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Characterizing observable COVID-19 controls in Pacific Northwest grocery stores

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Abstract

Utilizing a longitudinal, observational study, grocery store health and safety controls implemented during the COVID-19 pandemic across stores in two cities were characterized. Sixteen stores between Seattle, WA (n = 9) and Portland, OR (n = 7) were visited monthly by the study team from May 2020 to January 2021, and observations of controls were recorded using a standardized checklist in REDCap. The checklist included questions on the presence or absence of controls such as physical barriers, social distancing markers, required masking of customers, cleaning of check-out stands, and closures of store areas. Descriptive analyses were conducted to determine the proportion of stores with a certain control each month. Mixed-effects logistic regression was used to explore how controls changed over time, and whether differences were observed between cities or by income of the area the store serves. Source control (e.g., mask requirements) and engineering controls (e.g., physical barriers at checkout) were the most common and consistent controls observed across stores and over the study period. Controls such as having special hours for vulnerable populations, demarcations on aisles for directionality, and cleaning check-out stands between customers varied significantly over time ($p < 0.05$ in the mixed-effects model). Having an employee present to clean baskets and carts, as well as physical barriers between self-checkouts, were significantly more common in stores in areas above the median income ($p < 0.05$ in the mixed-effects model). To best protect workers and shoppers from infectious agents, controls should be evidence-based, consistently implemented across grocery stores, and coupled with administrative practices and policies to promote worker wellbeing.

Keywords

Controls; COVID-19; essential workers; grocery workers; infectious disease

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Disclosures

The authors have no relevant financial or non-financial competing interests to declare for this work.

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Introduction

Grocery store workers have frequent, close interactions with the public and other workers in an indoor setting and due to the essential nature of their work they have continued working in person throughout the COVID-19, increasing their risk of exposure to SARS-CoV-2 (Baker 2020). United Food and Commercial Workers (UFCW), representing about 30% of the 2.77 million grocery store workers in the United States (U.S. Bureau of Labor Statistics 2020), reported a total of 456 COVID-19 deaths and nearly 40,000 infections or exposures among their grocery worker membership as of April 2021 (Redman 2021). Washington State Department of Health and Washington State Department of Labor & Industries (WA L&I) reported that through July 20, 2021, 12% (15,387) of the confirmed COVID-19 cases in Washington State with industry known (28.4% of total reported cases) were in the retail trade industry sector, which includes grocery store workers.

This was second only to the Health Care and Social Assistance industry sector, which comprised 19% (24,908) of cases (24,908) (Washington State Department of Health and Washington State Department of Labor and Industries 2021). This, and the data from UFCW, indicates the need for appropriate guidance and controls to decrease exposure and infectious disease transmission at grocery stores (Redman 2021).

To control COVID-19 exposures in workplace settings, clear, enforceable, evidence-based regulations are needed. The United States Occupational Safety and Health Administration (OSHA) issued guidance for retail workers and employers in critical and high customer-volume environments that was not enforceable or updated as the pandemic progressed (OSHA). Other state regulatory agencies, such as WA L&I, issued more detailed and updated guidance for grocery stores (Washington State Department of Labor and Industries 2020), and some states issued emergency enforceable standards to protect workers during the pandemic (CalOSHA 2020; Virginia Occupational Safety and Health Program 2020; Oregon Occupational Safety and Health Division 2021; Washington State Department of Labor and Industries 2021) but largely information from state or federal regulatory agencies was either time-limited, unspecific to the needs of grocery store workers, or unenforceable guidance.

The literature has reported on limited enforcement for health and safety measures in grocery stores, with reports of some stores not allowing ill workers to go home or management curtailing efforts by workers to learn about COVID-19 cases or enforce safety rules in their store (Bhattarai 2020; Dungca et al. 2020; Mayer et al. 2020). Workers in grocery stores are often financially insecure (Patel et al. 2020), and despite growing concern over the risk of infection (Rodriguez-Rey et al. 2020), may be hesitant to raise their concerns with management out of fear of retaliation. Despite being essential workers, these workers have little voice or control to protect their own health (Ramos et al. 2020), highlighting the importance of both worker voice and support from management in ensuring workers are adequately protected during the COVID-19 pandemic.

