COVID-19 Health Precautions: Identifying Demographic and Socio-Economic Disparities and Changes over Time

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The recent coronavirus disease 2019 (COVID-19) pandemic has required the adoption of precautionary health behaviours to reduce the risk of infection. This study examines adherence, as well as changes in adherence, to four key precautionary behaviours among Canadian adults: wearing face masks, social distancing, hand washing, and avoiding large crowds. Data are drawn from Series 3 and 4 of the nationally representative Canadian Perspectives Survey Series, administered by Statistics Canada in June and July 2020. We calculate overall adherence levels as well as changes over time. Logistic regression models estimate each behaviour as a function of demographic and socio-economic characteristics to identify adherence disparities across population segments. We find a nearly universal increase in precautionary behaviours from June to July in mask wearing (67.3 percent to 83.6 percent), social distancing (82.4 percent to 89.2 percent), and avoiding crowds (84.1 percent to 88.9 percent); no significant change occurred in the frequency of hand washing. We observe significant disparities in adherence to precautionary behaviours, especially for mask wearing, in June; female, older, immigrant, urban, and highly educated adults were significantly more likely to adhere to precautionary behaviours than male, younger, Canadian-born, rural, and low-educated adults. By July 2020, these disparities persisted or were slightly attenuated; women, however, had consistently higher adherence to all behaviours at both time points. These findings have substantial implications for policy and potential public health interventions.

Keywords: adults, Canada, COVID-19, disparities, health, precautions

Mots clés : adultes, Canada, COVID-19, disparités, santé, prévention

La pandémie de COVID-19 (la maladie à coronavirus 2019) a exigé l’adoption de comportements préventifs en matière de santé afin de réduire les risques d’infection. La présente étude est consacrée à l’examen de l’adhésion, ainsi que de son évolution, à quatre comportements préventifs principaux chez les Canadiens adultes : le port de masques antiprojections, la distanciation physique, le lavage des mains et l’évitement des foules. Les données étudiées sont tirées des enquêtes 3 et 4 de la série d’enquêtes sur les perspectives canadiennes, réalisée par Statistique Canada en juin et juillet 2020. Nous calculons les niveaux globaux d’adhésion ainsi que l’évolution de cette adhésion dans le temps. Des modèles de régression logistique permettent d’estimer chaque comportement en fonction des caractéristiques démographiques et socio-économiques, et de cerner ainsi les disparités d’adhésion dans différents segments de population. Nous observons une augmentation quasi universelle des comportements préventifs de juin à juillet pour ce qui est du port du masque (67,3 pour cent à 83,6 pour cent), de la distanciation physique (82,4 pour cent à 89,2 pour cent) et de l’évitement des foules (84,1 pour cent à 88,9 pour cent) ; aucun changement significatif ne se manifeste dans la fréquence du lavage des mains. Nous observons également d’importantes disparités d’adhésion aux comportements préventifs, en particulier pour ce qui est du port du masque, en juin ; les femmes, les aînés, les immigrants, les citadins et les adultes très scolarisés sont sensiblement plus enclins à adhérer aux comportements préventifs que les hommes, les plus jeunes, les Canadiens de naissance, les résidents des régions rurales et les adultes peu scolarisés. En juillet 2020, ces disparités persistent ou s’atténuent légèrement ; les femmes, toutefois, affichent uniformément une plus grande adhésion à tous les comportements préventifs aux deux moments. Ces observations ont d’importantes conséquences pour la politique et les interventions potentielles en santé publique.

Mots clés : adultes, Canada, COVID-19, disparités, santé, prévention
Introduction

The coronavirus disease 2019 (COVID-19) pandemic has required Canadians to adopt new precautionary health behaviours. The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus is highly transmissible, with moderate to severe illness reported in approximately 20 percent of all cases (Kucharski et al. 2020; Riou and Althaus 2020). According to the WHO (2020), wearing face masks, practising social distancing, increasing the frequency of hand washing, and avoiding large crowds are the primary means of reducing the risk of infection. These behaviours thus represent the most important actions that Canadians can undertake to help fight the pandemic and are, thus, also among the most critical policy targets of the Canadian government. Research is therefore required to understand the adherence rates to these precautions in the Canadian population, as well as disparities in the rates of adherence and changes over time, in order to assess potential vulnerabilities across key segments of the population.

Wearing a face mask is particularly vital as a means to reduce the transmission of the virus (Brankston et al. 2020). Mask wearing is also predominantly seen as a behaviour aimed at protecting others rather than the individual’s self-interests (Adeel et al. 2020; van der Linden and Savoie 2020). In fact, an online poll from September 2020 found that the majority of Canadian respondents (87 percent) believed wearing a mask was a civic duty because it protects others from the risk of infection (Berthiaume 2020). However, mask wearing worldwide ranged widely during the same time period, from 1 percent in Denmark and Finland to more than 90 percent in Singapore and the Philippines, in large part because of varied government recommendations and regulations (CFR 2020). In Canada, Mohammed, Johnston, and van der Linden (2020) found that mask usage gradually increased from 10 percent at the start of the pandemic in March 2020 to approximately 63 percent in late May or early June. The increase in mask wearing during the pandemic’s early months may reflect the shift in public health officials’ recommendations: the effectiveness of masks was contested in the beginning of the pandemic, but mask wearing quickly became understood as the key precaution against the spread of the virus (Mohammed et al. 2020). Moreover, understanding rates of adherence to mask wearing and trends in this behaviour is essential for policy-makers, public health officials, and the public at large.

