Observed Face Mask Use Outside Retail Chain Stores during the COVID-19 pandemic in Two Cities in the State of Idaho, USA

Megan E. Cahill, PhD, MPhil[1,2], **Sujeith Barraza Lozoya, MPH, CHES**[1,3], **Michelle A. Griffin, EdD, MHA**[1], **Anna Blackstock, PhD**[4], **Kayden Stockdale**[5], **Savannah Cowman**[6], **Robert Graff, PhD**[1], **Caile Spear, PhD, MCHES**[6], **Kris Carter, DVM, MPVM, DACVPM**[1,7]

[1]Division of Public Health, Idaho Department of Health Welfare, Boise, Idaho, USA

[2]Epidemic Intelligence Service, Division of Scientific Education and Professional Development, Centers for Disease Control and Prevention, Atlanta, Georgia, USA

[3]Public Health Associate Program, Centers for Disease Control and Prevention, Atlanta, Georgia, USA

[4]Epidemiology Workforce Branch, Centers for Disease Control and Prevention, Atlanta, Georgia, USA

[5]College of Idaho, Caldwell, Idaho, USA

[6]Boise State University, Boise, Idaho, USA

[7]Center for Preparedness and Response, Centers for Disease Control and Prevention, Atlanta, Georgia, USA

Abstract

During the COVID-19 pandemic, public health authorities have encouraged the use of face masks to minimize transmission within the community. To assess mask wear during a COVID-19 surge and guide public health response efforts, including public messaging on mask recommendations, we compared observed mask use in the largest city in each of Idaho's 2 most populous counties without a current mask mandate. We recorded mask usage by every third person exiting stores of 5 retail chains in Boise and Nampa during November 8–December 5, 2021. Observations were conducted during three time periods (morning, afternoon, and evening) on weekday and weekend days. A multivariable model with city, retail chain, and city-chain interaction was used to assess mask wear differences by city for each chain. Of 3021 observed persons, 22.0% wore masks. In Boise, 31.3% (430/1376) of observed persons wore masks; in Nampa, 14.3% (236/1645) wore masks. Among all persons wearing masks, >94% wore masks correctly; cloth and surgical masks were most common. By retail chain, observed individuals at Boise locations were 2.3–5.7 times as likely to wear masks than persons at respective Nampa locations. This study provided a rapid, nonconfrontational assessment of public use of mitigation measures in 2 Idaho cities during a COVID-19 surge.

Corresponding author: Megan Cahill. Megan.Cahill@dhw.idaho.gov; rjz4@cdc.gov. *Phone*: (208) 334-5959.

Keywords

COVID-19; face masks; coronavirus; observational study; public health practice

Introduction

The use of face masks among the public has been a recommended mitigation measure during the COVID-19 pandemic [1]. A May 2022 study, using data from 92 regions on 6 continents, determined community mask wear reduced SARS-CoV-2 transmission [2]. Most studies estimating mask wear relied on a survey design [3–5], which is subject to response bias, including social desirability bias [6, 7]. The observational study design allows for direct, impartial, and rapid assessment of easily observed behaviors like mask wear in public areas, but few observational studies have measured adherence to mask wear recommendations in communities. Of 2 published observational studies, persons observed wearing masks ranged widely: 67.7% in Portland, Oregon, (during June–August 2020) and 41.2% in Wisconsin (May–June 2020) [8, 9].

Ada and Canyon Counties, Idaho's 2 most populous counties, are similar in many measures, including percentages of population 65 years (14.9% Ada, 14.0% Canyon), female (49.9%, 50.4%), and White (91.9%, 93.2%) [10–12]. These neighboring counties are designated urban, with population densities one order of magnitude larger than the state average (Ada: 470 individuals per square mile, Canyon: 393, Idaho: 22) [10–12]. As of April 12, 2022, the percentage of the population that is fully vaccinated is lower in both Ada (53%) and Canyon (41%) counties than the percentage nationwide (65.8%) [13, 14]. These counties differ by overall political affiliation (43% of voters are registered with the Republican party in Ada County; 55.9% Canyon County) [15] and by percentage of residents aged >25 years with at least a bachelor's degree (40.7% Ada County; 20.7% Canyon County) [11, 12]. Neither county had a mask mandate during our study, although Boise (Ada County's largest city) previously had a mandate from August 2020 through May 2021 [16, 17].

Under the direction of Idaho public health leadership, we observed mask usage to assess contemporary mask wear during the COVID-19 surge driven by the Delta variant in Fall 2021. Both Ada and Canyon counties were experiencing high community transmission, with 7-day average of >50 cases/100,000 people during the entire study period [18]. During this period, CDC recommended everyone, regardless of vaccination status, wear a mask in indoor public settings in communities with high transmission [19]. As the number of patients with COVID-19 overwhelmed hospitals, Idaho public health encouraged residents to get vaccinated and wear a mask [20]. We conducted observations in Boise and Nampa (Canyon County's largest city) as these are the 2 largest cities in each of Idaho's 2 most populous counties, are geographically adjacent, and have similar demographic profiles by race, sex, and proportion of population 65 years of age. We observed persons exiting different stores and public venues to measure mask wear, including where, when, and how people wore masks. We conducted this investigation to guide public health response efforts during a COVID-19 surge and while crisis standards of care were enacted for hospitals

(statewide: September 16–November 22; northern public health districts: September 6–December 20).