Appropriate workplace controls not only protect workers from transmitting and contracting COVID-19, but can also promote worker health beyond COVID-19 by improving the safety

culture and climate (Mearns and Flin 1999). As many grocery store workers are not paid a living wage (Living Wage Calculator), they are more likely to experience job insecurity (Landsbergis et al. 2014; Baker 2020), be under greater mental strain (Karasek 1979), and be of poorer health (Braveman et al. 2010), such that a COVID-19 infection could severely impact their mental, physical, and financial wellbeing. Thus, robust workplace controls that protect workers from contracting COVID-19 can alleviate some of the stress attributed to working during a pandemic in a high exposure risk workplace.

Despite the importance of grocery store workers during the COVID-19 pandemic and the increased exposure risks they face, there have been few studies investigating their health and safety and evaluating workplace controls in grocery stores during the pandemic (Mayer et al. 2020; Janson et al. 2021; Lan et al. 2021). In this brief report, an exploratory longitudinal observational study was utilized to investigate which controls were present in grocery stores in the Pacific Northwest between May 2020 and January 2021, and factors that may influence the implementation of controls, including the median income level of the community served by the grocery store and the city in which the store is located. Results from this exploratory study have the potential to increase understanding of how grocery stores responded during the COVID-19 pandemic and allow for the identification of areas for intervention to ensure increased customer and worker safety.

Methods

Study setting and sample

An exploratory longitudinal, observational approach was utilized to characterize health and safety controls in grocery stores from May 2020 to January 2021. Sixteen grocery stores in the greater Seattle, WA (n = 9) and Portland, OR (n = 7) areas were selected into the study using a purposive sampling approach, with stores selected with regard to both community (median income of the area it serves) and store (association with local or national chains) characteristics. Researchers utilized U.S. Census Bureau data to identify census tracts in each city that were below and above the median income ($113,300 in Seattle and $92,100 in Portland), and had at least two different national chains and one different local chain to include in the study (U.S. Census Bureau). At this step, only stores which could primarily have been classified as a grocery store were included (for example, mini marts or convenience stores were excluded). Recognizing where many people shop for groceries, the nearest national big box retailer to the city center was also included in each city. Two additional stores were chosen in Seattle because an additional national chain was present in each of the higher and lower income census tracts. One Portland store was lost to follow-up due to permanently closing in late August (after August observations were made).

Data collection

A standardized checklist, consisting primarily of yes/no questions, was developed in REDCap (Research Electronic Data Capture, Vanderbilt University, Nashville, TN). The checklist was developed based on initial assumptions (as of April 2020) of how SARS-CoV-2 spreads (Centers for Disease Control and Prevention 2020), industrial hygiene guidance on how to prevent spread of biologic hazards in workplaces (U.S. Department

of Labor Occupational Safety and Health Administration 2007; Ahmed et al. 2018; Kurgat et al. 2019; Su et al. 2019), and guidance from occupational health agencies about how to keep workers safe during COVID-19 (Washington State Department of Labor and Industries 2020). The full checklist can be found in Appendix A (Supplementary material) and includes questions on the presence or absence of controls such as physical barriers, social distancing markers, masking of customers, and closures of store areas. The checklist instrument was piloted in the field by two members of the study team (AC, MGB) and during the pilot process pictures were taken of each control to discuss the application of the checklist over Zoom (San Jose, CA). The checklist went through two rounds of pilots and refinements before the researchers began to collect data. After each month of data collection, observations were discussed and compared over Zoom to ensure interobserver reliability in the interpretation and application of the checklist, and pictures of unexpected observations were taken to discuss and resolve with all team members.

The 16 stores were visited monthly by the same observer for 9 consecutive months, from May 2020 to January 2021. Stores were visited on either the third or fourth weekend of the month, on a Thursday, Friday, Saturday, or Sunday between 12 pm–6 pm. These days of the week and times were chosen to represent when grocery stores would tend to be busier, allowing the researchers a better opportunity to observe all controls on the checklist (e.g., multiple checkout lanes would be open, stores would be more likely to be limiting entry if this is a control they practice) (Day 2020).

In each store, the observer followed a set pattern, starting with the entrance controls, taking a lap around the periphery of the store, and ending at the staffed and then self-check-outs. A control was only considered “present” if the observer could visually see it the first time they walked by, and for controls that could be in multiple places, it was only considered present if it was located in all places (e.g., demarcations needed to be on all lanes, physical barriers present at all check-out stands). If the control was present in some but not all locations, observers left a note in the checklist indicating this.

Observations were recorded into REDCap using smart phones while in the field. The study protocol was reviewed by the University of Washington Human Subjects Division and was determined not to be human research subjects. In total, 81 observations were made in Seattle stores, and 58 observations were made in Portland stores.

