about-health-canada/reports-publications/health-products-food-branch/health-canada-decision-making-framework-identifying-assessing-managing-health-risks.html

9. Kriebel D, Tickner J, Epstein P, Lemons J, Levins R, Loechler EL, et al. The precautionary principle in environmental science. Environ Health Perspect [Internet]. 2001 [cited 2021 Jan 30];109(9):871–6. Available from: https://pubmed.ncbi.nlm.nih.gov/11673114/

10. Sandman PM, Lanard J. What to Say When a Pandemic Looks Imminent: Messaging for WHO Phases Four and Five (Peter Sandman/Jody Lanard column) [Internet]. 2007 [cited 2021 Jan 29]. Available from: https://www.psandman.com/col/panflu4-3.htm#msg13

11. Aven T, Bouder F. The COVID-19 pandemic: how can risk science help? 2020; Available from: https://www.tandfonline.com/action/journalInformation?journalCode=rjrr20

12. Company History – Hugh Moore Dixie Cup Company Collection, 1905-2008 [Internet]. [cited 2021 Jan 28]. Available from: https://sites.lafayette.edu/dixiecollection/company-history/

13. City of Vancouver. Single-Use Item Reduction Strategy | City of Vancouver [Internet]. 2020 [cited 2021 Jan 29]. Available from: https://vancouver.ca/green-vancouver/single-use-items.aspx

14. Retail Council of Canada. Shopping bag and single-use plastic regulations across Canada [Internet]. 2020 [cited 2021 Jan 29]. Available from: https://www.retailcouncil.org/regulations-and-bylaws-on-shopping-bags-in-canada/

15. Willner-Fraser E. Should We Be Using Reusable Grocery Bags During the COVID-19 Pandemic? — Nova Scotia Environmental Network [Internet]. [cited 2021 Jan 28]. Available from: https://www.nsenvironmentalnetwork.com/blog/should-we-be-using-reusable-grocery-bags-during-the-covid-19-pandemic

16. Starbucks is Ready to Reintroduce Reusables across EMEA - Starbucks Stories EMEA [Internet]. 2020 [cited 2021 Jan 28]. Available from: https://stories.starbucks.com/emea/stories/2020/starbucks-is-ready-to-reintroduce-reusables-across-emea/

17. Kitz, Robert; Walker, Tony; Charlebois, Sylvian; Music J. Plastic Food Packaging: Before and After COVID-19 [Internet]. Agri-Food Analytics Lab, Dalhousie University. 2020 [cited 2021 Jan 21]. Available from: https://www.dal.ca/sites/agri-food/research/plastic-food-packaging--before-and-after-covid-19.html

18. Health Expert Statement Addressing Safety of Reusables and COVID-19 [Internet]. 2020 [cited 2021 Jan 28]. Available from: https://storage.googleapis.com/planet4-international-stateless/2020/06/26618dd6-health-expert-statement-reusables-safety.pdf

19. Government of Canada. Canada one-step closer to zero plastic waste by 2030 - Canada.ca [Internet]. 2020 [cited 2021 Jan 29]. Available from: https://www.canada.ca/en/environment-climate-change/news/2020/10/canada-one-step-closer-to-zero-plastic-waste-by-2030.html

20. Canadian Public Health Association. Widespread Praise for Federal Single-Use Plastic Ban | Canadian Public Health Association [Internet]. [cited 2021 Jan 29]. Available from: https://www.cpha.ca/widespread-praise-federal-single-use-plastic-ban

21. Otter JA, Donskey C, Yezli S, Douthwaite S, Goldenberg SD, Weber DJ. Transmission of SARS and MERS coronaviruses and influenza virus in healthcare settings: The possible role of dry surface contamination. Vol. 92, Journal of Hospital Infection. 2016.

22. Retail Council of Canada. COVID-19 Requirements for Retailers by Region [Internet]. Retail Council of Canada. 2020 [cited 2021 Jan 26]. Available from: https://www.retailcouncil.org/coronavirus-info-for-retailers/provincial-covid-19-resources-and-updates/

23. Health Canada. Regulatory considerations on the classification of non-medical masks or face coverings: Notice to industry [Internet]. Government of Canada. 2020 [cited 2021 Jan 29]. Available from: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/medical-devices/personal-protective-equipment/medical-masks-respirators/face-covering-classifications-notice.html

24. Thompson M. Select Beer Stores in Ontario to start accepting empties next week. CTV News [Internet]. 2020 Apr 2 [cited 2021 Jan 21]; Available from: https://london.ctvnews.ca/select-beer-stores-in-ontario-to-start-accepting-empties-next-week-1.4879237

25. COVID-19 and Food Safety: Guidance for Food Businesses [Internet]. World Health Organization. 2020 [cited 2021 Jan 21]. Available from: https://www.who.int/publications/i/item/covid-19-and-food-safety-guidance-for-food-businesses

26. Considerations for Restaurants and Bars [Internet]. Centers for Disease Coltrol and Prevention. 2020 [cited 2021 Jan 21]. Available from: https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/business-employers/bars-restaurants.html

27. Coronavirus disease (COVID-19): Food businesses [Internet]. WHO. [cited 2021 Jan 21]. Available from: https://www.who.int/news-room/q-a-detail/coronavirus-disease-covid-19-food-businesses

28. Disinfection of environments in healthcare and non-healthcare settings potentially contaminated with SARS-CoV-2 [Internet]. 2020 [cited 2021 Jan 21]. Available from: https://echa.europa.eu/covid-19.

29. What Grocery and Food Retail Workers Need to Know about COVID-19 [Internet]. Centers for Disease Coltrol and Prevention. [cited 2021 Jan 21]. Available from: https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/grocery-food-retail-workers.html

30. Food and Coronavirus Disease 2019 (COVID-19) [Internet]. Centers for Disease Coltrol and Prevention. [cited 2021 Jan 21]. Available from: https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/food-and-COVID-19.html

31. Van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. Vol. 382, New England Journal of Medicine. Massachussetts Medical Society; 2020. p. 1564–7.

32. Lui G, Lai CKC, Chen Z, Tong SLY, Ho WCS, Yeung ACM, et al. SARS-CoV-2 RNA detection on disposable wooden chopsticks, hong kong. Emerg Infect Dis [Internet]. 2020 Sep 1 [cited 2021 Jan 7];26(9):2274–6. Available from: https://wwwnc-cdc-gov.myaccess.library.utoronto.ca/eid/article/26/9/20-2135_article

33. Kasloff S, Strong J, Funk D, Cutts T. Stability of SARS-CoV-2 on Critical Personal Protective Equipment. medRxiv [Internet]. 2020 Jun 12 [cited 2021 Jan 7];2020.06.11.20128884. Available from: https://doi.org/10.1101/2020.06.11.20128884

34. Mouchtouri VA, Koureas M, Kyritsi M, Vontas A, Kourentis L, Sapounas S, et al. Environmental contamination of SARS-CoV-2 on surfaces, air-conditioner and ventilation systems. Int J Hyg Environ Health. 2020 Sep 1;230.

35. Yamagishi T, Ohnishi M, Matsunaga N, Kakimoto K, Kamiya H, Okamoto K, et al. Environmental Sampling for Severe Acute Respiratory Syndrome Coronavirus 2 During a COVID-19 Outbreak on the Diamond Princess Cruise Ship. J Infect Dis. 2020 Sep 1;222(7):1098–102.

36. Fernández-de-Mera IG, Rodríguez del-Río FJ, de la Fuente J, Pérez-Sancho M, Hervás D, Moreno I, et al. Detection of environmental SARS-CoV-2 RNA in a high prevalence setting in Spain. Transbound Emerg Dis. 2020;

37. Harvey 1# AP, Fuhrmeister ER, Cantrell M, Pitol AK, Swarthout JM, Powers JE, et al. Longitudinal monitoring of SARS-CoV-2 RNA on high-touch surfaces in a community setting. [cited 2020 Nov 4]; Available from: https://doi.org/10.1101/2020.10.27.20220905

38. Abrahão JS, Sacchetto L, Rezende IM, Rodrigues RAL, Crispim APC, Moura C, et al. Detection of SARS-CoV-2 RNA on public surfaces in a densely populated urban area of Brazil: A potential tool for monitoring the circulation of infected patients. Sci Total Environ. 2020;

39. Luo L, Liu D, Zhang H, Li Z, Zhen R, Zhang X, et al. Air and surface contamination in non-health care settings among 641 environmental specimens of 39 COVID-19 cases. PLoS Negl Trop Dis. 2020 Oct;14(10):e0008570.