Methods

Data Collection

We followed the same protocol as a previous study conducted in winter 2020–2021, at Boise and Nampa locations of 5 retail chains [21, 22]. This was adapted for retail settings from a CDC protocol for recording mask wear, type, and placement in university settings [23]. One observer counted every third person appearing >2 years of age exiting a store. Observers recorded whether the person was wearing a mask and, if so, the mask type and placement. Observers attended a training session on observation procedures, mask types, and correct mask wear to ensure optimal accordance among observers. Mask type categories were cloth, N95-type masks (e.g., N95 and KN95), bandana, surgical, neck gaiter, or unknown. Mask placement was recorded as correct if it covered the person's mouth and nose. If a person removed a mask upon exiting a store, the person was recorded as wearing a mask. No further details on observed persons were recorded and observers did not interact with observed persons. This study underwent human subjects review by the Idaho Division of Public Health Research Determination Committee and was determined to be public health practice and not human subjects research. This activity was reviewed by Centers for Disease Control and Prevention (CDC) and was conducted consistent with applicable federal law and CDC policy.§

We scheduled 90 observational periods during November 8–December 5, 2021, with 49 on weekend days and 41 on weekdays. Periods were divided into 30 morning (8–10 AM), 34 afternoon (noon–2 PM), and 26 evening (4–6 PM) sessions. Periods ended when either 40 persons had been observed or 1 hour had passed, whichever came first. Periods were scheduled to ensure each store was observed at least once per time of day (morning, afternoon, and evening) on both a weekday and a weekend day. We conducted observations at Boise and Nampa stores of 5 retail chain companies: 2 grocery, 1 farm supply, 1 home improvement, and 1 gas station convenience stores (Store A, B, C, D, E, respectively) (Figure 1). We conducted observations at the same stores and during the same time periods as a study conducted a year prior in Idaho. The selected grocery stores are Idaho's 2 most visited non-membership grocery store chains and the gas station convenience chain with the most transactions in Idaho [24, 25]. A home improvement chain was chosen because of the rise in home improvement projects during the pandemic.[26] An Idaho-based farm supply chain was selected because of the state's rural nature. Comparable stores in both cities for each chain were identified using general size, neighborhood type, and facility conditions or newness (Graff, unpublished data, 2021).

Data Analysis

Descriptive summaries are presented for mask use, type, and fit by retail chain, city, and time, and for mask use by store and city. To compare mask use (for all fits and types)

§45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C.0 Sect.552a; 44 U.S.C. Sect. 3501 et seq.

among individuals in the 2 cities for each retail chain, a log binomial model with city, retail chain, and city and chain interaction was used; we controlled for day of week (weekend or weekday), time of day, and interaction between day and time. Analyses were performed using RStudio (R version 4.1.2) [27–29].

Results

Overall Mask Use

A total of 3021 persons were observed during the 90 observation periods. The mean number of persons observed per period was 31 (range: 7–40) in Boise and 35 (11–40) in Nampa (Table 1). The proportion of observed persons wearing a mask was 31.3% (430 of 1376) in Boise and 14.4% (236 of 1645) in Nampa. Observed mask wear was higher at all stores in Boise than in Nampa.

Among all observation periods conducted in both cities, observed mask use was highest at the grocery stores (Store A, 25.4%; Store B, 31.6%) and home improvement store (Store D, 25.6%) and lowest at the gas station and convenience store (Store E, 6.8%) (Table 2). Mask use was comparable by day of the week in Boise (29.3% of persons wore masks on weekdays; 32.7% weekends; $P = 0.18$), but in Nampa, mask use was lower on weekends (17.65% weekdays; 11.5% weekends; $P = 0.0004$).

Summary of Observed Mask Type

The 2 most common types of masks were cloth (50.5% of observed masked persons in Boise; 46.2% in Nampa) and surgical (44.4% in Boise; 49.6% in Nampa). Fewer than 6% of persons in both cities were observed wearing bandanas, neck gaiters, or N95-type masks. Cloth masks were the most observed type at all stores except the home improvement (Store D), where most persons wore surgical masks (Table 2). The most common types of mask worn varied by weekend or weekday and time of day (Table 3).

Overall Mask Placement

Among 659 persons wearing masks where placement could be determined, the majority wore masks correctly: 94.3% (399/423; excludes 7 with unknown placement) in Boise and 95.3% (225/236) in Nampa. At each store, >92% were observed wearing the masks correctly (Store A, 92.8%; B, 96.8%; C, 95.2%; D, 94.1%; E, 93.6%). Correct mask placement varied by time of day (Table 3).

Multivariable Log-Linked Binomial Analysis

In the multivariable model comparing mask wear in Boise and Nampa for each retail chain while controlling for combination of day of week and time of day, we found persons at gas station and convenience Store E in Boise were approximately 6 times (relative risk [RR] 5.71; 95% confidence interval [CI]: 2.23–14.60) as likely to wear masks as persons at Store E in Nampa. For grocery Store A, Boise shoppers were 1.4 times (RR 1.43; 95% CI: 1.12–1.83) more likely to wear a mask than Nampa shoppers. For farm supply Store C, Boise shoppers were 3.5 times (95% CI: 2.11–5.74) as likely to wear masks than Nampa shoppers. For grocery store B and home improvement Store D, Boise shoppers were more

than twice (Store B: RR 2.33, 95% CI: 1.80–3.00; Store D: RR 2.29, 95% CI: 1.73–3.02) as likely to wear a mask than Nampa shoppers.

Discussion

Of >3000 persons directly observed exiting 5 retail chain stores in Idaho's 2 largest cities during November 8–December 5, 2021, only 22.0% of individuals wore a mask. Although both cities were experiencing a surge in COVID-19 cases and neither city had a mask mandate, percentage of mask wear among observed individuals was more than double at Boise store locations (31.3%) than Nampa locations (14.3%). The percentage of persons wearing masks in both cities during our study were lower than percentages observed in similar studies conducted in Portland, Oregon, and Toronto, Canada, (93.5% at locations with mandates; observed during June–August 2020) and Wisconsin (41.2% at locations without mandates; May–June 2020), with differences in adherence to recommended COVID-19 mitigation efforts likely indicating behavioral shifts during different pandemic phases [8, 9, 30]. Boise previously had a mask mandate in effect that ended in May 2021, and the possibility exists that lingering effects of the mandate influenced mask use. However, a study conducted at community locations in Tennessee (observations during February–April 2021) found no statistically significant difference in mask use between the period when a county-wide mandate was in effect compared to immediately after the mandate was lifted [31].