Data analysis

Data were numerically coded (yes, control present = 1, no, control absent = 0) prior to analysis. Some measures were combined. For example, instead of considering whether social distancing markers were used in each individual section of the store (e.g., the bakery or deli) measures were combined to denote whether the store had social distancing markers in any floor section. Each store was de-identified and assigned a unique store ID prior to analysis. The count and proportion of stores that implemented a particular control were stratified by city and median income for each month of the study period.

Figure 1 presents a timeline of when COVID-19 policies that could influence the presence or absence of controls were enacted across Washington and Oregon during the study period.

At the time the study started, both WA and OR had enacted stay-at-home orders, with indoor mask mandates following early in our study period (late June 2020). In November, both states enacted stay-at-home orders which were extended into December.

Exploratory longitudinal mixed-effects logistic regression models were used to explore whether the controls differed over time, between cities, or by income in this sample. Separate models were used for each control and included month, income level, and location as fixed effects, and the store as a random effect. Month was included as a continuous variable instead of factor variable in order to limit degrees of freedom. All analyses were conducted utilizing RStudio (R version 3.6.1, Boston, MA).

Results

Results from the longitudinal mixed effects logistic regression models, as detailed in Table 1, showed that the adoption of many controls were significantly differed over time, and a few controls significantly differed by income level. Findings for specific store sections are detailed below.

Store entrance controls

Table 2 details the controls observed at the store entrances over time. The most common entry controls among all stores were requiring customers to wear masks (100% of stores after June 2020, when statewide mask mandates went into effect) and signage relating to COVID-19 (>80% of stores each month). A high proportion of Portland stores consistently had signage at entrances (100% each month), whereas there was more variability across Seattle stores (56% to 100% of stores each month, see Supplementary material, Appendix B1). Neither location or income was significantly associated with signage in the regression models (Table 1).

While mask requirements were consistently implemented, there was variation in the presence of staff for enforcement. Most stores did not offer masks to customers (<33% of stores each month after June 2020). Regression models found significant differences over time in the proportion of stores providing masks to customers, with a store more likely to provide masks to customers over time.

There were few differences observed in the adoption of special hours or customer limits by city or income level. Stores in both Seattle and Portland had an increase in stores enforcing customer limits in November 2020, which may correspond with stay-at-home orders being enacted in both states in November 2020, though not all stores maintained these limits subsequently.

Store floor controls

Store floor controls are detailed in Table 3. Wipe dispensers were the most commonly observed control in this category (73% to 100% of all stores each month). Regression analyses found that the presence of employees cleaning baskets and carts was significantly more common in areas above the median income compared to areas below the median income.

Demarcations in store aisles were significantly less likely to be present over time, but their presence was not associated with income or city. Social distancing markers in store sections were commonly observed (60% to 80% of stores each month), with a larger proportion of Portland stores having markers in one or all store sections compared to Seattle stores, though this was not found to be significant in regression models.

Checkout controls

Controls observed at checkout are detailed in Table 4. Most stores had physical barriers of at least one-breathing zone in size (Ojima 2012) at the checkout stands, separating the worker from the shopper (>87% of stores each month). Fewer stores had a second physical barrier behind the worker (<33% of stores each month). This tended to be more common in Seattle stores and stores in areas above the median income level, though not significantly so. It was significantly associated with month, with the control becoming more common over time.

Across the sample, >80% of all stores each month had social distancing markers at checkout. Few stores were observed to conduct checkout stand cleanings (<40% of stores each month). Cleanings at both staffed and self-checkout stands declined from May 2020 to January 2021, from 40% to 0% at staffed stands and from 25% to 0% at self-checkout stands. All considered checkout controls were significantly associated with month in the regression models, with social distance markers and cleaning of self check-outs becoming less common over time, and the use of barriers and cleaning the staffed check-out lanes becoming more common over time. The use of barriers between self-checkouts was significantly associated with income, with this control more likely to be present in higher-income areas.

Discussion

This study reports the observable controls grocery stores in Seattle and Portland implemented in the early months of the COVID-19 pandemic, and how they differed over time, by median income, and city. Requiring customers to mask, displaying COVID-19 signage, and installing physical barriers at staffed checkout stands were the most common controls observed over time and between the two cities, the former which was required under public health order. However, limited enforcement of masking was observed, and many controls were not consistently implemented over time (Table 1). Two controls (employees cleaning baskets/carts, and barriers between self check-out stands) were significantly more likely to be present in stores located in an area above the median income. These results point to the need for evidence-based enforceable state and local policies that remain consistent over time, and cover workers at all workplaces, and the need for increased worker empowerment to ensure health and safety needs are met in the absence of appropriate enforceable guidelines.