It is also critical to assess adherence to other important precautionary behaviours—social distancing, hand washing, and avoiding crowds. The importance of these precautionary behaviours (in contrast to mask wearing) had consistently been emphasized by Canada’s political and policy messaging since the onset of the pandemic (Merkley et al. 2020). This is likely a contributing factor to the relatively stable estimates of adherence to these precautionary behaviours (Mohammed et al. 2020). Some work suggests that most Canadians have been relatively willing to adhere to the policy recommendations for behaviours such as mask wearing and social distancing, based on the perceived dangers of COVID-19 and their trust in the government’s response to the pandemic (Mohammed et al. 2020; Sevi et al. 2020). Population compliance may also have increased over the pandemic months as a result of more aggressive public health policy initiatives (Armstrong, Lebo, and Lucas 2020). For instance, the implementation of mandatory mask policies on 7 July 2020 in Ontario’s largest public health units during the “reopening” phase (May–August) immediately increased mask-wearing adherence rates (Karaivanov et al. 2020). It is therefore important to assess the levels of and changes in all key precautionary behaviours jointly with mask wearing to gain a complete understanding of the precautionary behaviours of the Canadian population.

In addition to aggregate estimates, adherence disparities among population groups must be understood to effectively target interventions. Previous work on COVID-19 and previous pandemics in countries around the world have shown that adherence to precautions tends to be higher among some groups than others. During the 2003 SARS outbreak, a UK analysis (Bish and Michie 2010) found that being older, female, more educated, and non-White was associated with a higher likelihood of adopting precautionary behaviours such as hand washing, wearing face masks, and avoiding crowds. The use of precautions has also been found to vary across groups during the COVID-19 pandemic. For example, a recent US study found that older, female, and urban residents were more likely to wear a mask than younger, male, and rural residents (Haischer et al. 2020). In France, older age and female gender were positively associated with precaution adherence on the basis of an index that included measures of hand washing, social distancing, and avoiding crowds (Brouard, Vasilopoulos, and Becker 2020). In Canada, women and older adults were more likely than men and younger adults, respectively, to follow government recommendations during the pandemic (Brankston et al. 2020; Clark et al. 2020). Moreover, immigrant, urban, and higher-educated Canadians were more likely to practice social distancing than non-immigrant, rural, and less-educated Canadians. With respect to mask wearing, respondents living in urban areas reported higher use levels than those living in rural areas (Brankston et al. 2020). These studies provide some evidence that adherence to precautionary behaviours varies across demographics and measures of socio-economic status; however, the available findings are not based on nationally representative samples and do not include a comprehensive set of respondent demographic and socio-economic characteristics. This major omission represents a critical component of understanding adherence to precautionary behaviours because these characteristics are correlated and jointly reflect structural
positions and influences that define people’s exposure to various health-related norms and customs, which in turn shapes their health-related behaviours (Burdette et al. 2017; Mollborn et al. 2014; Ross, Hill, and Mirowsky 2016). Moreover, it is unclear whether changes over time in precautionary behaviours are attenuating or exacerbating disparities in rates of adherence.

The present study thus fills several important knowledge gaps. Using a large, nationally representative sample from a Statistics Canada survey, we assess the use of the four leading health precautions in the Canadian population. We provide aggregate estimates on the prevalence of mask wearing, social distancing, hand washing, and avoiding crowds in Summer 2020. We also assess changes in adherence from June to July 2020, a time when provincial governments intensified the calls for mask wearing. In addition to determining the aggregate changes, we explore them in key population segments to determine whether the changes led to increasing, persistent, or decreasing disparities. Finally, we examine the disparities at each time point in detail to identify segments of the population with particularly low adherence rates that may require targeted public health interventions.

**Methods**

**Data**

Analyses are based on the public use sample of the Canadian Perspective Survey Series (CPSS) data collected by Statistics Canada. The purpose of this repeated cross-sectional survey is to collect information about a wide range of social, economic, and health conditions as Canada continues to navigate pandemic restrictions and plan for recovery. The sampling frame for each survey series includes Canadians aged 15 years and older across the ten provinces; persons who are institutionalized and residents of the Yukon, Northwest Territories, and Nunavut are excluded from the sample. Eligible individuals were asked to provide an email address to participate in the CPSS sign-up process. Participants with valid personal information formed the probability panel. The data were collected using online surveys with an approximate response rate of 58 percent of the target population.

As of this writing in February 2021, Statistics Canada has administered a total of six surveys; however, only two surveys have data on the use of precautionary behaviours (mask wearing, social distancing, hand washing, and avoiding crowds). Series 3: Resuming Economic and Social Activities during COVID-19 was collected between 15 and 21 June 2020. Series 4: Information Sources Consulted during the Pandemic was collected between 20 and 26 July.

We define our target population as Canadian adults aged 25 years and older. This definition omits 371 respondents (4.4 percent of the total; 203 from Series 3 and 168 from Series 4) aged 15–24 years because this age category includes adolescents and young adults with incomplete socio-economic status measures, such as educational attainment and employment. The missingness on all covariates is very low; therefore, we conduct complete-case analyses, which excludes 141 respondents (1.7 percent of the total) with missing responses on the use of COVID-19 precautions as well as the covariates. The final analytic sample includes 3,939 respondents in Series 3 and 3,976 respondents in Series 4.

**Measures**

**Outcomes**

The data include information about four precautionary behaviours: wearing face masks, practising social distancing, washing hands “more frequently,” and avoiding large crowds. In Series 3, these behaviours were assessed with the question “Which of the following precautions will you take or continue to take as the COVID-19 safety measures are relaxed?” Respondents could then indicate yes or no to each of the following: “wear a mask in public places where physical distancing is difficult,” “keep a 2-meter or 6-foot distance from others,” “wash hands more frequently,” and “avoid crowds and large gatherings.” In Series 4, the behaviours were assessed with the question “Which of the following precautions have you taken to reduce your risk of exposure to COVID-19?” and respondents could indicate yes or no to “wore a mask or other personal protective equipment,” “used physical distancing when out in public,” “washed hands more regularly,” and “avoided crowds and large gatherings.”