40. Peyrony O, Ellouze S, Fontaine JP, Thegat-Le Cam M, Salmona M, Feghoul L, et al. Surfaces and equipment contamination by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in the emergency department at a university hospital. Int J Hyg Environ Health. 2020 Sep 1;230.

41. Atkinson B, Petersen E. SARS-CoV-2 shedding and infectivity [Internet]. Vol. 395, The Lancet. Lancet Publishing Group; 2020 [cited 2021 Jan 7]. p. 1339–40. Available from: http://ees.elsevier.com/thelancet/www.thelancet.com

42. Meyerowitz EA, Richterman A, Gandhi RT, Sax PE. Transmission of SARS-CoV-2: A Review of Viral, Host, and Environmental Factors. Ann Intern Med [Internet]. 2021 Jan 17 [cited 2021 Jan 30];174(1):69–79. Available from: https://www.acpjournals.org/doi/abs/10.7326/M20-5008

43. World Health Organization. Transmission of SARS-CoV-2: implications for infection prevention precautions [Internet]. Scientic Brief. 2020 [cited 2021 Jan 30]. Available from: https://www.who.int/news-room/commentaries/detail/transmission-of-sars-cov-2-implications-for-infection-prevention-precautions

44. Pawson C. Reusable bags slowly return to B.C. stores as plastic ones used during pandemic pile up | CBC News. CBC News [Internet]. 2020 Jun 14 [cited 2021 Jan 21]; Available from: https://www.cbc.ca/news/canada/british-columbia/reusable-bags-slowly-return-to-b-c-stores-as-plastic-ones-used-during-pandemic-pile-up-1.5611369

45. Weston G. Galen on evolving COVID-19 measures [Internet]. PC Optimum. 2020 [cited 2021 Jan 26]. Available from: https://www.pcoptimum.ca/galen-updates

46. Ross S. Island retailers permitted to waive paper bag fee during COVID-19 pandemic. CBC News [Internet]. 2020 Apr 5 [cited 2021 Jan 21]; Available from: https://www.cbc.ca/news/canada/prince-edward-island/pei-covid-19-paper-bags-1.5522598

47. Reusable Container [Internet]. IGA. [cited 2021 Jan 21]. Available from: https://www.iga.net/en/in_the_community/environment/reusable_container

48. Brown D. Bulk Barn halts the use of reusable containers over COVID-19 concerns [Internet]. Canadian Grocer. 2020 [cited 2021 Jan 21]. Available from: https://www.canadiangrocer.com/top-stories/headlines/bulk-barn-halts-the-use-of-reusable-containers-over-covid-19-concerns-93537

49. O'Brien C. Tim Hortons suspends use of reusable cups over COVID-19 fears. CTV News [Internet]. 2020 Oct 22 [cited 2021 Jan 21]; Available from: https://www.ctvnews.ca/health/coronavirus/tim-hortons-suspends-use-of-reusable-cups-over-covid-19-fears-1.4841678

50. Managing Through the Dynamics of COVID-19 [Internet]. Starbucks Stories Canada. 2020 [cited 2021 Jan 23]. Available from: https://stories.starbucks.ca/en/stories/2020/managing-through-the-dynamics-of-covid-19/

51. Bove LL, Benoit S. Restrict, clean and protect: signaling consumer safety during the pandemic and beyond. J Serv Manag. 2020;31(6):1185–202.

52. Lendal A, L. Wingstrand S. Reuse Rethinking Packaging Contents.

53. Kolm J. Tim Hortons to bring Loop containers to restaurants [Internet]. Strategy. 2020 [cited 2021 Jan 21]. Available from: https://strategyonline.ca/2020/10/22/tim-hortons-to-bring-loop-containers-to-restaurants/

54. Byrd K, Her ES, Fan A, Almanza B, Liu Y, Leitch S. Restaurants and COVID-19: What are consumers' risk perceptions about restaurant food and its packaging during the pandemic? Int J Hosp Manag. 2021 Apr 1;94:102821.

55. Sharma HB, Vanapalli KR, Cheela VS, Ranjan VP, Jaglan AK, Dubey B, et al. Challenges, opportunities, and innovations for effective solid waste management during and post COVID-19 pandemic. Resour Conserv Recycl. 2020;162:105052.

56. Steg L, Vlek C. Encouraging pro-environmental behaviour: An integrative review and research agenda. J Environ Psychol. 2009;29(3):309–17.

57. Verplanken B, Wood W. Interventions to break and create consumer habits. J Public Policy Mark. 2006;25(1):90–103.

58. Auld J, Ley H, Verbas O, Golshani N, Bechara J, Fontes A. A stated-preference intercept survey of transit-rider response to service disruptions. Public Transp. 2020;12(3):557–85.

59. McManus R, Mary Gallagher J. "it really was a shock to the system"- A socio-technical study of the effects of the christchurch earthquakes on water conservation habits. New Zeal Sociol. 2015;30(1):63–88.

60. Chappells H, Medd W, Shove E. Disruption and change: Drought and the inconspicuous dynamics of garden lives. Soc Cult Geogr. 2011;12(7):743–56.

61. Urban J, Kohlova MB. The COVID-19 Crisis Diminishes Neither Pro-Evnvironmental Motivation nor Pro-Environmental Behavior: A Panel Study. PsyArXiv [Internet]. [cited 2021 Jan 21]; Available from: https://psyarxiv.com/k2gnm/

62. Lucarelli C, Mazzoli C, Severini S. Applying the Theory of Planned Behavior to Examine Pro-Environmental Behavior: The Moderating Effect of COVID-19 Beliefs. Sustainability [Internet]. 2020 Dec 17 [cited 2021 Jan 29];12(24):10556. Available from: https://www.mdpi.com/2071-1050/12/24/10556

63. Babader A, Ren J, Jones KO, Wang J. A system dynamics approach for enhancing social behaviours regarding the reuse of packaging. Expert Syst Appl. 2016;46:417–25.

64. Beitzen-Heineke EF, Balta-Ozkan N, Reefke H. The prospects of zero-packaging grocery stores to improve the social and environmental impacts of the food supply chain. J Clean Prod. 2017;140(3):1528–41.

65. Lofthouse VA, Bhamra TA, Trimingham RL. Investigating customer perceptions of refillable packaging and assessing business drivers and barriers to their use. Packag Technol Sci. 2009;22:335–48.

66. Bashir H, Jørgensen S, Pedersen LJT, Skard S. Experimenting with sustainable business models in fast moving consumer goods. J Clean Prod. 2020;270:122302.

67. Bartolotta JF, Hardy SD. Barriers and benefits to desired behaviors for single use plastic items in northeast Ohio's Lake Erie basin. Mar Pollut Bull. 2018;127:576–85.

68. Yeow P, Dean A, Tucker D. Bags for Life: The Embedding of Ethical Consumerism. J Bus Ethics. 2014;125(1):87–99.

69. Novoradovskaya E, Mullan B, Hasking P. Choose to reuse: Predictors of using a reusable hot drink cup. J Consum Behav. 2020;19(6):608–17.

70. Dunn J, Caplan AJ, Bosworth R. Measuring the value of plastic and reusable grocery bags. J Environ Econ Policy. 2014;3(2):125–47.

71. Ertz M, Huang R, Jo MS, Karakas F, Sarigöllü E. From single-use to multi-use: Study of consumers' behavior toward consumption of reusable containers. J Environ Manage. 2017 May 15;193:334–44.

72. Arı E, Yılmaz V. Consumer attitudes on the use of plastic and cloth bags. Environ Dev Sustain. 2017;19(4):1219–34.

73. Cherrier H. Consumer identity and moral obligations in non-plastic bag consumption: A dialectical perspective. Int J Consum Stud. 2006;30(5):515–23.