Implementation of controls were seen to coincide with government mandates. Only one of the 16 stores observed in this study required masks in May 2020, and only two required masks in June 2020. However, all stores had mask requirements in place by July, aligning with mask mandates implemented by WA and OR in late June/early July (Figure 1); these mask requirements remained for all stores through the end of the study. Similarly, there was an increase in stores enforcing capacity limits in November 2020, which coincided with both

the OR and WA stay-at-home orders enacting limits on indoor gatherings, and the adoption of the Oregon OSHA COVID-19 standard—though many stores had dropped their capacity limits by December 2020.

Enforcement of controls was found to be limited in this study, whether the control was required under public health order or a voluntary control. For example, despite all stores adopting a mask requirement, enforcement of the mask requirement (e.g., having staff at entrances to ensure masks are worn) was limited, as was the provision of masks to customers. Similarly, while stores commonly had social distancing controls (e.g., lanes and markers), limited enforcement was observed. These findings corroborate those from the Arizona Frontline Worker Survey, where grocery store management was found to infrequently enforce health and safety rules that were in place at their stores (Mayer et al. 2020). Health and safety rules may need to be more comprehensive in that they not only require certain controls, but also are specific in approaches to enforcement to protect workers and customers. However, care needs to be taken to ensure that workers can enforce controls without facing retaliation, harassment, or violence from customers, and not further burdening them with work duties.

These findings point to the importance of creating enforceable guidelines for workplaces, even when faced with a novel threat. In a review of the effectiveness of legislative and policy levers in improving occupational health and safety, Tompa et al. (2016) found that having enforceable regulatory health and safety policies moderately increased voluntary compliance, and when workplace inspections and penalties were utilized both compliance and resultant injury rates improved, even in workplaces that were not directly inspected or penalized. Both Federal and State OSHA plans can pass emergency temporary standards, and a coordinated and early effort to do so could have potentially protected many workers from infection (Baker et al. 2020). Gaps in enforcement and inconsistency in the presence of controls over time could also be addressed by educating and empowering workers to enforce controls for customers or request controls from management without fear of retaliation from management or customers. Both OR OSHA and WA L&I mandate workplace health and safety committees that meet regularly to discuss health and safety concerns, with the number of employee-selected members equal to or exceeding the number of employer-selected members. However, members of these committees must be able to recognize problems and solutions, and concerns must be taken seriously by employers to be the most effective (Seixas et al. 2013). Developing materials for use by safety committees, such as resources on what to ask your employer about COVID-19 controls in your workplace, how and when to refuse unsafe work, and how to suggest new controls, could be a way to take advantage of existing structures and further empower workers.

Limitations in the checklist and study design

Findings here are limited to the controls considered in the checklist, which was developed early in the pandemic (April 2020) as evidence about transmission—and thus appropriate controls—was evolving. At the time of checklist development, SARS-CoV-2 was thought to primarily spread via short-range droplets, with some spread through fomites, making cleaning, social distancing, and physical barriers relevant for mitigating its spread. As

evidence accumulated, small aerosol transmission was determined to be the primary route of transmission (Jones 2020; Prather et al. 2020; Greenhalgh et al. 2021), making masks the most protective and evidence-based control considered in this checklist. Despite PPE being at the bottom of the hierarchy of controls (The National Institute for Occupational Safety and Health 2015), masks provide source control by limiting the exhalation of virus containing droplets and particles, and some masks can serve as a barrier against inhaling them (Brooks and Butler 2021). Due to the logistical challenges and timing of our study, observations were not included on engineering controls such as ventilation effectiveness, despite their vital importance in controlling transmission of SARS-CoV-2.

Several administrative controls could also not be characterized utilizing an observational study design but are important to protecting worker and customer health. Administrative controls were frequently adopted by employers during the COVID-19 pandemic, and include things such as sick leave policies, policies around employee tracing and tracking, holding breaks/team meetings outdoors instead of indoors, staggering break schedules to reduce employee congregation, developing, enacting, and communicating an emergency response plan, and training workers on COVID-19 prevention and controls specific to their work environment. As this study was conducted during a time period when vaccines were not readily available, policies relating to vaccination were also not included in the protocol.