**Covariates**

Demographic characteristics include gender (male as reference), age (originally coded in 10-year groups ranging from 25–34 y to ≥ 75 y; we recoded to 25–44 y as the reference, 45–64 y, and ≥ 65 y for parsimony), immigrant status (Canadian born as the reference vs. foreign born), urban residence as the reference versus rural, marital status (married or common-law as the reference, previously married, and never married), and presence of children (no children aged < 18 y at home as the reference vs. at least one child at home).

Socio-economic status was measured using education and employment status. Educational attainment was coded as high school or less as the reference, trade certificate, college diploma, and university degree, including advanced degrees. Employment status was coded with employed as the reference, absent from work, and not employed. The last category includes retired adults and those not in the labour force. The “absent from work” category refers to temporary absences and, in the original data, distinguishes whether the absence was COVID-19 related or not; we combine the two categories because the two groups are small and do not significantly differ with
respect to any outcome. Finally, we include dwelling type to tap into possible social and physical space available to the respondents (single detached home as the reference, low-rise apartment, high-rise apartment, and other).

**Statistical Analysis**

We first describe the characteristics of the target population for all variables in this study (Table 1). The descriptive analyses are conducted separately for each survey series; we then calculate the percentage point difference between Series 3 and 4 and test for statistically significant differences in the distribution of the covariates. For our four outcome measures, we also express the difference between each survey series using odds ratios. We then estimate a sequence of bivariate logistic regression models separately for Series 3 and 4 for each precaution and each covariate to identify gross intergroup differences (Table 2). To better interpret these models, we calculate average adjusted probabilities, as well as corresponding 95 percent confidence intervals, from the estimated odds ratios and present the findings graphically for the demographic characteristics (Figure 1) and socio-economic status measures (Figure 1b). Please note that these results are the same as simply calculating the weighted prevalence of each behaviour across levels for each covariate; we use this latter definition in the figure titles. We also estimate fully adjusted logistic regression models separately for Series 3 and 4 and for each precaution to examine the effect of each covariate net of all other covariates (Table 3). Last, we estimate models on the pooled Series 3 and 4 data that include interactions between covariates and a Series 4 indicator to test how changes in the adherence to precautionary behaviours differed across groups; the difference would be captured with a statistically significant odds ratio associated with the interaction term or terms. We first estimate the models for each covariate separately (Table 4). We then estimate fully adjusted interaction models in which all covariates are included in each of the four models, with each variable also being interacted with the Series 4 indicator (Table 5). All analyses are weighted to adjust for the complex sampling design of the CPSS series.

**Results**

Table 1 presents the prevalence of each precautionary behaviour as reported in Series 3 and Series 4, summarizes changes over time, and describes the characteristics of the target population across all variables in this study. Mask-wearing prevalence is lowest in both surveys (67.3 percent and 83.6 percent for Series 3 and 4, respectively); however, the increase between surveys is the steepest: 16.3 percentage points, or an odds ratio of 2.48 for wearing relative to not wearing a mask in Series 4 over Series 3 ($p < 0.001$). Social distancing also increased significantly ($p < 0.001$), by 6.8 pp or an odds ratio of 1.76, from 82.4 to 89.2 percent. Hand washing is reported by 94.3 percent of respondents in Series 3 and remains at a statistically similar level, 92.7 percent, in Series 4. Finally, more respondents reported that they avoided crowds in Series 4 relative to Series 3: 4.8 percentage points more, or an odds ratio of 1.52 ($p < 0.001$).

The remainder of Table 1 shows the distribution of population characteristics in each survey series. The most important result here is that the distributions of nearly all variables did not change between each survey series. The statistical tests confirm that the sample for both surveys is statistically equivalent and that changes observed in the precautionary behaviours reflect changes in the population, not changes in the sample design. The only variable that shows marginally significant difference between each survey series is employment status, which is reasonable given the continued upheavals in the labour markets during the pandemic.

We then investigate group differences in precautionary behaviours for each survey series. Table 2 shows bivariate relationships, and Table 3 shows differences across groups in a fully adjusted model. We highlight several key results. Uniformly, for both surveys and all precautions, women report significantly and substantially higher adherence than men. With respect to age, older Canadians tend to report higher prevalence of precautionary behaviours than their younger counterparts in Series 3, but the age differences largely converge by Series 4. A similar convergence is observed for immigrant status. For Series 3, immigrants have significantly higher adherence to the precautions, but by Series 4 the immigrant–Canadian-born difference becomes not statistically significant (except for the bivariate relationship with respect to mask wearing). Rural respondents also have much lower adherence to mask wearing than their urban counterparts (OR = 0.53–0.66 across the two surveys and the bivariate vs. adjusted models), but there is no difference for the other precautions. Respondents who are married, and those who have children at home, tend to have lower adherence to all precautions regardless of what other characteristics we control for, although in most cases the differences are not statistically significant.

The main SES differences in adherence to precautions is by level of education. Trade certificates are associated with no better, and in many cases worse, adherence to all precautions, compared with having at most a high school degree. Adults with a college diploma are also comparable to the high school graduates. Those with a university degree, however, had higher adherence for most outcomes in both surveys and in both bivariate and adjusted models. Compared with this relatively clear set of education patterns, employment status and dwelling-type differences yield a more intricate story with no differences, or with odds ratios in different directions, for different health precautions.
Table 1: Characteristics of the Target Population