During the equivalent study conducted December 2020 through February 2021 when Boise's mandate was in effect, >93% of Boise patrons were observed wearing masks at 5 stores, whereas the range of patrons wearing masks at Nampa stores was 49.6%–79.6% by store [16, 17, 21, 22]. In our study conducted during November–December 2021, neither city had a mask mandate and the percentage of persons wearing masks was lower in all stores in both cities, compared to the study conducted the previous winter (Figure 2). The largest decrease in mask wear was among persons observed at Store E in Boise (previous study: 96.9%; our study: 12.0%). On average, observed mask use decreased by 67.1 percentage points at Boise store locations and 54.9 points at Nampa locations. An observational study conducted outside grocery stores in Wisconsin in 2020 reported similar effects of mandates on face coverings: mask wear was initially 41% in mandate's absence but increased to 93% with store mandates and then to 96% after a statewide mandate [32]. In Idaho, cloth masks were less common (Boise: 50.5%; Nampa: 46.2%) during November–December 2021 than during December 2020–February 2021 (Boise: 56.7%; Nampa: 54.7%) (Graff, unpublished data, 2021), possibly reflecting wider availability of surgical masks and the shift towards encouraging surgical masks over cloth mask.

Mask use is supported by CDC and World Health Organization and remains one of the most cost-effective COVID-19 mitigation measures available [33, 34]. During this study period, both Ada and Canyon counties were classified as high transmission areas, and federal and state public health recommended all persons wear masks indoors in high transmission areas. Without mandates, alternative measures to increase uptake to public health recommendations should be considered where possible and might have been helpful in both cities, and likely statewide, during this study. Personalization of masks has been

shown to increase mask wear, as has distribution of free masks and frequent reminders by community leaders and event organizers [35, 36]. One study reported emphasizing how masks protect other community members led to an increase in mask wear among surveyed Americans, whereas no increase was reported in mask wear when emphasizing how masks protect the wearer [37]. In other studies, researchers found messages focused on empathy, especially toward community members most at risk for severe disease, were successful in increasing participants' motivation to undertake COVID-19 preventive measures [38, 39].

Across all stores, mask wear was lower on weekend days, compared with weekdays in Nampa. Proportion of persons wearing masks was higher in certain locations during the morning. Persons who are older or have conditions that might put them at higher risk for severe COVID-19 outcomes might shop at times that are less crowded [40]. Earlier in the pandemic, many stores offered reserved shopping hours for persons at higher risk; no store locations were advertising reserved hours, but a residual effect is possible. Increased work flexibility resulting from pandemic policies might have enabled more persons to shop during traditionally less crowded hours [41]. Certain stores, such as farm supply Store C, have senior discount days or hours, which might also affect shopping behavior. Published studies have shown higher mask wear among vaccinated persons compared with unvaccinated persons [42], and among registered Democrats compared to registered Republicans [43, 44]. Higher education levels, female gender, and older age are all associated with mask use [45]. Vaccination rates and the percentage of voters registered as Democrat were higher in Ada County than Canyon County, the percentage of residents with at least a bachelor's degree is higher in Ada than Canyon County, and the average of median age is slightly higher in Boise than Nampa (37.2 years vs. 34.5 years) [11, 12]. These factors might explain some of the difference in observed mask wear between the 2 cities.

Observational studies are a rapid, nonconfrontational way to evaluate use of mitigation measures among the public, but are limited to the locations and times assessed. We captured a sample of shoppers in the community by selecting a range of retail chain companies; demographic information was not ascertained and ability to assess representativeness was not possible. One limitation of our study is not knowing why people chose to wear a mask or not because we did not conduct interviews. Possible reasons for not wearing a mask include believing protection from a mask was not needed after COVID-19 vaccination, doubting mask effectiveness, forgetting a mask, or believing the pandemic to be exaggerated [46–48]. Observations varied by chain, with the number of individuals observed lowest at the gas station convenience store in both cities; only 5 individuals were observed wearing masks at the Nampa location, leading to a large CI and less precise RR estimate. The other store types had more shoppers, which allowed us to collect more data and provided more insight into mask wear in the community. Another limitation was observers might have been unable to distinguish between mask types or determine correct placement from a distance. Unclear observations were recorded as 'unknown', but misclassification is possible. To minimize effects of reduced visibility after sunset and to ensure observer safety, sessions ended by 6 PM; we did not observe those shopping from 6 PM–8 AM, a period which may include shift workers.

Another limitation is mask-wearing behavior might have shifted during the month-long study. The Delta surge peaked on September 16, 2021, and reported cases were declining during the study period, which ended before Omicron was identified in Idaho [49]. Persons who wore masks during the peak might have stopped doing so as reported cases decreased, despite the counties continuing to experience high transmission. Decreasing community cases could lower an individual's perceived risk for contracting COVID-19, therefore mask use might be less prevalent [50]. Pandemic fatigue can lead to complacency and a disregard to mitigation measures, including mask wear [51, 52].