By design, this study lacks generalizability given its small sample size and sampling strategy. As one researcher completed all observations in Seattle and another researcher completed all observations in Portland, while intra-examiner reliability would be assumed to be high, inter-examiner reliability could be poor, leading to biased findings. However, both researchers underwent multiple rounds of training on the instrument, compared pictures of controls observed over Zoom to ensure consistent application of the checklist, and communicated after each round of data collection in order to adjudicate discrepancies in attempts to increase inter-examiner reliability, and no significant differences in the presence or absence of controls were noted between cities, policies, and compare case numbers among workers at the stores being observed, to the extent it is feasible.

Conclusions

The COVID-19 pandemic has illustrated how the health of grocery store workers and the public are linked, with workers and the public potentially transmitting the virus to each other in settings such as grocery stores. The work presented here shows that grocery stores in the sample took steps to enact controls even without clear regulatory guidance, and when a control was required under public health it influenced implementation. Consistent regulations outlining evidence-based controls coupled with enforcement activity are necessary in high contact workplaces such as grocery stores to protect both the workers and the public. Such controls should be coupled with appropriate administrative supports to the workers such as increased sick leave, hazard pay, and access to healthcare and social safety nets.

Work presented here was specific to the early months of the COVID-19 pandemic, and represents some of the only work done to characterize presence of and changes in workplace

controls over time in a standardized way. However, future work investigating changes in observable controls implemented by grocery stores should include a larger, random sample of stores in order to provide generalizable results, conclusions, and recommendations; assess controls across all rungs of the hierarchy of controls (including engineering and administrative controls) and collect data on health outcomes among workers at the stores being observed, to the extent it is feasible.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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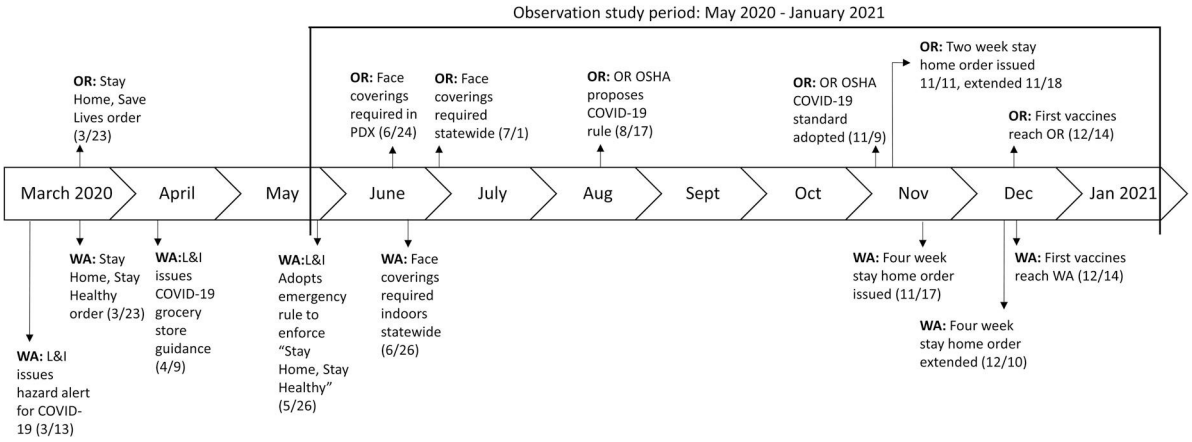

Figure 1.

Timeline of COVID-19 policies across Washington and Oregon.

L&I: Washington State Department of Labor & Industries; OR OSHA: Oregon Occupational Safety & Health Administration; WA: Washington; OR: Oregon.

Table 1.

Results from exploratory longitudinal mixed effects logistic regression including month of observation, city of store, and income of surrounding trade area (above or below median income) as fixed effects and store as random effect.