| Characteristic                  | %     | S3    | S4    | S3–S4 Difference (pp) | p-value | S3–S4 OR |
|--------------------------------|-------|-------|-------|------------------------|---------|---------|
| COVID-19 precautions           |       |       |       |                        |         |         |
| Wearing masks                  | 67.3  | 83.6  | 16.3  | < 0.001                | 2.48†   |
| Social distancing              | 82.4  | 89.2  | 6.8   | < 0.001                | 1.76†   |
| Hand washing                   | 94.3  | 92.7  | –1.6  | 0.064                  | 0.77    |
| Avoiding crowds                | 84.1  | 88.9  | 4.8   | < 0.001                | 1.52†   |
| Demographics                   |       |       |       |                        |         |         |
| Female                         | 50.9  | 51.2  | 0.3   | 0.880                  |         |         |
| Age, y                         |       |       |       |                        | 0.970   |         |
| 25–44                          | 38.5  | 38.2  | –0.3  | 0.0                    |         |         |
| 45–64                          | 37.5  | 37.5  | 0.0   | 0.979                  |         |         |
| ≥ 65                           | 24.0  | 24.3  | 0.3   | 0.979                  |         |         |
| Immigrant                      | 24.6  | 23.8  | –0.8  | 0.637                  |         |         |
| Rural                          | 15.7  | 15.1  | –0.6  | 0.583                  |         |         |
| Marital status                 |       |       |       |                        | 0.979   |         |
| Married or common-law          | 70.6  | 70.8  | 0.2   | 0.949                  |         |         |
| Previously married             | 12.8  | 12.6  | –0.2  | 0.949                  |         |         |
| Never married                  | 16.6  | 16.6  | 0.0   | 0.949                  |         |         |
|Presence of children            | 28.3  | 27.9  | –0.4  | 0.949                  |         |         |
| Socio-economic status          |       |       |       |                        | 0.949   |         |
| Level of education             |       |       |       |                        | 0.949   |         |
| High school or less            | 30.7  | 31.3  | 0.6   | 0.346                  |         |         |
| Trade certificate              | 11.2  | 10.6  | –0.6  | 0.346                  |         |         |
| College diploma                | 22.6  | 22.3  | 0.0   | 0.949                  |         |         |
| University degree              | 35.5  | 35.8  | 0.3   | 0.949                  |         |         |
| Employment status              |       |       |       |                        | 0.949   |         |
| Employed                       | 52.0  | 52.0  | 0.0   | 0.949                  |         |         |
| Absent from work               | 6.3   | 8.8   | 2.5   | 0.949                  |         |         |
| Not employed                   | 41.7  | 39.3  | –2.4  | 0.949                  |         |         |
| Dwelling type                  |       |       |       |                        | 0.922   |         |
| Single detached                | 60.9  | 60.9  | 0.0   | 0.922                  |         |         |
| Low-rise apartment             | 12.9  | 12.1  | –0.8  | 0.922                  |         |         |
| High-rise apartment            | 9.5   | 9.6   | 0.1   | 0.922                  |         |         |
| Other                          | 16.7  | 17.4  | 0.7   | 0.922                  |         |         |
| No. of observations            | 3,939 | 3,976 |       |                        |         |         |

Notes: Descriptive analyses include sampling weights to account for unequal probability of selection into the sample.
S3 = Series 3; S4 = Series 4; pp = percentage points; OR = odds ratio; COVID-19 = coronavirus disease 2019.
* p < 0.001.
Source: Statistics Canada (2020), Canadian Perspectives Survey Series 3 (N = 3,939) and 4 (N = 3,976).

Figure 1 shows the changes in all four behaviours for major demographic groups. Several patterns are worth noting. First, mask wearing differs from the other three behaviours in several aspects: mask-wearing adherence is lower in both series (as Table 1 indicates) compared with the other three behaviours. There are also relatively large disparities in mask wearing across demographic groups, especially in Series 3. Perhaps because mask wearing was relatively low in Series 3, the increases by Series 4 are statistically significant and substantively large in most demographic groups (evident in the non-overlapping error bars and also supported by bivariate and fully adjusted interaction models; see Tables 4 and 5). The increase in mask wearing between surveys also tends to be larger for those groups that lagged the most in Series 3—that is, there is suggestion of convergence toward all groups wearing masks at comparably high rates. However, statistical tests (Table 4) indicate convergence only by age and immigrant
Table 2: Bivariate Logistic Regression Models Estimating the Use of COVID-19 Precautions

| Covariates                          | Wearing Masks | Social Distancing | Hand Washing | Avoiding Crowds |
|-------------------------------------|---------------|-------------------|--------------|-----------------|
|                                     | Series 3      | Series 4          | Series 3     | Series 4        | Series 3 | Series 4 | Series 3 | Series 4 |
| Demographics                        |               |                   |              |                 |          |          |          |          |
| Female (ref. = male)                | 1.82***       | 1.50**            | 1.50**       | 1.57*           | 2.63**** | 1.64*    | 1.75**** | 1.53*    |
| Age, y (ref. = 25–44)               |               |                   |              |                 |          |          |          |          |
| 45–64                               | 1.35*         | 1.07              | 1.34*        | 0.91            | 0.82     | 1.15     | 1.42*    | 1.10     |
| ≥65                                 | 2.19***       | 1.19              | 1.52*        | 1.19            | 1.19     | 1.19     | 2.86**** | 1.12     |
| Immigrant (ref. = Canadian-born)    | 2.68***       | 1.46*             | 1.79****     | 1.08            | 1.23     | 0.76     | 2.58**** | 1.35     |
| Rural (ref. = urban)                | 0.57***       | 0.57***           | 0.85         | 0.73            | 1.15     | 0.80     | 0.82     | 0.80     |
| Marital status (ref. = married)     |               |                   |              |                 |          |          |          |          |
| Previously married                  | 0.97          | 0.71              | 1.06         | 0.86            | 0.87     | 0.95     | 0.78     | 0.88     |
| Never married                       | 0.58***       | 1.05              | 0.72         | 0.74            | 0.85     | 0.69     | 0.57***  | 0.80     |
| Presence of children (ref. = no children) | 0.83          | 0.73*             | 0.83         | 0.64*           | 1.20     | 1.05     | 0.79     | 1.03     |
| Socio-economic status               |               |                   |              |                 |          |          |          |          |
| Level of education (ref. = HS or less) |             |                   |              |                 |          |          |          |          |
| Trade certificate                   | 0.51***       | 0.57*             | 0.58*        | 0.74            | 0.46*    | 1.46     | 0.47**   | 0.77     |
| College diploma                     | 0.95          | 1.36              | 1.11         | 1.74*           | 0.78     | 1.31     | 0.89     | 0.80     |
| University degree                   | 1.62***       | 2.49***           | 1.25         | 2.07**          | 1.20     | 1.94**   | 1.59*    | 1.27     |
| Employment status (ref. = employed) |               |                   |              |                 |          |          |          |          |
| Absent from work                    | 1.56*         | 1.14              | 1.48         | 1.02            | 1.68     | 1.22     | 1.45     | 0.82     |
| Not employed                        | 1.66***       | 1.00              | 1.32*        | 0.78            | 1.27     | 0.79     | 1.85***  | 0.91     |
| Dwelling type (ref. = single detached) |             |                   |              |                 |          |          |          |          |
| Low-rise apartment                  | 1.14          | 1.07              | 0.90         | 0.83            | 1.26     | 0.53*    | 1.06     | 0.82     |
| High-rise apartment                 | 1.97***       | 2.77***           | 2.07**       | 1.15            | 0.96     | 1.35     | 1.21     | 0.78     |
| Other                               | 1.08          | 0.87              | 1.01         | 0.74            | 1.16     | 0.80     | 1.03     | 0.66     |