74. Nielsen TD, Holmberg K, Stripple J. Need a bag? A review of public policies on plastic carrier bags – Where, how and to what effect? Waste Manag. 2019;15(87):428–40.

75. Wagner TP. Reducing single-use plastic shopping bags in the USA. Waste Manag. 2017;70:3–12.

76. Poortinga W, Whitaker L. Promoting the use of reusable coffee cups through environmental messaging, the provision of alternatives and financial incentives. Sustain. 2018;10(3):873.

77. Jiang J. Peer Pressure in Voluntary Environmental Programs: a Case of the Bag Rewards Program. J Ind Compet Trade. 2016;

78. Principato L, Secondi L, Cicatiello C, Mattia G. Caring more about food: The unexpected positive effect of the Covid-19 lockdown on household food management and waste. Socioecon Plann Sci. 2020;100953.

79. Pappalardo G, Cerroni S, Nayga RM, Yang W. Impact of Covid-19 on Household Food Waste: The Case of Italy. Front Nutr. 2020;7.

80. Qian K, Javadi F, Hiramatsu M. Influence of the COVID-19 pandemic on household food waste behavior in Japan. Sustain. 2020;12(23):9942.

81. Rodgers RF, Lombardo C, Cerolini S, Franko DL, Omori M, Linardon J, et al. "Waste not and stay at home" evidence of decreased food waste during the COVID-19 pandemic from the U.S. and Italy. Appetite. 2021 May 1;160:105110.

82. Rabenau HF, Cinatl J, Morgenstern B, Bauer G, Preiser W, Doerr HW. Stability and inactivation of SARS coronavirus. Med Microbiol Immunol [Internet]. 2005 Jan [cited 2021 Jan 30];194(1–2):1–6. Available from: https://pubmed-ncbi-nlm-nih-gov.myaccess.library.utoronto.ca/15118911/

83. Chin AWH, Chu JTS, Perera MRA, Hui KPY, Yen H-L, Chan MCW, et al. Stability of SARS-CoV-2 in different environmental conditions. The Lancet Microbe. 2020 May 1;1(1):e10.

84. Riddell S, Goldie S, Hill A, Eagles D, Drew TW. The effect of temperature on persistence of SARS-CoV-2 on common surfaces. Virol J. 2020 Oct 7;17(1).

85. Pastorino B, Touret F, Gilles M, de Lamballerie X, Charrel RN. Prolonged Infectivity of SARS-CoV-2 in Fomites. Vol. 26, Emerging infectious diseases. NLM (Medline); 2020.

86. Biryukov J, Boydston JA, Dunning RA, Yeager JJ, Wood S, Reese AL, et al. Increasing temperature and relative humidity accelerates inactivation of SARS-COV-2 on surfaces. mSphere. 2020;5(4).

87. Grinchuk PS, Fisenko EI, Fisenko SP, Danilova-Tretiak SM. Isothermal evaporation rate of deposited liquid

aerosols and the SARS-CoV-2 coronavirus survival. arXiv [Internet]. 2020 Apr 22 [cited 2021 Jan 7]; Available from: http://arxiv.org/abs/2004.10812

88. Kratzel A, Steiner S, Todt D, V'kovski P, Brueggemann Y, Steinmann J, et al. Temperature-dependent surface stability of SARS-CoV-2 [Internet]. Vol. 81, Journal of Infection. W.B. Saunders Ltd; 2020 [cited 2021 Jan 7]. p. 452–82. Available from: https://doi.org/10.1016/j.jinf.2020.05.066

89. Szpiro L, Pizzorno L, Durimel L, Marie Y, Calatrava, M R, V M. Role of interfering substances in the survival of coronaviruses on surfaces and their impact on the efficiency of hand and surface disinfection. medRxiv [Internet]. 2020 Aug 25 [cited 2021 Jan 7];2020.08.22.20180042. Available from: https://doi.org/10.1101/2020.08.22.20180042

90. Harbourt DE, Haddow AD, Piper AE, Bloomfield H, Kearney BJ, Fetterer D, et al. Modeling the stability of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) on skin, currency, and clothing. Murray KO, editor. PLoS Negl Trop Dis [Internet]. 2020 Nov 9 [cited 2021 Jan 7];14(11):e0008831. Available from: https://dx.plos.org/10.1371/journal.pntd.0008831

91. REALM. Test 3: Natural attenuation as a decontamination approach for SARS-CoV-2 on five plastic-based materials.

92. REALM. Test 5: Natural attenuation as a decontamination approach for SARS-CoV-2 on textile materials [Internet]. [cited 2020 Nov 2]. Available from: http://oclc.org/realm

93. Morris DH, Claude Yinda K, Gamble A, Rossine FW, Huang Q, Bushmaker T, et al. The effect of temperature and humidity on the stability of SARS-CoV-2 and other enveloped viruses 2. 2020; Available from: https://doi.org/10.1101/2020.10.16.341883

94. Liu Y, Li T, Deng Y, Liu S, Zhang D, Li H, et al. Stability of SARS-CoV-2 on environmental surfaces and in human excreta [Internet]. Vol. 107, Journal of Hospital Infection. W.B. Saunders Ltd; 2021 [cited 2021 Jan 29]. p. 105–7. Available from: https://doi.org/10.1016/j.jhin.2020.10.021

95. Matson MJ, Yinda CK, Seifert SN, Bushmaker T, Fischer RJ, Doremalen N Van, et al. Effect of environmental conditions on sars-cov-2 stability in human nasal mucus and sputum. Emerg Infect Dis [Internet]. 2020 Sep 1 [cited 2021 Jan 7];26(9):2276–8. Available from: https://doi.org/10.1056/NEJMc2004973

Appendix A: Public health guidance

Environmental Scan of Guidance		
Federal (CAN)	Government of Canada	G1. Advice for essential retailers during COVID-19 pandemic (September 22, 2020) G2. Non-medical masks and face coverings: About (November 3, 2020) G3. Coronavirus Disease and Food Safety / Safe shopping (August 21, 2020)
	PHAC	
	CCOHS	G4. Coronavirus Tips: Restaurants and Food Services (April 17, 2020) G5. Coronavirus Tips: Retail (April 15, 2020)
British Columbia (BC)	BCCDC	G6. Covid-19 Guidance to Retail Food and Grocery Stores (with the Ministry of Health) - No longer available as of November 28, 2020. G7. Food businesses (September 23, 2020) G8. Farmers Markets (November 20, 2020)
	WorkSafe BC	G9. Restaurants, cafes, pubs and nightclubs: Protocols for returning to operation (October 2, 2020) G10. Retail: Protocols for returning to operation (no date)
	Ministry of Health	G11. Order of the Provincial Health Officer: Vending Markets (May 28, 2020)
	Regional Health Authorities, BCCDC, Ministry of Health	G12. Guidance for Food Service Establishments and Liquor Services, Including Restaurants, Cafés and Pubs (June 13, 2020)
Ontario (ON)	Public Health Ontario	G13. Mask Use for Non-Healthcare Workers (November 5, 2020)
	Government of Ontario (Ministry of Labour)	G14. Restaurant and food services health and safety during COVID-19 (November 27, 2020)
	Toronto Public Health	G15. COVID-19 Guidelines for Restaurants, Bars and other Food Premises (November 24, 2020) G16. COVID-19 Guidance for Farmers' Markets (September 10, 2020) G17. COVID-19 Guidance for Food Stores (August 17, 2020) G18. COVID-19 guidance for Mobile Food Premises (August 27, 2020)
	Middlesex-London Public Health	G19. COVID-19: Public health guidance for markets (September 30, 2020) G20. COVID-19: Public health guidance for re-opening your restaurant (September 30, 2020)