		Coefficient (SE)			
	Control	**Month**	**Income**	**City**	**Intercept**
Store entrance controls	Special hours	**−0.70 (0.15)** ***	0.48 (1.51)	−0.11 (1.47)	**3.34 (1.42)** *
	Customer limit	−0.03 (0.08)	−0.27 (0.78)	0.56 (0.78)	−0.26 (0.73)
	COVID signage	−0.02 (0.13)	0.88 (2.09)	2.38 (2.14)	3.03 (2.09)
	Mask requirement	**0.11 (0.01)** ***	0.03 (0.05)	−0.01 (0.05)	**0.22 (0.06)** ***
	Mask provided	**0.34 (0.13)** **	1.32 (1.26)	−0.57 (1.30)	**−5.06 (1.47)** ***
Store floor controls	Wipe dispenser present	**0.01 (0.01)** *	0.09 (0.07)	0.12 (0.07)	**0.77 (0.07)** ***
	Employees cleaning baskets/carts	−0.15 (0.09)	**2.45 (0.64)** ***	0.96 (0.61)	**−1.71 (0.65)** **
	Demarcation down aisles	**−0.91 (0.22)** ***	−1.82 (3.38)	1.65 (2.96)	2.77 (2.71)
	Any distancing marker in store section	0.01 (0.11)	0.72 (1.95)	3.19 (2.19(	0.30 (1.61)
Checkout controls	Barriers at checkout	**0.02 (0.01)** **	−0.02 (0.05)	0.06 (0.05)	**0.86 (0.05)** ***
	Barrier behind checkout	**0.01 (0.005)** **	0.12 (0.23)	−0.07 (0.13)	0.20 (0.17)
	Cleaning checkout lane	**0.01 (0.004)** *	0.31 (0.15) *	0.16 (0.11)	−0.11 (0.12)
	Social distance markings at checkout	**−0.01 (0.01)** *	0.05 (0.05)	0.07 (0.05)	**0.96 (0.05)** ***
	Barriers between self-checkouts	**0.03 (0.01)** ***	**0.34 (0.27)** ***	−0.14 (0.27)	0.15 (0.21)
	Cleaning self-checkouts	**−0.67 (0.25)** **	0.46 (2.17)	−1.90 (2.24)	−1.38 (2.34)

*** $p < 0.001$

** $p < 0.01$

* $p < 0.1$.

In model, for controls: 1 = YES, control present; 0 = NO, control not present; for month: treated continuous with 1 = first month of observation, and 9 = last month of observation; for Income: 0 = area below median income; 1 = area above median income; for City: 0 = Portland; 1 = Seattle

Table 2.

Proportions of stores with observed controls at the store entrance over time.

	Special hours	Customer limits	COVID-19 signage	Mask required	Mask wearing enforced	Masks provided	n
May-20	88%	63%	75%	6%	0%	0%	16
Jun-20	88%	44%	94%	13%	0%	6%	16
Jul-20	44%	31%	94%	100%	31%	19%	16
Aug-20	56%	38%	88%	100%	13%	19%	15
Sep-20	40%	33%	100%	100%	33%	27%	15
Oct-20	27%	27%	80%	100%	20%	20%	15
Nov-20	27%	87%	87%	100%	20%	7%	15
Dec-20	27%	33%	93%	100%	27%	33%	15
Jan-21	33%	33%	87%	100%	53%	20%	15

Table 3.

Proportions of stores with observed controls on the store floor over time.

	Wipe dispensers available	Employees cleaning baskets and/or carts	Demarcation of traffic lanes	Social distancing markers in at least 1 store section	Social distancing markers in all store sections	n
May-20	75%	38%	63%	75%	19%	16
Jun-20	81%	38%	56%	63%	13%	16
Jul-20	69%	25%	50%	56%	13%	16
Aug-20	94%	33%	53%	60%	20%	15
Sep-20	94%	40%	47%	60%	20%	15
Oct-20	100%	40%	20%	60%	13%	15
Nov-20	100%	27%	13%	73%	13%	15
Dec-20	94%	13%	27%	73%	20%	15
Jan-21	87%	20%	20%	67%	27%	15

Table 4.

Proportions of stores with observed controls at the checkout section over time.

	Physical barrier at staffed checkout (1 breathing zone)	Barrier behind staffed checkout	Cleaning of staffed checkout between customers	Social distancing markers	Physical barriers between self-checkouts**	Cleaning self-checkouts between customers**	n
May-20	88%	25%	38%	94%	19%	19%	16
Jun-20	94%	31%	19%	94%	25%	13%	16
Jul-20	94%	38%	13%	94%	25%	6%	16
Aug-20	100%	33%	13%	100%	33%	25%	15
Sep-20	100%	33%	13%	100%	33%	0%	15
Oct-20	100%	33%	0%	80%	42%	8%	15
Nov-20	100%	33%	0%	87%	42%	0%	15
Dec-20	100%	33%	13%	93%	50%	0%	15
Jan-21	100%	33%	0%	100%	50%	0%	15

** Note, only 12 stores had self-checkouts.