Community-level data collected through observational studies can inform public health officials and guide future studies [53, 54]. Studies that observe public health-related behaviors at retail locations also might provide unique opportunities for future messaging strategies. For example, locations with a small percentage of persons observed wearing masks might be selected as locations for promoting alternative mitigation measures, such as pop-up vaccination or testing sites. This would be based on further studies that included collection of shopper demographics, values, and motivations. Research supports multipronged approaches for increasing community vaccination, and mobile sites at places persons are already visiting would decrease cost and physical barriers and increase vaccination opportunity [55]. None of the store locations had mask requirements in place at the time of our study, but efforts to work with stores to encourage mask wear or to host vaccination clinics might be beneficial, especially in areas with low vaccination rates [56]. Future work could build on observation studies such as ours to leverage marketing products such as demographic profiles created by retail chain companies, or the use of innovative marketing techniques, to identify store locations with customer demographics that might be at higher risk for severe outcomes and reach those customers with tailored messaging.

Conclusions

Despite both cities experiencing a COVID-19 surge, only 22.0% of >3000 persons were observed wearing a mask after exiting retail stores. Proportion of persons wearing masks was higher at all Boise locations, compared with Nampa locations, possibly indicating residual effects of Boise's earlier mask mandate or sociodemographic differences such as age, education, or political affiliation between the 2 cities. Vaccination rates are low in both counties, but lower in Canyon County, perhaps indicating the need for broader promotion of mitigation efforts. Among people wearing masks, >94% wore masks correctly in each city. Variations in mask wear by weekend vs weekday and time of day indicate observational studies should include a variety of observational periods. Interviews with observed persons or recording of identifiers would be needed in future studies to learn more about shopping behaviors and mask wear.

Public health should consider benefits of developing an infrastructure that can be used to rapidly conduct similar observation studies statewide in future extended outbreaks or pandemics. Data collected might be helpful for allocating resources or focusing communications. Protocols for conducting observations could readily be adapted for other behaviors. A statewide collaboration with colleges and universities, such as training select faculty to train and deploy teams of student observers under the direction of public health,

could be a viable option. Periodic refresher trainings could be conducted, in much the same way as preparedness exercises, so that observation studies could be quickly initiated when the need arises.

References

1. Use masks to slow the spread of Covid-19. Centers for Disease Control and Prevention. Accessed August 12, 2021. https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/masks.html.

2. Leech G, Rogers-Smith C, Monrad JT, Sandbrink JB, Snodin B, Zinkov R, et al. Mask wearing in community settings reduces SARS-CoV-2 transmission. Proceedings of the National Academy of Sciences. 2022;119(23):e2119266119.

3. Kramer S. More Americans say they are regularly wearing masks in stores and other businesses. Accessed February 3, 2022. https://www.pewresearch.org/fact-tank/2020/08/27/more-americans-say-they-are-regularly-wearing-masks-in-stores-and-other-businesses/.

4. Crabtree S. Mask use far less common at private gatherings than in public. Gallup. Accessed January 30, 2022. https://news.gallup.com/poll/327533/mask-far-less-common-private-gatherings-public.aspx.

5. Understanding America study. University of Southern California Dornsife Center for Economic and Social Research. 2020. Accessed June 30, 2021. https://covid19pulse.usc.edu/.

6. Nederhof AJ. Methods of coping with social desirability bias: A review. European Journal of Social Psychology. 1985;15(3):263–80. doi:10.1002/ejsp.2420150303

7. Brenner PS, DeLamater J. Lies, Damned Lies, and Survey Self-Reports? Identity as a Cause of Measurement Bias. Soc Psychol Q. 2016 Dec;79(4):333–54. doi:10.1177/0190272516628298. [PubMed: 29038609]

8. Atzema CL, Mostarac I, Button D, Austin PC, Javidan AP, Wintraub L, et al. Assessing effective mask use by the public in two countries: an observational study. BMJ Open. 2021;11(12):e049389. doi:10.1136/bmjopen-2021-049389.

9. Arp NL, Nguyen TH, Linck EJG, Feeney AK, Schrope JH, Ruedinger KL, et al. Use of face coverings in public during the COVID-19 pandemic: an observational study. medRxiv. 2020:2020.06.09.20126946. doi:10.1101/2020.06.09.20126946

10. Idaho. US Census Bureau. Accessed Feburary 6, 2023. https://www.census.gov/quickfacts/ID.

11. Canyon County, Idaho. US Census Bureau. Accessed May 22, 2022. https://www.census.gov/quickfacts/fact/table/canyoncountyidaho/AGE295220.

12. Ada County, Idaho. US Census Bureau. Accessed May 22, 2022. https://www.census.gov/quickfacts/fact/table/adacountyidaho/PST045221.

13. COVID-19 Vaccine Data Dashboard. Idaho Division of Public Health. Updated April 11, 2022. Accessed April 12, 2022. https://public.tableau.com/app/profile/idaho.division.of.public.health/viz/COVID-19VaccineDataDashboard/LandingPage.

14. COVID-19 Vaccinations in the United States. Centers for Disease Control and Prevention. Updated April 11, 2022. Accessed April 12, 2022. https://covid.cdc.gov/covid-data-tracker/#vaccinations_vacc-people-onedose-pop-5yr.

15. Voter registration totals. Idaho Secretary of State. Accessed January 24, 2022. https://sos.idaho.gov/elections-division/voter-registration-totals/

16. Mayor McLean Announces New COVID-19 Public Health Order, Enforcement. November 19, 2020, 2020. Accessed May 20, 2022. https://www.cityofboise.org/news/mayor/2020/november/mayor-mclean-announces-new-covid-19-public-health-order-enforcement/

17. Mask Requirement Lifted in Boise. May 14, 2021, 2021. Accessed May 20, 2022. https://www.cityofboise.org/news/mayor/2021/may/mask-requirement-lifted-in-boise/

18. United States COVID-19 County Level of Community Transmission Historical Changes. Data.gov. Updated October 30, 2021. Accessed February 1, 2022. https://catalog.data.gov/dataset/united-states-covid-19-county-level-of-community-transmission-historical-changes.

19. COVID-19 by County. Centers for Disease Control and Prevention. Updated August 11, 2022. Accessed September 1, 2022. https://www.cdc.gov/coronavirus/2019-ncov/your-health/covid-by-county.html.