Notes: The odds ratios are from separate bivariate models estimating the association between a single covariate and each outcome in each wave. All models include sampling weights to account for unequal probability of selection into the sample. COVID-19 = coronavirus disease 2019; ref. = reference.

* p < 0.05; ** p < 0.01; *** p < 0.001.

Source: Statistics Canada (2020), Canadian Perspectives Survey Series 3 (N = 3,939) and 4 (N = 3,976).

Table 3: Fully Adjusted Logistic Regression Models Estimating Use of COVID-19 Precautions

| Covariates                          | Wearing masks | Social distancing | Hand washing | Avoiding crowds |
|-------------------------------------|---------------|-------------------|--------------|-----------------|
|                                     | Series 3      | Series 4          | Series 3     | Series 4        | Series 3 | Series 4 | Series 3 | Series 4 |
| Demographics                        |               |                   |              |                 |          |          |          |          |
| Female (ref = male)                 | 1.77***       | 1.56***           | 2.56***      | 1.79**          | 1.41*    | 1.68**   | 1.62***  | 1.66**   |
| Age, y (ref. = 25–44)               |               |                   |              |                 |          |          |          |          |
| 45–64                               | 1.36*         | 1.09              | 0.94         | 1.21            | 1.23     | 0.76     | 1.34     | 1.09     |
| ≥65                                 | 2.03***       | 1.44              | 2.12*        | 1.75            | 1.26     | 1.23     | 2.35**   | 1.27     |
| Immigrant (ref. = Canadian-born)    | 2.12***       | 1.10              | 1.01         | 0.65            | 1.60**   | 0.94     | 2.12**   | 1.34     |
| Rural (ref. = urban)                | 0.61***       | 0.66*             | 1.23         | 0.70            | 0.95     | 0.70     | 0.94     | 0.74     |
| Marital status (ref. = married)     |               |                   |              |                 |          |          |          |          |
| Previously married                  | 0.75          | 0.61*             | 0.69         | 0.95            | 0.92     | 0.79     | 0.58     | 0.93     |
| Never married                       | 0.69*         | 0.97              | 1.07         | 0.73            | 0.81     | 0.58*    | 0.64*    | 0.88     |
| Presence of children (ref. = no children) | 0.90          | 0.67*             | 1.33         | 0.99            | 0.83     | 0.46***  | 0.86     | 0.96     |
| Socio-economic status               |               |                   |              |                 |          |          |          |          |
| Level of education (ref. = HS or less) |             |                   |              |                 |          |          |          |          |
| Trades certificate                  | 0.68          | 0.61*             | 0.61         | 1.49            | 0.69     | 0.74     | 0.65     | 0.81     |

(Continued)
Table 3: Continued

| Covariates                          | Wearing masks | Social distancing | Hand washing | Avoiding crowds |
|-------------------------------------|---------------|------------------|-------------|----------------|
|                                     | Series 3     | Series 4         | Series 3    | Series 4       | Series 3 | Series 4 |
| College diploma                     | 1.12          | 1.41             | 0.87        | 1.22           | 1.20     | 1.68*    | 1.10 | 0.74 |
| University degree                   | 1.73***       | 2.40***          | 1.38        | 1.99**         | 1.27     | 2.08**   | 1.85** | 1.22 |
| Employment status (ref. = employed) |               |                  |             |                |          |          |       |
| Absent from work                    | 1.49          | 1.02             | 1.36        | 1.02           | 1.48     | 0.89     | 1.34 | 0.71 |
| Not employed                        | 1.33*         | 0.85             | 0.99        | 0.61*          | 1.17     | 0.58*    | 1.45 | 0.75 |
| Dwelling type (ref. = single detached) |            |                  |             |                |          |          |       |
| Low-rise apartment                  | 1.04          | 0.97             | 1.27        | 0.55*          | 0.84     | 0.74     | 1.09 | 0.73 |
| High-rise apartment                 | 1.52          | 2.22*            | 0.97        | 1.35           | 1.83*    | 0.95     | 1.01 | 0.62 |
| Other                               | 0.93          | 0.78             | 1.12        | 0.79           | 0.94     | 0.66     | 0.95 | 0.57 |

Notes: The odds ratios are from separate bivariate models estimating the association between a single covariate and each outcome in each wave. All models include sampling weights to account for unequal probability of selection into the sample. COVID-19 = coronavirus disease 2019; ref. = reference.

* p < 0.05; ** p < 0.01; *** p < 0.001.

Source: Statistics Canada (2020), Canadian Perspectives Survey Series 3 (N = 3,939) and 4 (N = 3,976).