Environmental Scan of Guidance		
	Ottawa Public Health	G21. Grocery Shopping, meal planning and cooking during COVID-19 (August 20, 2020) G22. Shopping Etiquette (July 15, 2020)
	York Region Public Health	G23. COVID-19 Guidance for Farmers' Markets (June 25, 2020) G24. COVID-19 Guidance for Food Premises (no date) G25. COVID-19 Guidance for Mobile Food Premises (June 19, 2020)
	Windsor-Essex Health Unit	G26. Safe Return TO Business: A Public Health Toolkit for Windsor-Essex Business Community (no date)
Alberta (AB)	Government of Alberta	G27. Guidance for restaurants, cafes, pubs, and bars (September 17, 2020) G28. Guidance for Grocery Stores (October 2020) G29. Guidance for Farmers' Markets and Public Markets (September 30, 2020) G30. Guidance for wearing non-medical face masks for the general public (October 2020)
Quebec (QC)	Government of Quebec	G31. Wearing a mask or a face covering in public settings in the context of the COVID-19 pandemic (October 8, 2020) G32. Government Recommended Best Practices for Merchants (Food establishments) (no date) G33. Questions and answers concerning stores, public spaces and services during the COVID-19 pandemic (no date) G34. Wearing a Face Covering (Handcrafted mask) in public settings (no date)
	INSPQ: Institut national de santé publique du Québec	G35. Shops and Stores (June 15, 2020)
	Public Health Montreal	G36. Grocery shopping and eating safely (May 15, 2020) G37. Measures and Recommendations for organizers and user of public markets (April 20, 2020)
Yukon (YT)	Government of Yukon	G38. Face masks in Yukon (July 1, 2020) G39. Reopening food premises guidelines: Covid-19 (no date) G40. Guidance for retail food and grocery stores: Covid-19 (no date) G41. Guidance for farmers' markets sales of locally grown or produced food: Covid-19 (no date) G42. Bars, pubs, lounges and nightclubs reopening guidelines: COVID-19 (no date)
Northwest Territories (NT)	Government of Northwest Territories	G43. Non-medical masks (September 8, 2020) G44. Public Health Order – Covid-19 prohibition of gatherings and closures of certain businesses (April 11, 2

Environmental Scan of Guidance		
Manitoba (MB)	Government of Manitoba	G45. Guidance for Farmers' Markets (July 27, 2020) G46. Guidance for Retail Food and Grocery Stores (July 27, 2020) G47. Guidance to Food Trucks, Hot Dog and Food Push Carts (no date)
Saskatch-ewan (SK)	Government of Saskatchewan	G48. Grocery Stores Guidelines G49. Cloth Mask Guidelines (no date) G50. Restaurants and Licensed Establishments Guidelines (no date) G51. Public and Farmers' Market Guidelines (no date) G52. Temporary Food Vendor Guidelines (no date)
	WorkSafe Saskatchewan	G53. Service and Hospitality and COVID-19 safety (no date)
Nova Scotia (NS)	Government of Nova Scotia	G54. Coronavirus (COVID-19): Masks (no date)
Newfound-land and Labrador (NL)	Government of Newfoundland and Labrador	G55. Guidance for Restaurants and Lounges (September 23, 2020) G56. Guidance for Retail Establishments (August 24, 2020) G57. Public Markets (June 7, 2020) G58. Non-Medical Mask (NMM) Use in Indoor Public Spaces (August 24, 2020)
New Brunswick (NB)	Government of New Brunswick	G59. Use of a Community Face Mask to Help Reduce the Spread of COVID-19 (May 8, 2020)
Prince Edward Island (PEI)	Government of Prince Edward Island	G60. Wearing Non-medical Masks in the Community (November 16, 2020) G61. Food Premises Guidance (September 30, 2020) G62. Retail Operations Guidelines (October 27, 2020)

Note: Dates indicate most recent updates reviewed

Public health guidance document links

G1. https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/guidance-documents/advice-essential-retailers.html

G2. https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/prevention-risks/about-non-medical-masks-face-coverings.html

G3. https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/covid19.html

G4. https://www.ccohs.ca/images/products/pandemiccovid19/pdf/food_service.pdf

G5. https://www.ccohs.ca/images/products/pandemiccovid19/pdf/retail.pdf

G6. Wayback Machine (archive.org)

G7. http://www.bccdc.ca/health-info/diseases-conditions/covid-19/employers-businesses/food-businesses

G8. http://www.bccdc.ca/health-info/diseases-conditions/covid-19/community-settings/farmers-markets

G9. https://www.worksafebc.com/en/about-us/covid-19-updates/covid-19-returning-safe-operation/restaurant-cafes-pubs

G10. https://www.worksafebc.com/en/about-us/covid-19-updates/covid-19-returning-safe-operation/retail

G11. https://www2.gov.bc.ca/assets/gov/health/about-bc-s-health-care-system/office-of-the-provincial-health-officer/covid-19/covid-19-pho-order-vending-merchandise-at-markets.pdf

G12. https://www.interiorhealth.ca/YourEnvironment/Documents/Guidelines%20for%20Restaurants%20Cafes%20and%20Pubs.pdf

G13. https://www.publichealthontario.ca/-/media/documents/ncov/factsheet/2020/05/factsheet-covid-19-masks-not-healthcare.pdf?la=en

G14. https://www.ontario.ca/page/restaurant-and-food-services-health-and-safety-during-covid-19

G15. https://www.toronto.ca/wp-content/uploads/2020/06/8e95-COVID-19-Guidance-for-Reopening-your-Restaurant.pdf

G16. https://www.toronto.ca/wp-content/uploads/2020/06/90ef-COVID-19-Recovery_Response-Guidance-for-Farmers-and-Fresh-Food-Markets.pdf

G17. https://www.toronto.ca/home/covid-19/covid-19-reopening-recovery-rebuild/covid-19-reopening-guidelines-for-businesses-organizations/covid-19-guidance-food-premises/?accordion=food-stores

G18. https://www.toronto.ca/wp-content/uploads/2020/06/9580-COVID-19_Fact-Sheet_Mobile-Food-Premises.pdf

G19. https://www.healthunit.com/uploads/covid19_guidance_for_restaurants_reopening_2020-09-30.pdf

G20. https://www.healthunit.com/uploads/covid19_guidance_for_restaurants_reopening_2020-09-30.pdf

G21. https://www.ottawapublichealth.ca/en/public-health-topics/grocery-shopping.aspx#3-Should-I-be-taking-any-specific-precautions-when-ordering-take-out-or-delivery-food-

G22. https://www.ottawapublichealth.ca/en/public-health-topics/resources/Documents/COVID-19_Shopping-Etiquette-en.pdf

G23. https://www.york.ca/wps/wcm/connect/yorkpublic/544e3ee9-c193-4b45-8a1c-273256c0c0fe/COVID-19+Guidance+for+Farmers+Markets.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE.Z18_29D41BG0PGOC70QQGGJK4I0004-544e3ee9-c193-4b45-8a1c-273256c0c0fe-ncgBPW0

G24. https://www.york.ca/wps/wcm/connect/yorkpublic/fded2f87-a412-4d6b-b198-85c741d42dc4/COVID-19+Guidance+for+Food+Premises.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE.Z18_29D41BG0PGOC70QQGGJK4I0004-fded2f87-a412-4d6b-b198-85c741d42dc4-nnsWNUS

G25. https://www.york.ca/wps/wcm/connect/yorkpublic/fded2f87-a412-4d6b-b198-85c741d42dc4/COVID-19+Guidance+for+Food+Premises.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE.Z18_29D41BG0PGOC70QQGGJK4I0004-fded2f87-a412-4d6b-b198-85c741d42dc4-nnsWNUS

G26. https://www.wechu.org/sites/default/files/edit-resource/em-safe-return-business/covid-19-toolkit-small-businesses-safely-reopen.pdf

G27. https://open.alberta.ca/dataset/5d8d3adb-8fe4-417e-9545-b1e49b0a720a/resource/cd1f6d75-a9fe-4d4a-827c-c708a756278d/download/covid-19-relaunch-guidance-restaurants-cafes-pubs-and-bars-2020-09.pdf

G28. https://www.alberta.ca/assets/documents/covid-19-relaunch-guidance-grocery-stores.pdf

G29. https://www.alberta.ca/assets/documents/covid-19-relaunch-guidance-farmers-markets-and-public-markets.pdf