20. Idaho expands Crisis Standards of Care statewide due to surge in COVID-19 patients requiring hospitalization. Idaho Department of Health and Welfare; September 16, 2021, 2021. https://healthandwelfare.idaho.gov/news/idaho-expands-crisis-standards-care-statewide-due-surge-covid-19-patients-requiring-0.

21. Graff R, Spear C, Ordosgoitia MN, Nguyen J. (2021, June 13-17). Observing the Impact of Mask Orders on Mask Wearing Behaviors [Conference presentation abstract]. Council of State and Territorial Epidemiologists 2021 Annual Conference, Pittsburgh, PA, United States (virtual). https://www.csteconference.org/wp-content/uploads/2022/01/2021_CSTE-AC-Pocket-Agenda_FINAL-FINAL-June-7-1.pdf

22. Graff R, Spear C. (2022, March 22-25). Do COVID-19 mask mandates work? A tale of two cities [Conference presentation abstract]. Society for Public Health Education (SOPHE) Annual Conference, virtual, https://elearn.sophe.org/products/a4-covid-19-promoting-safety-and-mental-health.

23. Barrios LC RM, Green RF, et al. Observed Face Mask Use at Six Universities — United States, September–November 2020. MMWR Morb Mortal Wkly Rep 2021;70:. February 12, 2021 2021;70(6):208–211. doi:doi:10.15585/mmwr.mm7006e1. [PubMed: 33571175]

24. Goodwin S. Idahoans shop at this grocery store the most. How do prices compare to other favorites? Idaho Statesman. https://www.idahostatesman.com/news/business/article258429383.html.

25. Most popular gas stations by state for businesses. Divvy. Accessed May 27, 2022. https://getdivvy.com/blog/most-popular-gas-stations/

26. Baker K. Despite Devestating Effects on the Broader Economy, Pandemic has been a Boon for US Home Improvement. Harvard Joint Center for Housing Studies. Accessed May 20, 2022. https://www.jchs.harvard.edu/blog/despite-devastating-effects-broader-economy-pandemic-has-been-boon-us-home-improvement

27. Kuhn M WJ, Weston S, Williams A, Keefer C, et al. caret: Classification and Regression Training. R Packages. 6.0-93 ed: Comprehensive R Archive Network; 2022.

28. O'Callaghan A KM, Weston S, Wing J, Forester J, Thaler T. contrast: A Collection of Contrast Methods. R Packages. 0.24.2 ed: Comprehensive R Archive Network; 2022.

29. Wickham H AM, Brayn J, Chang W et al. Welcome to the Tidyverse. Journal of Open Source Software 2019 November 21, 2019;4(43):1686.

30. Brenan M. Pandemic Pessimism Grows Amid Omicron Surge. Gallup. Updated January 20, 2022. Accessed February 10, 2022, 2022.

31. Condra A, Coston T, Jain M, Manning S, Pettyjohn S, Wahlquist AE. Mask Adherence to Mask Mandate: College Campus Versus the Surrounding Community. Journal of Community Health. 2023 2023/01/25.

32. Haischer MH, Beilfuss R, Hart MR, Opielinski L, Wrucke D, Zirgaitis G, et al. Who is wearing a mask? Gender-, age-, and location-related differences during the COVID-19 pandemic. PLOS ONE. 2020;15(10):e0240785. [PubMed: 33057375]

33. Zafari Z, Goldman L, Kovrizhkin K, Muennig PA. The cost-effectiveness of common strategies for the prevention of transmission of SARS-CoV-2 in universities. PLOS ONE. 2021;16(9):e0257806. [PubMed: 34591874]

34. When and how to use masks. World Health Organization. Updated December 2021. Accessed January 15, 2022. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/when-and-how-to-use-masks.

35. Abaluck J KL, Styczynski A, Haque A, Kabir MA, Bates-Jefferys E, Crawford E, Benjamin-Chung J. Normalizing community mask-wearing: A cluster randomized trial in Bangladesh. National Bureau of Economic Research Working Paper Series. 2021 April 2021;28734.

36. Palcu J, Schreier M, Janiszewski C. Facial mask personalization encourages facial mask wearing in times of COVID-19. Scientific Reports. 2022 2022/01/18;12(1):891. [PubMed: 35042911]

37. Bokemper SE, Cucciniello M, Rotesi T, Pin P, Malik AA, Willebrand K, et al. Experimental evidence that changing beliefs about mask efficacy and social norms increase mask wearing for COVID-19 risk reduction: Results from the United States and Italy. PLOS ONE. 2021;16(10):e0258282. [PubMed: 34634089]

38. Morstead T, Zheng J, Sin NL, King DB, DeLongis A. Adherence to Recommended Preventive Behaviors During the COVID-19 Pandemic: The Role of Empathy and Perceived Health Threat. Ann Behav Med. 2022 Apr 2;56(4):381–92. doi:10.1093/abm/kaab107. [PubMed: 34964460]

39. Pfattheicher S, Nockur L, Böhm R, Sassenrath C, Petersen MB. The Emotional Path to Action: Empathy Promotes Physical Distancing and Wearing of Face Masks During the COVID-19 Pandemic. Psychological Science. 2020;31(11):1363–73. doi:10.1177/0956797620964422. [PubMed: 32993455]

40. Time to Shop: Consumer insights on how convenience stores deliver quick shopping experiences. 2018. November 2018. https://www.convenience.org/Research/Consumer-Insights/Time-to-Shop.

41. Changes in Grocery Shopping Habits During COVID-19. C+R Research. Updated April 16, 2020. 2022. https://www.crresearch.com/blog/coronavirus-shopping-habits/.