Figure 1: Prevalence of Precautionary Behaviours in Series 3 and 4 by (a) Demographic Characteristics and (b) Socio-Economic Status
Notes: Point estimates and 95% CI shown. All models include sampling weights to account for unequal probability of selection into the sample. Source: Statistics Canada (2020), Canadian Perspectives Survey Series 3 (N = 3,939) and 4 (N = 3,976).
Figure 1: Continued

Table 4: Bivariate Interaction Models Testing Changes in Disparities between Series 3 and 4

| Covariates                        | Wearing Masks | Social Distancing | Hand Washing | Avoiding Crowds |
|-----------------------------------|---------------|-------------------|--------------|-----------------|
| Demographics                      |               |                   |              |                 |
| Gender (ref. = male)              |               |                   |              |                 |
| Female                            | 1.82***       | 1.50***           | 2.63***      | 1.75***         |
| Female × Series 4                 | 0.82          | 1.05              | 0.62         | 0.88            |
| Age, y (ref. = 25–44)             |               |                   |              |                 |
| 45–64                             | 1.35*         | 1.34*             | 0.82         | 1.42*           |
| ≥ 65                              | 2.19***       | 1.52*             | 1.71         | 2.86***         |
| 45–64 × Series 4                  | 0.79*         | 0.68              | 1.40         | 0.77*           |
| ≥ 65 × Series 4                   | 0.55*         | 0.78              | 0.70         | 0.39***         |
| Immigrant status (ref. = Canadian-born) |            |                   |              |                 |
| Immigrant                         | 2.68***       | 1.79***           | 1.23         | 2.58***         |
| Immigrant × Series 4              | 0.55***       | 0.60              | 0.62         | 0.52***         |

(Continued)
Table 4: Continued

| Covariates                        | Wearing Masks | Social Distancing | Hand Washing | Avoiding Crowds |
|-----------------------------------|---------------|-------------------|--------------|-----------------|
| Residence (ref. = urban)          |               |                   |              |                 |
| Rural                             | 0.53***       | 0.85              | 1.15         | 0.82            |
| Rural × Series 4                   | 1.08          | 0.86              | 0.69         | 0.97            |
| Marital status (ref. = married)   |               |                   |              |                 |
| Previously married                 | 0.97          | 1.06              | 0.87         | 0.78            |
| Never married                      | 0.58**        | 0.72              | 0.85         | 0.52***         |
| Previously married × Series 4      | 0.74*         | 0.82              | 1.09         | 1.13            |
| Never married × Series 4           | 1.81*         | 1.03              | 0.81         | 1.55            |
| Presence of children (ref. = no children) |     |                   |              |                 |
| Children present                   | 0.83          | 0.83              | 1.20         | 0.79            |
| Children present × Series 4        | 0.89          | 0.78              | 0.87         | 1.31            |
| Socio-economic status              |               |                   |              |                 |
| Level of education (ref. = HS or less) |           |                   |              |                 |
| Trade certificate                  | 0.51***       | 0.58*             | 0.46*        | 0.47**          |
| College diploma                    | 0.95          | 1.11              | 0.78         | 0.89            |
| University degree                  | 1.62***       | 1.25              | 1.20         | 1.59*           |
| Trade certificate × Series 4       | 1.11          | 1.28              | 3.20*        | 1.62            |
| College diploma × Series 4         | 1.43          | 1.57              | 1.69         | 0.90            |
| University degree × Series 4       | 1.53          | 1.66              | 1.62         | 0.80            |
| Employment (ref. = employed)       |               |                   |              |                 |
| Absent from work                   | 1.56*         | 1.48              | 1.68         | 1.45            |
| Not employed                       | 1.66***       | 1.32*             | 1.27         | 1.85***         |
| Absent from work × Series 4        | 0.73*         | 0.69              | 0.73         | 0.57*           |
| Not employed × Series 4             | 0.60*         | 0.59*             | 0.62         | 0.49***         |
| Dwelling type (ref. = single detached) |       |                   |              |                 |
| Low-rise apartment                  | 1.14          | 0.90              | 1.26         | 1.06            |
| High-rise apartment                 | 1.97**        | 2.07**            | 0.96         | 1.21            |
| Other                              | 1.08          | 1.01              | 1.16         | 1.03            |
| Low-rise apartment × Series 4       | 0.94          | 0.92              | 0.42*        | 0.77            |
| High-rise apartment × Series 4      | 1.41          | 0.55              | 1.40         | 0.65            |
| Other × Series 4                    | 0.81          | 0.74              | 0.69         | 0.63            |

Notes: The table shows results from 10 separate logistic models for each behaviour. There is a separate model for each covariate; the model includes only the covariate, Series 4 indicator, and the interaction between the covariate and the Series 4 indicator. For parsimony, we do not show the main effect of Series 4, which captures the difference between Series 3 and 4 for the omitted reference category. Those results are available on request. In nearly all of the 30 models for mask wearing, social distancing, and avoiding crowds, the odds ratio is statistically significant at \( p < 0.001 \), signifying that the likelihood of the given precaution has increased significantly for the omitted category between Series 3 and 4. The exception was hand washing, for which the changes were not statistically significant. All models include sampling weights to account for unequal probability of selection into the sample. Ref. = reference.

*These cells show the only instances in which the interaction effect is statistically significant for the categorical variable as such—that is, jointly for all levels of the variable.

\( * p < 0.05; ** p < 0.01; *** p < 0.001. \)

Source: Statistics Canada (2020), Canadian Perspectives Survey Series 3 (\( N = 3,939 \)) and 4 (\( N = 3,976 \)).

status. Second, rates of social distancing and avoiding crowds are fairly high in June, although both behaviours still increase significantly in many demographic categories by Series 4. Hand washing, as noted earlier, remains fairly uniformly high across all groups and both surveys.