G30. https://open.alberta.ca/dataset/989e490e-5959-4a20-bfc7-b126b08ea996/resource/523f7856-31f5-4af1-be62-3a48a0acad4c/download/covid-19-guidance-for-wearing-non-medical-masks.pdf

G31. https://www.quebec.ca/en/health/health-issues/a-z/2019-coronavirus/wearing-a-face-covering-in-public-settings-in-the-context-of-the-covid-19-pandemic/

Public Health Guidance Document Links (continued)

G32. https://cdn-contenu.quebec.ca/cdn-contenu/adm/min/agriculture-pecheries-alimentation/publications-adm/Covid-19/FS_covid19_etablissements_alimentaires_MAPAQ_anglais.pdf?1585697999

G33. https://www.quebec.ca/en/health/health-issues/a-z/2019-coronavirus/answers-questions-coronavirus-covid19/questions-answers-stores-public-spaces-covid-19/#c52692

G34. https://cdn-contenu.quebec.ca/cdn-contenu/sante/documents/Problemes_de_sante/covid-19/Couvre-visage/20-210-64W_couvre-visage-anglais.pdf?1598386587

G35. https://www.inspq.qc.ca/sites/default/files/covid/2926-grocery-stores-essential-businesses-covid19.pdf

G36. https://santemontreal.qc.ca/fileadmin/fichiers/Campagnes/coronavirus/multilingue/Epicerie/Epicerie_Anglais.pdf

G37. https://santemontreal.qc.ca/fileadmin/fichiers/Campagnes/coronavirus/Consignes-directives/20-avril-2020-DirectivesInterimaires-MarchesPublics-FR.pdf

G38. https://yukon.ca/sites/yukon.ca/files/face_masks_yukon_english_web.pdf

G39. https://yukon.ca/en/health-and-wellness/covid-19-information/industry-operating-guidelines-covid-19/reopening-food-premises-guidelines-covid-19

G40. https://yukon.ca/en/guidance-retail-food-and-grocery-stores-covid-19

G41. https://yukon.ca/en/guidance-farmers-markets-and-sales-locally-grownproduced-food-covid-19

G42. https://yukon.ca/en/health-and-wellness/covid-19-information/industry-operating-guidelines-covid-19/bars

G43. https://www.gov.nt.ca/covid-19/en/services/prevention/non-medical-masks

G44. https://www.hss.gov.nt.ca/sites/hss/files/resources/public-health-order-covid-19-prohibition-gatherings-closures-certain-business.pdf

G45. https://manitoba.ca/covid19/restoring/farmersmarkets.html

G46. https://manitoba.ca/covid19/restoring/grocery-stores.html

G47. https://manitoba.ca/covid19/restoring/food-carts.html

G48. https://www.saskatchewan.ca/government/health-care-administration-and-provider-resources/treatment-procedures-and-guidelines/emerging-public-health-issues/2019-novel-coronavirus/re-open-saskatchewan-plan/guidelines/grocery-store-guidelines

G49. https://www.saskatchewan.ca/government/health-care-administration-and-provider-resources/treatment-procedures-and-guidelines/emerging-public-health-issues/2019-novel-coronavirus/re-open-saskatchewan-plan/guidelines/cloth-mask-guidelines

G50. https://www.saskatchewan.ca/government/health-care-administration-and-provider-resources/treatment-procedures-and-guidelines/emerging-public-health-issues/2019-novel-coronavirus/re-open-saskatchewan-plan/guidelines/restaurants-and-licensed-establishments-guidelines

G51. https://www.saskatchewan.ca/government/health-care-administration-and-provider-resources/treatment-procedures-and-guidelines/emerging-public-health-issues/2019-novel-coronavirus/re-open-saskatchewan-plan/guidelines/public-and-farmers-market-guidelines

G52. https://www.saskatchewan.ca/government/health-care-administration-and-provider-resources/treatment-procedures-and-guidelines/emerging-public-health-issues/2019-novel-coronavirus/re-open-saskatchewan-plan/guidelines/copy-of-temporary-food-vendor-guidelines

G53. https://www.worksafesask.ca/covid-19/what-employers-should-do/service-and-hospitality/

G54. https://novascotia.ca/coronavirus/masks/

G55. https://www.gov.nl.ca/covid-19/information-sheets-for-businesses-and-workplaces/guidance-for-restaurants/

G56. https://www.gov.nl.ca/covid-19/information-sheets-for-businesses-and-workplaces/guidance-for-retail-establishments/

G57. https://www.gov.nl.ca/covid-19/information-sheets-for-businesses-and-workplaces/public-markets/

G58. https://www.gov.nl.ca/covid-19/non-medical-masks-use-in-public/

G59. https://www2.gnb.ca/content/dam/gnb/Departments/h-s/pdf/MASK.pdf

G60. https://www.princeedwardisland.ca/en/information/health-and-wellness/wearing-non-medical-masks-community

G61. https://www.princeedwardisland.ca/en/information/health-and-wellness/food-premises-guidance

G62. https://www.princeedwardisland.ca/en/information/health-and-wellness/retail-operations-guidelines

Appendix B: Statements on transmission risk

Public Health Authority	Statements on Transmission Risk
Government of Canada (G1): Advice for essential retailers during COVID-19 pandemic	"COVID-19 is spread through contact with the respiratory droplets produced by infected individuals when they cough, sneeze, or even when they laugh or speak, including by individuals who have not yet or who may never develop symptoms."
Government of Canada (G3): Coronavirus Disease and Food Safety	"Scientists and food safety authorities around the world are closely monitoring the spread of COVID-19. There are currently no confirmed cases of COVID-19 being spread through food or food packaging."
BCCDC (G7): Food Businesses	Bulk Items: "For bulk items (e.g., muffins, baking supplies, or candy) that customers can dispense themselves, including self-service beverage stations (soda, coffee, slushies): while there is no documented spread of COVID-19 through food, there is a theoretical risk that a person infected with COVID-19 could spread the virus to others when touching shared equipment and utensils, for example, handles of coffee pots or bulk scoops". Customer-provided containers, bags, cups: "COVID-19 is mainly spread from person-to-person through respiratory droplets. Although the COVID-19 virus may remain on surfaces from hours to days, this risk of spread is probably low." Handling Take-Away Containers: "COVID-19 is mainly spread person-to-person through respiratory droplets. Since it is possible the COVID-19 virus may remain on surfaces from hours to days, some spread through this route may also be occurring. Practicing good hygiene through regular hand washing and use of hand sanitizers will minimize the risk with handling or touching take-away containers".
WorkSafe BC (G9): Restaurants, cafes, pubs and nightclubs: Protocols for returning to operation	"The virus that causes COVID-19 spreads in several ways, including through droplets when a person coughs or sneezes, and from touching a contaminated surface before touching the face. Higher risk situations require adequate protocols to address the risk." "The risk of surface transmission is increased when many people contact same surface, and when those contacts happen in short intervals of time. Effective cleaning and hygiene practices help mitigate this risk."
WorkSafe BC (G10): Retail: Protocols for returning to operation	
BC Ministry of Health (G11): Order of the Provincial Health Officer: Vending Markets	"A person infected with SARS-CoV-2 can infect other people with whom the infected person is in direct contact, through droplets in the air, or from fluid containing SARS-CoV-2 left on surfaces."
BC Regional Health Authorities (G12): Guidance for Food Service Establishments and Liquor Services,	"COVID-19 is spread through liquid droplets when an infected person coughs or sneezes. The virus in these droplets can enter the body directly through the eyes, nose or mouth of another person if they are in close contact with the person who coughed or sneezed. COVID-19 is not transmitted through viral particles floating in the air and is not something that can enter the body through the skin."