42. Calamari LE, Tjaden AH, Edelstein SL, et al. Self-Reported Mask Use in SARS-CoV-2 Vaccinated and Unvaccinated Populations. medRxiv. 2022:2022.04.06.22273448. doi:10.1101/2022.04.06.22273448.

43. Naeim A, Baxter-King R, Wenger N, Stanton AL, Sepucha K, Vavreck L. Effects of Age, Gender, Health Status, and Political Party on COVID-19-Related Concerns and Prevention Behaviors: Results of a Large, Longitudinal Cross-sectional Survey. JMIR Public Health Surveill. Apr 28 2021;7(4):e24277. doi:10.2196/24277. [PubMed: 33908887]

44. Sinicrope PS, Maciejko LA, Fox JM, et al. Factors associated with willingness to wear a mask to prevent the spread of COVID-19 in a Midwestern Community. Prev Med Rep. Dec 2021;24:101543. doi:10.1016/j.pmedr.2021.101543. [PubMed: 34493965]

45. Badillo-Goicoechea E, Chang T-H, Kim E, LaRocca S, Morris K, Deng X, et al. Global trends and predictors of face mask usage during the COVID-19 pandemic. BMC Public Health. 2021 2021/11/15;21(1):2099. [PubMed: 34781917]

46. Martinelli L, Kopilaš V, Vidmar M, Heavin C, Machado H, Todorovi Z, et al. Face Masks During the COVID-19 Pandemic: A Simple Protection Tool With Many Meanings, Frontiers in Public Health. 2021 2021-January-13;8. English.

47. Li H, Yuan K, Sun Y-K, Zheng Y-B, Xu Y-Y, Su S-Z, et al. Efficacy and practice of facemask use in general population: a systematic review and meta-analysis. Translational Psychiatry. 2022 2022/02/01;12(1):49. [PubMed: 35105851]

48. Taylor S, Asmundson GJG. Negative attitudes about facemasks during the COVID-19 pandemic: The dual importance of perceived ineffectiveness and psychological reactance. PLOS ONE. 2021;16(2):e0246317. [PubMed: 33596207]

49. COVID-19 Statewide Cases. Idaho Division of Public Health. Updated April 11, 2022. Accessed April 12, 2022. https://public.tableau.com/app/profile/idaho.division.of.public.health/viz/DPHIdahoCOVID-19Dashboard/Home.

50. Kassas B, Morgan SN, Lai JH, Kropp JD, Gao Z. Perception versus preference: The role of self-assessed risk measures on individual mitigation behaviors during the COVID-19 pandemic. PLOS ONE. 2021;16(8):e0254756. [PubMed: 34347778]

51. Petherick A, Goldszmidt R, Andrade EB, Furst R, Hale T, Pott A, et al. A worldwide assessment of changes in adherence to COVID-19 protective behaviours and hypothesized pandemic fatigue. Nature Human Behaviour. 2021 2021/09/01;5(9):1145–60.

52. Pandemic fatigue – reinvigorating the public to prevent COVID-19: policy framework for supporting pandemic prevention and management. 2020. https://apps.who.int/iris/handle/10665/335820.

53. Brown L. Collecting Data Through Observation. University of Washington. Updated 2020. Accessed May 27, 2022. https://faculty.washington.edu/wpratt/MEBI598/Methods/Collecting%20Data%20Through%20Observation.htm.

54. Observational Studies. Course Hero. Updated 2022. Accessed May 27, 2022. https://www.coursehero.com/study-guides/boundless-statistics/observational-studies/

55. Ways Health Departments Can Help Increase COVID-19 Vaccinations. Centers for Disease Control and Prevention. Updated June 17, 2022. Accessed August 8, 2022. https://www.cdc.gov/vaccines/covid-19/health-departments/generate-vaccinations.html.