Figure 1b shows changes in the four behaviours for both surveys across socio-economic status (SES) categories. The patterns are similar to those in Figure 1a for several features. Mask wearing increases the most and across most SES groups (as Tables 4 and 5 show, the changes between surveys are statistically equivalent for all SES categories except employment status; those not employed increase mask wearing significantly less than those who are employed). The other three behaviours increase less...
## Table 5: Fully Adjusted Interaction Models Testing Changes in Disparities between Series 3 and 4

| Covariates                              | Wearing Masks | Social Distancing | Hand Washing | Avoiding Crowds |
|------------------------------------------|---------------|-------------------|--------------|-----------------|
| **Series 4 (ref. = Series 3)**           | 4.19***       | 3.84***           | 1.14         | 3.41***         |
| Female (ref. = male)                     | 1.77***       | 1.41*             | 2.56***      | 1.62***         |
| **Age, y (ref. = 25–44)**                |               |                   |              |                 |
| 45–64                                    | 1.36*         | 1.23              | 0.94         | 1.34            |
| ≥ 65                                     | 2.03***       | 1.26              | 2.12*        | 2.35**          |
| **Immigrant (ref. = Canadian-born)**     | 2.12***       | 1.60**            | 1.01         | 2.12**          |
| Rural (ref. = urban)                     | 0.61***       | 0.95              | 1.23         | 0.94            |
| **Marital status (ref. = married)**      |               |                   |              |                 |
| Previously married                       | 0.75          | 0.92              | 0.69         | 0.58            |
| Never married                            | 0.69*         | 0.81              | 1.07         | 0.64*           |
| **Presence of children (ref. = no children)** | 0.90          | 0.83              | 1.33         | 0.86            |
| **Level of education (ref. = HS or less)** |            |                   |              |                 |
| Trade certificate                        | 0.68          | 0.69              | 0.61         | 0.65            |
| College diploma                          | 1.12          | 1.20              | 0.87         | 1.10            |
| University degree                        | 1.73***       | 1.27              | 1.38         | 1.85**          |
| **Employment (ref. = employed)**         |               |                   |              |                 |
| Absent from work                         | 1.49          | 1.48              | 1.36         | 1.34            |
| Not employed                             | 1.33*         | 1.17              | 0.99         | 1.45            |
| **Dwelling type (ref. = single detached)** |             |                   |              |                 |
| Low-rise apartment                        | 1.04          | 0.84              | 1.27         | 1.09            |
| High-rise apartment                       | 1.52          | 1.83*             | 0.97         | 1.01            |
| Other                                    | 0.93          | 0.94              | 1.12         | 0.95            |
| **Interactions with Series 4**           |               |                   |              |                 |
| Female (ref. = male)                     | 0.88          | 1.19              | 0.70         | 1.02            |
| **Age, y (ref. = 25–44)**                |               |                   |              |                 |
| 45–64                                    | 0.81          | 0.62              | 1.30         | 0.82            |
| ≥ 65                                     | 0.71          | 0.98              | 0.83         | 0.54            |
| **Immigrant (ref. = Canadian-born)**     | 0.52**        | 0.59              | 0.65         | 0.63            |
| Rural (ref. = urban)                     | 1.09          | 0.74              | 0.57         | 0.79            |
| **Marital status (ref. = married)**      |               |                   |              |                 |
| Previously married                       | 0.81          | 0.85              | 1.38         | 1.59            |
| Never married                            | 1.39          | 0.72              | 0.68         | 1.37            |
| **Presence of children (ref. = no children)** | 0.75          | 0.55*             | 0.74         | 1.11            |
| **Level of education (ref. = HS or less)** |            |                   |              |                 |
| Trade certificate                        | 0.90          | 1.07              | 2.47         | 1.25            |
| College diploma                          | 1.26          | 1.40              | 1.41         | 0.67            |
| University degree                        | 1.39          | 1.64              | 1.44         | 0.66            |
| **Employment (ref. = employed)**         |               |                   |              |                 |
| Absent from work                         | 0.69          | 0.60              | 0.75         | 0.53            |
| Not employed                             | 0.64*         | 0.50*             | 0.62         | 0.52*           |
| **Dwelling type (ref. = single detached)** |             |                   |              |                 |
| Low-rise apartment                        | 0.94          | 0.88              | 0.43         | 0.67            |
| High-rise apartment                       | 1.46          | 0.52              | 1.39         | 0.61            |
| Other                                    | 0.84          | 0.70              | 0.71         | 0.61            |

Note: The table shows results from a logistic model of each behaviour, which includes all covariates, Series 4 indicator, and the interaction of all covariates with the Series 4 indicator. The interaction effects test whether the change between Series 3 and 4 differed statistically across levels of each covariate, net of all other covariates. All models include sampling weights to account for unequal probability of selection into the sample.

* p < 0.05; ** p < 0.01; *** p < 0.001.

Source: Statistics Canada (2020), Canadian Perspectives Survey Series 3 (N = 3,939) and 4 (N = 3,976).
than mask wearing, partly because adherence is already high in Series 3, and converge toward roughly 90 percent in Series 4 in most groups. A notably exceptional SES category is adults with trade certificates, who have significantly lower probability of all precautionary behaviours in Series 3. Compared with the reference category of adults with a high school diploma or less, they are significantly less likely to adhere to all four behaviours. In fact, the odds that Canadian adults with a trade certificate adhere to any precautionary behaviour is only about half (the odds ratios range from 0.46, \( p < 0.05 \), for social distancing to 0.58, \( p < 0.05 \), for hand washing; Table 4).

**Discussion**

COVID-19 health precautions remain a critical means of reducing the risk of infection and slowing the pandemic’s spread. Government health officials continue to recommend wearing face masks, practising social distancing, increasing the frequency of hand washing, and avoiding large crowds (Canada 2020). We use high-quality nationally representative data to expand our understanding of adherence to these four critical precautionary behaviours. We assess overall adherence, as well as changes in adherence, from June to July 2020; we also provide a comprehensive portrait of adherence by identifying disparities across key demographic and socio-economic population segments. The findings substantially extend prior work by providing more up-to-date aggregate estimates, assess changes over the summer months, and identify population groups with the lowest adherence rates.