Public Health Authority	Statements on Transmission Risk
Including Restaurants, Cafés and Pubs	
Public Health Ontario (G14): Restaurant and food services health and safety during COVID-19	"COVID-19 can be spread at the workplace in two main ways: person to person, by people who are in close contact by surfaces or objects when people touch their face with contaminated hands"
Toronto Public Health (G15): COVID-19 Guidelines for Restaurants, Bars and other Food Premises	"COVID-19 is spread mainly from person-to-person through close contact from respiratory droplets of someone with COVID-19. The respiratory droplets can travel up to two metres/six feet when we cough, sneeze or talk. It is possible for a person to get COVID-19 by touching a surface or object that has the virus on it and then touching their mouth, nose, or eyes. The virus may survive on plastic and metal surfaces for several hours."
Toronto Public Health (G18): COVID-19 Guidelines for mobile food premises	"There is currently no evidence of COVID-19 being transmitted through food."
Ottawa Public Health (G21): Grocery Shopping, meal planning and cooking during COVID-19	"Coronaviruses are usually spread through respiratory droplets…" "There is currently no evidence that people have become infected with COVID-19 through items bought at a grocery store. It is possible that the item you handled or bought was recently touched by someone who had coronavirus on their unwashed hands. Even though viruses like COVID-19 can survive between a few hours to a few days on foods and on surfaces before dying, you do not need to wash all your purchases. Here are the best ways to protect yourself: Wash your hands often with soap and water." "Coronaviruses generally die off fairly rapidly on surfaces that they have contaminated. While potentially surviving for a few days under ideal conditions on smooth surfaces, on cardboard and paper, no living coronavirus remains after one day." "Coronaviruses spread most often from an infected person by respiratory droplets that could get directly into your eyes, nose, or mouth such as those produced by sneezes, coughs, singing, or talking. Spread of the virus can also be by direct contact with fresh secretions from an infected person, for example, by a handshake followed by touching your eyes, nose, or mouth with unwashed hands."
Government of Quebec (G33): Questions and answers concerning stores, public spaces and services during the COVID-19 pandemic	"Although it is possible to contract COVID-19 by touching a surface or object where the virus is found and then touching your mouth, nose or eyes, this is not the primary means of transmission." "Many viruses from the coronavirus family can survive on surfaces for a duration ranging anywhere from two hours up to nine days, depending on the type of surface and the environmental conditions (temperature, humidity, etc.). However, you do not need to wash all your purchases. The key is washing your hands often once you return home and after you have put your groceries away. As always, you should wash your hands before cooking and before eating."

Public Health Authority	Statements on Transmission Risk
Sante Montreal (G3): Grocery shopping and eating safely	"The risk of catching COVID-19 through food is low."
Yukon (G42): Bars, pubs, lounges and nightclubs reopening guidelines: COVID-19	"COVID-19 is most commonly spread from someone who is infected through: ▫ respiratory droplets generated when they cough or sneeze; ▫ close prolonged personal contact, such as touching or shaking hands; or ▫ touching something with the virus on it then touching their mouth, nose or eyes before washing their hands."
Saskatchewan (G50): Restaurants and Licensed Establishments Guidelines	"Proper and frequent hand hygiene by staff is a vital component in preventing the transmission of illnesses." "The COVID-19 virus can survive for several days on different surfaces and objects. Frequent cleaning and disinfection is important to prevent the spread of the disease."

Appendix C: Laboratory evidence of surface detection of SARS-CoV-2

Surface		Temp. (°C)*	RH*	Starting titre (log10)*	Mean survival days)	Ref(s)
Cloth	Cloth	22	65	2	5	(83)
	Cotton cloth	20-40	50	6	5.5	(84)
	T-shirt	20	38	1	7.88	(33)
Glass	Glass	20-40	50-65	8.2	5.5-6	(84), (85), (83)
Gloves	Nitrile medical exam gloves	20	38	7	7.88	(33)
	Nitrile rubber gloves	24-35	20-60	1.6	2	(86)
	Reinforced chemical resistant gloves	20	38	4	7.88	(33)
Masks	Mask, inner layer	22	65	7	6	(83)
	Mask, outer layer	22	65	7	6	(83)
	N-100 respirators	20	38	21	7.88	(24)
	N-95 respirators	20	38	21	7.88	(24)
Metals	Aluminum	20	50	2.1	6	(85)
	Brushed stainless steel	20-40	50	12.3	5.5	(84)
	Copper	22	40	0.2	3.55-4	(87)
	Metal Discs	4-30	35	5.7	7.2	(88)
	Stainless steel	7-35	20-65	3.2	2-7.88	(87), (33), (89) (83), (86), (31)
Money	Australian polymer bank notes	20-40	50	12.3	5.5	(84)
	Banknote	22	65	4	6	(83)
	De-monetized paper bank notes	20-40	50	17	5.5	(84)
	US bank notes ($1, 25% linen/75% cotton)	4-37	45	2.5	4.5	(90)
	US bank notes ($20, 25% linen/75% cotton)	4-37	45	2.8	4.5	(90)
Paper	Cardboard	22	40	1	3.55-4	(31), (87)
	Paper	22	65	0.1	5	(83)
	Tissue Paper	22	65	0.1	5	(83)
Plastics	ABS Plastic	24-35	20-60	1.6	2	(86)
	Low-density polyethylene plastic	21.9	37.4	5	5	(91,92)

Surface		Temp. (°C)*	RH*	Starting titre (log10)*	Mean survival days)	Ref(s)
	Plastic, unspecified	22	40-65	5	4-6	(31), (83)
	Polypropylene plastic	4-27	40-85	5.8	3.55-5	(87), (31)
	Polystyrene plastic	20	50	3	6	(85)
	Storage Container (high density polyethylene (HDPE), recycline #2	21.9	37.4	5	5	(91,92)
	Vinyl	20-40	50	11	5.5	(84)
Protective Clothing	Face Sheilds	20	37.5	21	7.88	(33)
	Scrub fabric (35% cotton/65% polyester)	4-37	45	1.4	4.5	(90)
	Tyvek coveralls	20	38	14	7.88	(33)
Skin	Swine Skin	4-37	45	6.1	4.5	(90)

** values for temperature (Temp.), relative humidity (RH) and starting titre are shown either as a single value or a range of values, whichever reflects the summarized studies*

Appendix D: Narrative summary of laboratory (experimental) studies

One of the earliest laboratory studies was from van Doremalen et al. (31) and evaluated SARS-CoV-2 survival in five environmental conditions (i.e., aerosol, plastic, stainless steel, copper, and cardboard) all at room temperature and relative humidity. The virus had an exponential decay rate in virus titer across all experimental conditions. The virus' survival on surfaces varied; it was most stable on plastic and stainless steel (up to 3 days). The virus was less stable on copper or cardboard, with no viable virus detected after 4 hours and 24 hours, respectively.

Pastorino et al. (85) found that SARS-CoV-2 survived on glass for 24 hours, aluminum for two hours, and plastic for more than 96 hours (about four days). When the protein content of the inoculation solution was increased to mimic the content in respiratory fluids, the virus survived for more than 96 hours (about four days) on all surfaces. The authors offered a caution about over-interpreting these results, as protein is only one component of respiratory fluids and other components may negatively affect virus survival.

Chin et al. (83) found that SARS-CoV-2 survived for three hours on printing and tissue paper, two days on treated wood and cloth, four days on glass and banknotes, and seven days on stainless steel and plastic. To recover SARS-CoV-2 from contaminated surfaces, the surface was soaked with a specific transport medium to retrieve the virus. Due to this process, the study's findings were not reflective of contact transmission from casual contact with surfaces.

As part of the REALM project,(91,92) materials of relevance to libraries have been investigated for their potential to harbour SARS-CoV-2. This work was thorough but was not peer reviewed (unlike the other studies located). Though many different materials and surfaces were tested as part of this work, the following surfaces were considered most relevant to the use of reusable products: low-density polyethylene plastic, high density polyethylene plastic, 100% polyolefin, nylon webbing, cotton fabric, and synthetic leather. The virus survived on both low-density polyethylene plastic and high-density polyethylene plastic for five days, and for eight days on synthetic leather. Survival times were inadequately determined on nylon webbing, cotton fabric, and 100% polyolefin fiber reportedly due the presence of unaccounted for chemicals in the tested materials.