56. Wehby WLG. Community Use Of Face Masks And COVID-19: Evidence From A Natural Experiment Of State Mandates In The US. Health Affairs. 2020;39(8):1419–1425. doi:10.1377/hlthaff.2020.00818. [PubMed: 32543923]
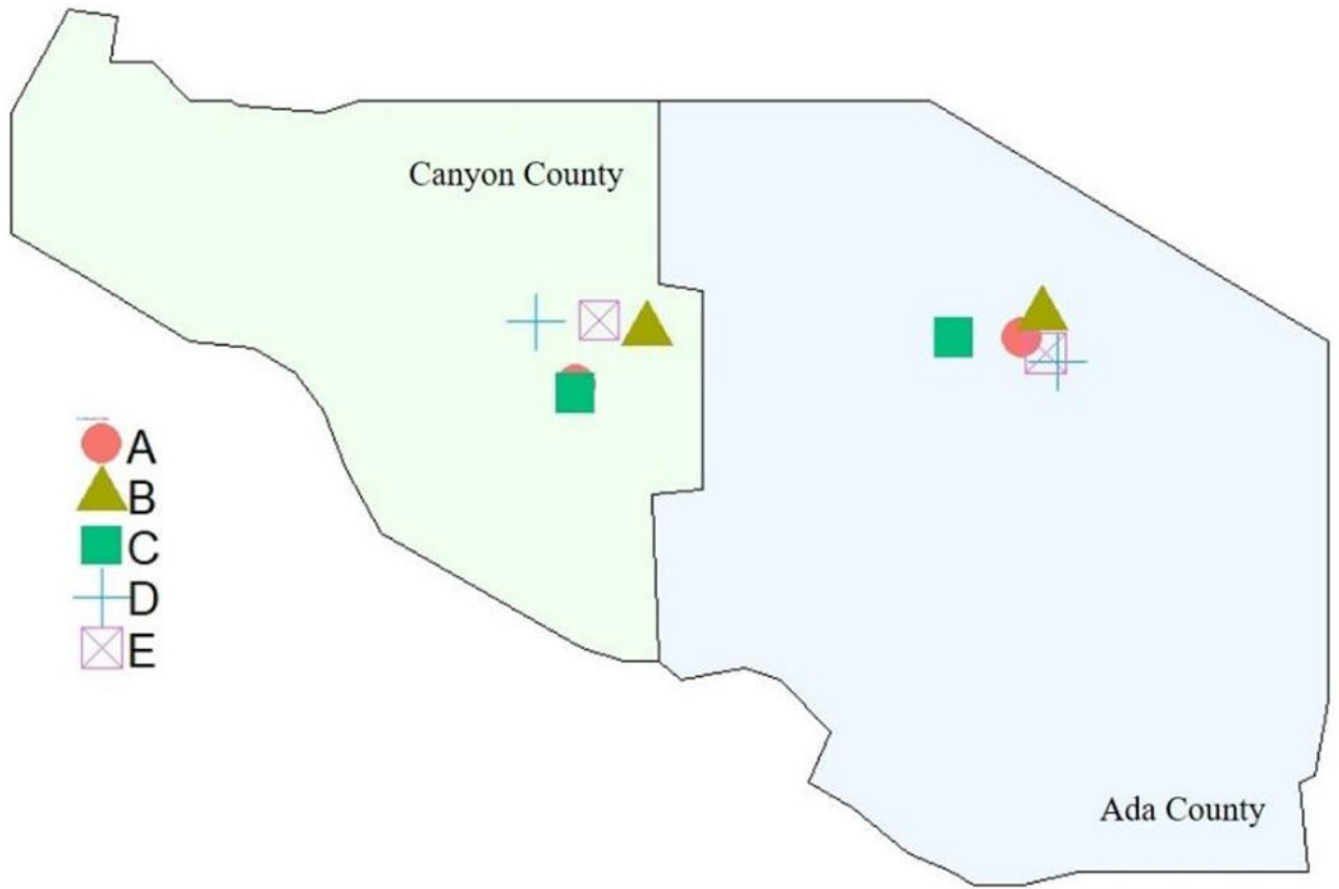
Figure 1.
Map of retail chain company* locations in Boise (Ada County) and Nampa (Canyon County), Idaho, where observations were conducted.
*The 5 retail chain companies have locations in both Boise and Nampa. Stores A and B are grocery stores, Store C is a farm supply store, Store D is a home improvement store, and Store E is a gas station and convenience store.
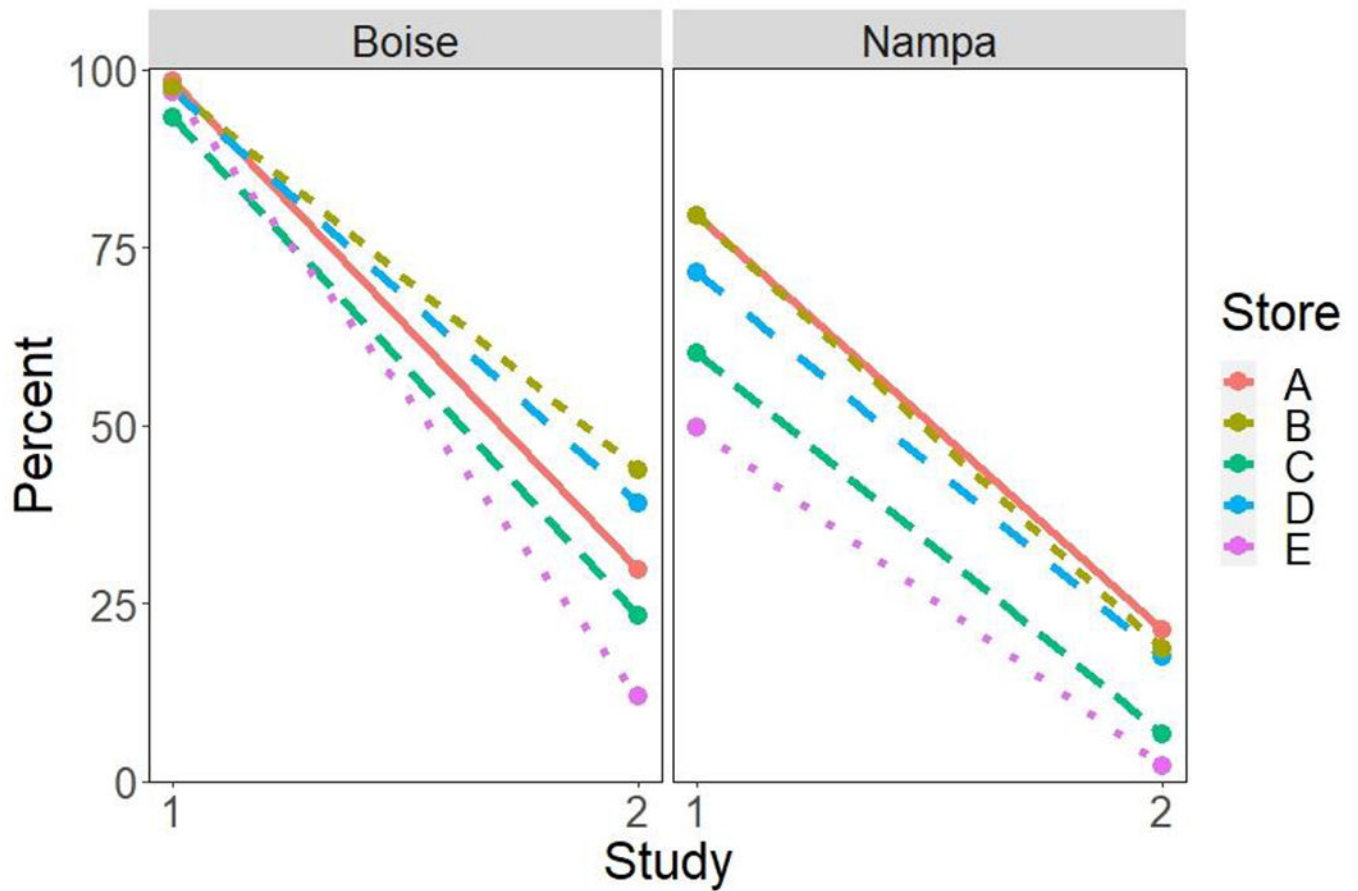
Figure 2.
Percent of mask wear among observed persons by city and store locations, in both the previous study (Study 1)* and current study (Study 2).