Overall adherence rates differ across the four precautionary behaviours, as do changes in adherence over time. The highest adherence by far is for hand washing: more than 92 percent of Canadians reported washing their hands more frequently in both surveys. However, the nearly universal compliance may be overreported. Borchgrevink, Cha, and Kim (2013) found that people typically do not wash their hands as frequently as they report. The survey question is also non-specific, because it does not clarify whether the increase is overall or only after certain activities, and it captures the increase since before the pandemic rather than the absolute level of hand washing. Adherence to both social distancing and avoiding crowds was also relatively high, more than 82 percent in June, which increased significantly to about 89 percent by July. Because these are fairly similar behaviours, the comparable rates of adherence during both surveys serves as a validity check for these items. Our finding on adherence to social distancing also resembles Statistic Canada’s report from the earlier stages of the pandemic that showed an approximately 87 percent compliance rate (Ramage-Morin and Polsky 2020).

In comparison, mask wearing was considerably lower: only 67 percent of Canadians reported that they “wear a mask in public places where physical distancing is difficult” in June 2020 (Series 3). This percentage, however, increases dramatically by July (Series 4), when nearly 84 percent of Canadian adults reported that they “wear a mask to reduce the risk of exposure to COVID-19,” narrowing the gap with other precautionary behaviours. Some of that difference may be due to the slight change in the wording of the question, but we believe most of the 16-percentage-point increase is valid for two reasons. First, the June estimate (67 percent) fits closely with the findings from a large longitudinal study that describes a steady increase in mask wearing from 10 percent in March to just more than 60 percent in late May 2020 (Mohammed et al. 2020). Second, the sharp increase by late July may reflect mask-wearing mandates implemented by various provincial governments during that month (Karaivanov et al. 2020). Although the increasing adherence is a positive finding, it is important to note that the Canadian rates remained well below the proportions found in Singapore or the Philippines, where more than 90 percent of adults reported wearing a mask (CFR 2020). Thus, the comparatively lower rate of mask adoption in Canada at that time may have been problematic, given how critical this behaviour is to reducing transmission of the virus (Brankston et al. 2020; Leffler et al. 2020) and lowering mortality rates (WHO 2020).

The use of precautionary behaviours also differs across population groups, although not necessarily in the same way across all behaviours and the two time points. We therefore summarize the general patterns. The most consistent result pertained to gender: in each survey series, for all four behaviours and regardless of included covariates, women report a significantly greater likelihood of adhering to the precautions. This finding corroborates published studies that repeatedly demonstrate women’s greater adherence to public health recommendations (e.g., Brankston et al. 2020). Disparities across age and immigrant status also generally corroborate previous research (e.g., Clark et al. 2020): adults aged older than 65 years and immigrants tend to demonstrate greater adherence to some or most behaviours than younger and Canadian-born adults. In addition, we found that rural resident Canadians are much less likely to wear masks than their urban resident counterparts. This corroborates similar rural–urban discrepancies in the United States (Haischer et al. 2020) and in Canada (Brankston et al. 2020).

Although our gender, age, immigrant, and rural–urban differentials largely corroborate previous findings, we also found additional important disparities. Education is a strong determinant of adherence to all behaviours. Although higher educational attainment is associated with better health behaviours in general (Cutler and Lleras-Muney 2010), our findings add two important details. Compared with adults with a high school education or less, only adults with at least a university degree
consistently demonstrate statically higher adherence to precautionary behaviours, although adults with a college degree also exhibited somewhat higher adherence. This finding is consistent with a recent study that found adults with lower levels of education to be significantly more likely to engage in negative health behaviours, such as smoking, during the COVID-19 pandemic (Zajacova et al. 2020). An unexpected finding pertains to adults with a trade certificate. This group, despite their greater schooling, have significantly lower adherence to most precautions, and especially mask wearing, than adults with high school or less. Perhaps adults in this group disproportionately work outside and at a distance from others such that precautions, especially wearing masks, may be viewed as unnecessary. Finally, available measures of socio-economic status, including employment status and type of dwelling, do not have consistent relationships with adherence to the four precautions.

Our findings have several limitations. Questions on precautionary behaviours differed somewhat between Series 3 ("Which of the following precautions will you take or continue to take as the COVID-19 safety measures are relaxed?") and Series 4 ("Which of the following precautions have you taken to reduce your risk of exposure to COVID-19?"). The different phrasing might have affected the respondents’ reports. Some, for instance, may have worn a mask to reduce their risk but have been less willing to continue mask wearing when safety measures were relaxed. Moreover, the data come from two cross-sectional surveys that do not permit us to examine how the use of precautions may have evolved within individuals, as a panel design might have. However, the two surveys are statistically identical with respect to the distribution of demographic and stable socio-economic characteristics, suggesting that the cross-sectional comparisons are not biased by systematically different samples. Finally, the data lack important demographic characteristics (e.g., race–ethnicity and province) and additional measures of socio-economic status (e.g., income and occupation). These characteristics may be related to adherence to precautionary behaviours. Information about province in particular would be critical to link changes in behaviours to province-specific public health messaging and regulations. We therefore urge the addition of these variables in future waves of the CPSS.

**Conclusion**

Despite these limitations, our findings are useful to researchers and policy-makers. We describe the relatively high adoption rates for most precautionary behaviours during June 2020; however, the use of face masks, at 67 percent reported adherence, lagged far below other precautions. By July 2020, Canadians had substantially increased their adherence to the recommended precautions, particularly among those groups that lagged the most during the first survey (Series 3). Although mask-wearing adherence increased dramatically by more than 16 percentage points to 84 percent, it remained lower than the other precautions. Our analysis of socio-demographic discrepancies identified groups with particularly low adherence, especially to mask wearing: men, rural residents, adults with lower education, and those with trade certificates. These findings should inform policy initiatives and targeted public health interventions.

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