Morris et al. (93) determined the half-life of SARS-CoV-2 on polypropylene plastic at two different temperatures, 10°C and 20°C. The experiments were completed at varying levels of relative humidity (40%, 65%, and 85%). Results suggest that SARS-CoV-2 survived better at lower temperatures. Biryukov et al. (86) also examined the stability of SARS-CoV-2 on stainless steel, acrylonitrile butadiene styrene (ABS) plastic, and nitrile rubber gloves under several temperature and humidity conditions and concluded that, as temperature and humidity increases, the survival of SARS-CoV-2 decreases.

Liu et al. (94) studied the stability of SARS-CoV-2 on nine surfaces at room temperature. SARS-CoV-2 was found to be viable for up to seven days on plastic, stainless steel, glass, ceramics, wood, latex gloves, and surgical masks. No viable virus was recovered from cotton clothing after four days and from paper after five days.

Riddell et al. (84) was the only study that examined SARS-CoV-2 in the dark, in order to eliminate potential decay effects from light sources (UV radiation). However, the authors did not directly compare light and dark conditions. This study was conducted at 50% RH and several temperature conditions (20°C, 30°C, and 40°C). At 20°C in the dark, SARS-CoV-2 was detectable after 28 days (about four weeks) on all non-porous surfaces (i.e., glass, polymer banknote, stainless steel, vinyl, and paper notes). On non-porous surfaces, the virus was not recovered after 14 days (cotton cloth). At 30°C the virus was recoverable after seven days on stainless steel, polymer notes and glass, and three days on both vinyl

and cotton cloth. It was present up to 21 days (about three weeks) on paper notes. At 40°C, SARS-CoV-2 survival was significantly reduced in comparison to other temperature conditions.

Kratzel et al. (88) examined the surface stability of SARS-CoV-2 at different temperature (4°C, room temperature, and 30°C) and relative humidity (30-40%) combinations. SARS-CoV-2 survival on metal disks were assessed at different time intervals over 9 days. Results from this study suggested that that SARS-CoV-2 survival on metal was not dependent on temperature, contrary the findings of previous studies.

Szpiro et al. (89) examined surface stability of SARS-CoV-2 on stainless steel with or without artificial mucus/saliva at 7°C and 25°C, both at 65% relative humidity. The mucus/saliva mixture did not impact the surface survival. However, temperature did; at 25°C no viable virus was detected after 72hours (about 3 days) at 7°C this point was not reached until 96 hours (about four days).

Kasloff et al. (33) examined the stability of SARS-CoV-2 on personal protective equipment, including nitrile medical examination gloves, reinforced chemical resistant gloves, N99 and N-100 respirators, Tyvek coveralls. Experimental conditions were controlled at 20°C with 35-40% relative humidity. On non-porous materials, viable SARS-CoV-2 was recovered up to 21 days (about 3 weeks) on plastic, 14 days (about two weeks) on stainless steel, seven days on nitrile gloves, and four days on chemical resistant gloves. On porous materials, viable virus was recovered from both respirators for up to 21 days (about 3 weeks), Tyvek coveralls up to 14 days (about 2 weeks), and up to one day on cotton.

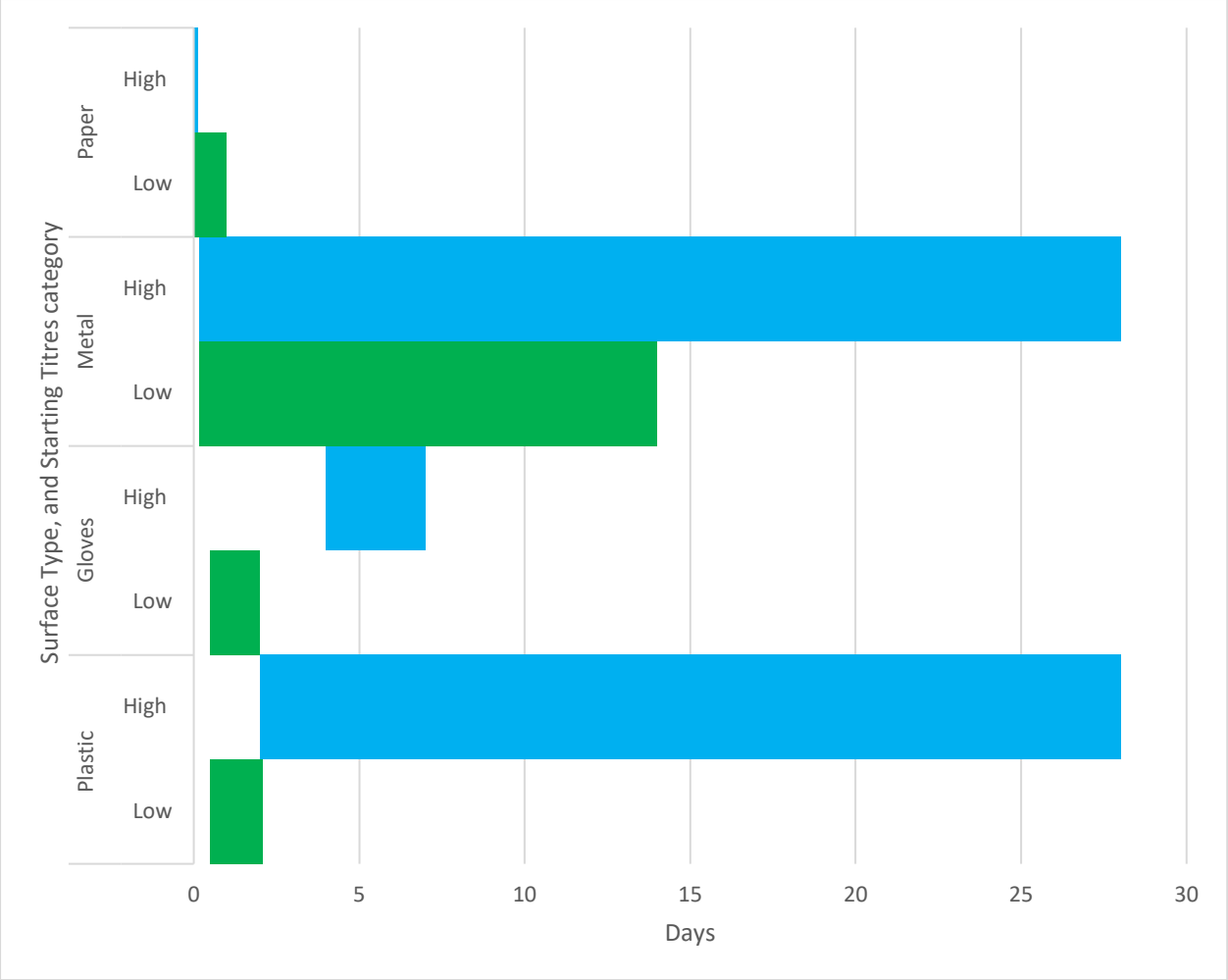
Habourt et al. (90) examined the stability of SARS-CoV-2 on swine skin, bank notes, and clothing at three different temperature conditions (4°C, 22°C, and 37°C and relative humidity of 40-50%). At 4°C, the virus remained detectable on swine skin for the duration of the experiment (336 hours (about 2 weeks)), on clothing for 96 hours (about four days), on bank notes for 168 hours (about one week). At 22°C, the virus was detectable after 96 hours (about 4 days) on swine skin, 4 hours on clothing, 8 hours on US $1 bank note, and 24 hours on the US$20 bank note. At 37°C, the virus was detectable after eight hours on swine skin, four hours on clothing, four hours on US $1 bank note, and eight hours on US $20 bank note.

Two laboratory studies were located that investigated the survival of SARS-CoV-2, but with methodological features that tried to introduce some of the complexity that is present in the real-world settings where SARS-CoV-2 may be present on surfaces.

Grinchuk et al. (87) examined whether the isothermal evaporation of deposited liquid aerosols affects the SARS-CoV-2 coronavirus survival at room temperature (21-23°C) and 40% relative humidity. The lifetime of the virus was found to be 50 hours (about 2 days) on plastic, 30 hours on stainless steel, 24 hours on carboard, and five hours on copper.