*We followed the same study protocol as used during a previous study conducted during December 2020–February 2021 (Graff, unpublished data, 2021). The same 5 retail chain companies in Boise and Nampa, Idaho, were used as observation locations, and observation periods scheduled for the same times and days of the week. Stores A and B are grocery stores, Store C is a farm supply store, Store D is a home improvement store, and Store E is a gas station and convenience store.

Table 1.

Number of observational periods and observed persons by store [*] and city, at the Boise and Nampa, Idaho, store locations of 5 retail chains during November 8–December 5, 2021.

	Boise			Nampa			Both Cities	
	No. of Periods	No. of Persons	Median (Range)	No. of Periods	No. of Persons	Median (Range)	No. of Periods	No. of Persons
Store A	10	386	40 (29-40)	10	396	40 (36-40)	20	782
Store B	9	360	40 (40-40)	9	333	40 (17-40)	18	693
Store C	9	185	20 (7-40)	9	305	40 (11-40)	18	490
Store D	7	228	40 (16-40)	10	373	40 (22-40)	17	601
Store E	9	217	21 (17-40)	8	238	30 (19-40)	17	455
Total	44	1,376	40 (7-40)	46	1,645	40 (11-40)	90	3,021

[*] The 5 retail chain companies have locations in both Boise and Nampa. Stores A and B are grocery stores, Store C is a farm supply store, Store D is a home improvement store, and Store E is a gas station and convenience store.

Table 2.

Persons observed wearing a mask and mask types worn by store[*] and city, at the Boise and Nampa, Idaho, store locations of 5 retail chains during November 8–December 5, 2021

| Store | City | Observed Mask Wear | | | Mask type counts | | | | |
| | | Number (%) | | | Number (%) | | | | |
		Total Persons observed	Persons wearing a mask	Relative risk (95% CI)	Cloth	Surgical	N95-type	Neck Gaiter	Bandana
A	Boise	386	115 (29.8)	1.43 (1.12–1.83)	64 (55.7)	48 (41.7)	2 (1.7)	1 (0.9)	0
	Nampa	396	84 (21.2)		37 (44.0)	44 (52.4)	3 (3.6)	0	0
B	Boise	360	157 (43.6)	2.33 (1.80–3.00)	75 (47.8)	72 (45.9)	6 (3.8)	4 (2.5)	0
	Nampa	333	62 (18.6)		42 (67.7)	17 (27.4)	2 (3.2)	1 (1.6)	0
C	Boise	185	43 (23.2)	3.48 (2.11–5.74)	24 (55.8)	17 (39.5)	2 (4.7)	0	0
	Nampa	305	20 (6.6)		8 (40.0)	10 (50.0)	0	1 (5.0)	1 (5.0)
D	Boise	228	89 (39.0)	2.29 (1.73–3.02)	38 (42.7)	47 (52.8)	3 (3.4)	1 (1.1)	0
	Nampa	373	65 (17.4)		20 (30.8)	44 (67.7)	0	1 (1.5)	0
E	Boise	217	26 (12.0)	5.71 (2.23–14.60)	16 (61.5)	7 (26.9)	0	2 (7.7)	1 (3.8)
	Nampa	238	5 (2.1)		2 (40.0)	2 (40.0)	0	0	1 (20.0)

[*] The 5 retail chain companies have locations in both Boise and Nampa. Stores A and B are grocery stores, Store C is a farm supply store, Store D is a home improvement store, and Store E is a gas station and convenience store.

Table 3.

Type of mask use * and correct mask placement observed during morning^a, afternoon^b, and evening^c periods by city

Period		Boise Number (%)	Nampa Number (%)
		City	
Morning	Mask type	126 (100)	70 (100)
	Surgical	**61 (48.4)**	29 (41.4)
	Cloth	57 (45.2)	**39 (55.7)**
	N95-type	4 (3.2)	1 (1.4)
	Neck Gaiter	4 (3.2)	1 (1.4)
	Bandana	0 (0)	0 (0)
	Correct use	112** (89.6)	67 (95.7)
Afternoon	Mask type	167 (100)	97 (100)
	Surgical	64 (38.3)	**49 (50.5)**
	Cloth	**93 (55.7)**	43 (44.3)
	N95-type	6 (3.6)	3 (3.1)
	Neck Gaiter	3 (1.8)	1 (1.0)
	Bandana	1 (0.6)	1 (1.0)
	Correct use	156** (96.3)	94 (96.9)
Evening	Mask type	137 (100)	69 (100)
	Surgical	66 (48.2)	**39 (56.5)**
	Cloth	**67 (48.9)**	27 (39.1)
	N95-type	3 (2.2)	1 (1.4)
	Neck Gaiter	1 (0.7)	1 (1.4)
	Bandana	0 (0)	1 (1.4)
	Correct use	131** (96.3)	64 (92.8)

* The most common mask(s) in each period by city is bolded

^{a} 8–10 AM

^{b} noon–2 PM

^{c} 4–6 PM

** Correct placement could not be assessed for seven observed persons wearing masks (Boise, morning 1 surgical; afternoon: 4 cloth, 1 surgical; evening: 1 cloth)