Matson et al. (95) examined the effects of environmental conditions on SARS-CoV-2 stability in human nasal mucus and sputum on polypropylene disks. Experimental conditions were controlled at several temperatures (4°C, 21°C, 27°C) and relative humidity's (40%, 85%). SARS-CoV-2 RNA remained detectable for more than 7 days on all surface samples. Notably this study was the only laboratory study that used RT-PCR to detect the virus on the surfaces and therefore was not measuring viable SARS-CoV-2 as was the case in other laboratory studies.

Appendix E: Surface transmission risk by surface type and starting titres category



Notes: Only surfaces where data was located for a range of titers is included.
High = greater than or equal to 104; Low = less than 104).

Figure E1: Chart showing range (min – max) of days until SARS-CoV-2 was not detected on various surfaces, stratified by the starting titer or concentrations of the virus

Appendix F: Summary of positivity by community setting where surface samples were collected for SARS-CoV-2

Results are combined across studies and stratified by whether the location was associated with known COVID-19 cases. All samples were tested using RT-PCR.

	Location	Location not associated with any known cases			Location associated with known cases		
		# samples	# pos.	% pos.	# samples	# pos.	% pos.
Objects	Floor, bathroom	19	5	26%	13	7	54%
	Phone	19	2	11%	13	6	46%
	Pillow	18	6	33%	13	5	38%
	Trash can	0	-	-	16	4	25%
	TV remote	19	4	21%	13	3	23%
	Table	19	5	26%	14	3	21%
	Chair arm	19	2	11%	13	2	15%
	Metro entrance	0	-	-	16	2	13%
	Crosswalks	0	-	-	48	5	10%
	Knobs/switches	57	3	5%	26	2	8%
	Toilet seat	19	1	5%	13	1	8%
	Gas pumps	0	-	-	60	2	3%
	Post office box	0	-	-	7	0	0%
	Toilet flusher	91	2	2%	13	0	0%
	Bar counter	1	1	100%	0	0	-
	Flour scoop handle	1	1	100%	0	-	-
	Toilet door knob	1	1	100%	0	-	-
	Toilet	42	10	24%	0	-	-
	Corridor handrail	1	0	0%	0	-	-
	Dishes (in cabinet)	1	0	0%	0	-	-
	Fridge handle	1	0	0%	0	-	-
	HVAC outlet	1	0	0%	0	-	-
	Pet	8	0	0%	0	-	-

	Location	Location not associated with any known cases			Location associated with known cases		
		# samples	# pos.	% pos.	# samples	# pos.	% pos.
Places	City hall	0	-	-	1	1	100%
	Petrol station	0	-	-	2	1	50%
	Pharmacy	0	-	-	2	1	50%
	Liquor store	0	-	-	20	3	15%
	Bank	0	-	-	30	4	13%
	Bus terminal	0	-	-	64	7	11%
	Grocery store	0	-	-	38	4	11%
	Public market	0	-	-	13	1	8%
	Gas station	0	-	-	29	2	7%
	Laundromat	0	-	-	36	2	6%
	Public square	0	-	-	269	17	6%
	Health care unit	0	-	-	403	20	5%
	Other public places	0	-	-	86	4	5%
	Bar/restaurant	30	0	0%	31	1	3%
	Convenience store	0	-	-	21	0	0%
	Education center	0	-	-	44	0	0%
	Mall	0	-	-	13	0	0%
	Police	0	-	-	2	0	0%
	Post office	0	-	-	2	0	0%
	Public park	0	-	-	41	0	0%
	Car	10	2	20%	0	-	-
	Waiting room	21	4	19%	0	-	-
	Kitchen	8	1	13%	0	-	-
	Bedroom	18	1	6%	0	-	-
	House	295	17	6%	0	-	-
	Hotel	113	6	5%	0	-	-
	Marketplace	122	0	0%	0	-	-
	Public area	108	0	0%	0	-	-

Appendix G: Factors influencing use of reusables

Table G.1. Factors influencing use of reusables by consumers

General Barriers	
Convenience	Yamaguchi and Takeuchi, 2016 RfH, Lofthouse et al. 2009 RtG (container) (+forgetting), Bashir et al. 2020 (container refill), Jiang et al. 2020 (Returning container takes time) RtG, Yeow et al 2014 (forgetting - bags), Beitzen-Heineke et al. 2017 (container), Chan et al. 2008, Barlotta & Hardy 2018 (cups, bags)
Habits	Chan et al. 2008; Bashir et al 2020
Ability to be easily cleaned	Ertz et al. 2017
Single-use widely available	Ertz et al. 2017
Context	Ertz et al. 2017 (perceived awkwardness or cashier not asking) (RfG)
Storage of empty containers	Lofthouse et al. 2009
Cleanliness / food health and safety	Jiang et al. 2020 (container)
General Incentives / Positive influences	
Social norms/desirability/pressure	Ari & Yilmaz, 2017 (for plastic avoidance), Jiang 2016 (belonging to reusable bag user group), Romero et al 2018; Bashir et al 2020, Borg et al 2020 (descriptive norms), Yeow et al. 2014, Cherrier 2006 (social identity, fear of judgement)
Pro-environmental attitude	Lofthouse et al. 2009, Escario et al. 2020
Framing and messages about environmentally friendliness and safety	Bashir et al. 2020
Context / Environmental influence	Yeow et al. 2014 (active involvement by supermarkets key factor in initiating reusable bag use in UK), Ertz et al. 2017 (facilitating/inhibiting using reusable containers)
Habits	Novoradovskaya et al. 2020 (Intention & strong habits), Novoradovskaya et al. 2021 (habits and uncertainty tolerance)
Financial considerations	Dunn et al. 2014 (price imposed on single-use alternatives, discount for reusables)

**Factors across service models: RfH = Refill at Home; RfG = Refill on the Go; RtH = Return from Home; RtG = Return on the Go*

Table G.2. Interventions to encourage use of reusables

Type of Intervention	Effect	Source
Reusable bags		
Single-use plastic bag fee	Consumption reduced by 80%-90%+ (Washington DC, Ireland, United Kingdom)	Nielsen et al. 2019
Reusable bag bonus (credit on bill)	No effect	Homonoff 2018
Prompt (customers were asked whether they wanted a free plastic bag instead of automatically handing them one)	5% decrease in plastic bag consumption	Ohtomo & Ohnuma, 2014
Refillable containers		
Environmental messaging + safety messaging	Increased intention to use home cleaning service offering RfH for cleaning products	Bashir et al. 2020
Social norm messaging	No effect	Dorn & Stokli 2018
Social influence	Customers 6X more likely to choose reusables over single-use when observing others doing the same	Dorn & Stokli 2018
Reusable cups		
Environmental messaging about reusable cups	Hot drink sales in reusable cups increased 2.3%	Poortinga & Whitaker 2018
Started selling reusable cups	Hot drink sales in reusable cups increased 2.5%	Poortinga & Whitaker 2018
Distributed free reusable cups	Hot drink sales in reusable cups increased 4.3%	Poortinga & Whitaker 2018
Discount on sales in reusable cups	No change	Poortinga & Whitaker 2018
Additional fee for sales in disposable cups	Hot drink sales in reusable cups increased 3.4%	Poortinga & Whitaker 2018
Compared interventions with free reusable cups: (1) environmental messaging, (2) goal-setting, (3) cup colour choice + cue-setting	No difference in reusable cup use among the 3 intervention groups	Novoradovskaya et al. 2021
Compared interventions with control group that did not receive free cups	Intervention groups using reusable cups 2.5 times more frequently than control after 1 week. Only environmental messaging group using reusable cups more frequently after 6 weeks	Novoradovskaya et al. 2021

Table G.3. Factors influencing use of reusables by retailers

Negative Factors	
Storage space constraints	Lofthouse et al. 2009
Hygiene and food safety concerns (cross contamination)	Lofthouse et al. 2009; Beitzen-Heineke et al. 2017, Jiang et al. 2020 (Return on the Go containers)
Increased cost (Return on the Go containers)	Jiang et al. 2020
Positive Factors	
Lower cost products	Beitzen-Heineke et al 2017
Promotion of environmental benefits	Lofthouse et al. 2009
Reduced waste & transportation costs	Lofthouse et al. 2009
Reusable containers as marketing tools	Lofthouse et al. 2009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