JOURNAL OF
EMERGING INVESTIGATORS

Article

High school students show some reluctance to COVID-19 guidelines

M. Abdul Basit Abid[1], Mariam Abu-Rahma[2], Enas A. Mahmoud[3], Nirmeen A. Sabry[3]

[1] The City School, Punjab, Pakistan

[2] Homestead High School, Santa Clara County, California, USA

[3] Faculty of Pharmacy, Cairo University, Egypt

SUMMARY

With the emergence of coronavirus disease 2019 (COVID-19), the general population followed the COVID-19 guidelines to safeguard themselves against the virus. Over time, even after COVID-19 has been officially downgraded from the status of a health emergency, people still followed the COVID-19 guidelines to some extent. However, are they keeping themselves ready and looking for cues to protect themselves from the next pandemic? In this research we hypothesized that high school students are still following the COVID-19 guidelines even after COVID-19 is no longer a public health emergency regardless of their gender or geographic location. We surveyed high school students in Punjab, Pakistan, and Santa Clara County, California, USA. The survey results showed that the students had adequate knowledge of how COVID-19 spread and the protection measures against the virus. More males than females considered getting COVID not a significant health concern. We reported that 40.7–55.9% of the students had reverted to their pre-pandemic hand hygiene practice and that there was resistance to wear masks even in cases where there was contact with sick people. The percentage of students who mentioned that they don't wear masks anymore was 28.1–36.1%. The survey showed that 30.6% of the Punjab students are using less alcohol based sanitizers now than their use before the start of the COVID-19 emergency but that percentage was only 8.5% in the US survey. We observed that a notable number of students were suffering from pandemic fatigue and, thus, had stopped following COVID-19 protection measures or built their own beliefs on how to deal with the pandemic. These findings suggest that we will face a resistance in following protection measures if we face a new pandemic or even another serious wave of this pandemic.

INTRODUCTION

Coronavirus disease 2019 (COVID-19) originated in Wuhan, China in December of 2019, and then rapidly spread to other countries (1). On January 30th, 2020, the World Health Organization (WHO) declared the virus outbreak a global health emergency (2). To decrease the spreading of the airborne virus, the WHO released guidelines so that the common public could effectively protect themselves from the virus (3). These guidelines included a) hand sanitizing with an alcohol-based hand sanitizer frequently, b) washing hands multiple times throughout the day, c) using masks, and d) maintaining physical distancing. These guidelines caused an increase in the usage of hand sanitizers, soap, and masks during the pandemic as the public was following these guidelines religiously to protect themselves against the virus (4, 5).

High school students may show different adherence behavior to COVID-19 guidance compared to other age categories due to peer influence, sense of responsibility and how important they consider their social life. We made the objective of our research to investigate if the COVID-19 guidelines issued by the WHO became embedded into high school students' daily lives despite COVID-19 no longer being a global health emergency (6). We hypothesized that high school students are following the COVID-19 safety measures and know COVID-19 spreading methods regardless of their gender or geographic location. We conducted our survey in two different regions of the world, Punjab, Pakistan and Santa Clara County, California, USA. We asked questions to learn about the basic knowledge of the high school students on COVID-19 transmission methods and protection measures, as well as their behaviors in response to COVID-19. Specifically, we asked the students if they considered COVID-19 to be a health concern during the emergency lockdown and now. We analyzed the data based on region, gender, and student allowance. We saw gender differences in COVID-19 danger perception and that the use of a face mask was the most unfollowed COVID-19 protection measure. The results showed that students started relaxing on following the COVID-19 guidance even in cases where they were in contact with a sick person. This behavior may indicate a resistance to follow any future lockdown measures.

RESULTS

We conducted a survey to study if the school students in Punjab, US or both regions are triggered by dangerous cues to implement protective measurements again infection. We received 112 responses from Punjab and 62 responses from Santa Clara County (SCC), (**Table 1**). The survey started on September 7th, 2023, and ended in September 22nd, 2023. The age of students in Punjab matched a left-skewed distribution with a mode of age 17 and range 14-19 years (**Figure 1**). The mode of the SCC age distribution was 14 and the range was 13-17 years (**Figure 2**). The students fell into the different allowance amount categories (cash received from parents; check the **Appendix** for more details). Most of the Punjab students were at private school (88.9%) as they had the privilege to access online surveys unlike public schools in Punjab. On the other hand, as students at public schools

https://doi.org/10.59720/23-295

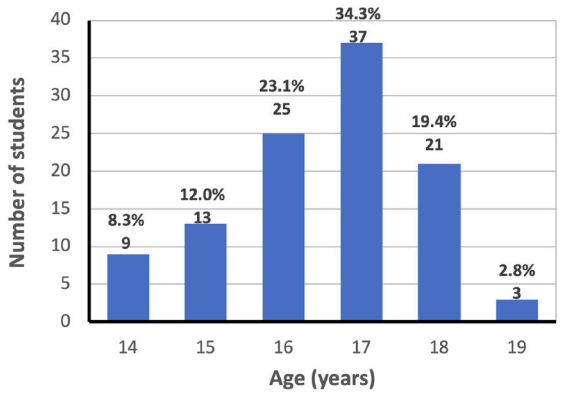


Figure 1. Punjab student age distribution. The age ranged between 14-19 years (n=108). The numbers indicate the number of students in each age category. The percentage indicated the percentage of this age category.

in SCC have access to electronic devices and represent the majority of students in the county, they represented the majority of students taking this survey (93.2%) in SCC.

The students identified themselves as males, females or did not disclose their gender (**Figure 3**). In Punjab, a higher percentage of male students compared to females did not consider getting COVID-19 to be a dangerous health concern during the emergency period (25% males vs 3.7% females, p = 0.00168) or now (69.2% vs 40.7%, p = 0.00318). That trend was the same for SCC where a greater percent of males than females did not consider getting COVID-19 as a dangerous health concern during the emergency period (60.9% vs 37.1%, p = 0.07672) and now (95.7% vs 71.4%, p = 0.02144) (**Figure 4**).

The students had a good knowledge of how COVID-19 can spread but 27.1% of SCC surveyee didn't select touching contaminated surface as a source of infection whereas in Punjab, 26.9% didn't select staying for a long period in crowded areas with one or more infected person as a source of infection (**Figure 5**). The majority of respondents in Punjab and SSC agreed that being in close contact with an infected person was a source of infection, 92.6% and 100%,

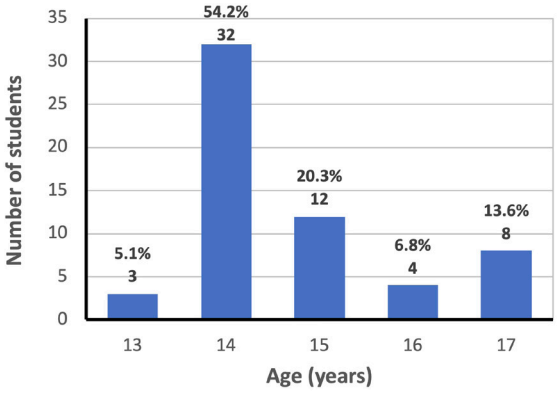


Figure 2. SCC student age distribution. The age ranges between 13-17. n=59. The numbers indicate the number of students in each age category. The percentage indicated the percentage of this age category.

Location	Surveyee who accepted to take the survey	Surveyee who were eligible to finish the survey
Punjab, Pakistan	112	108
Santa Clara Count, CA, USA	62	59

Table 1. Number of surveyee who took the survey and surveyee who were eligible to finish the survey.

respectively (**Figure 5**).

The students were asked to select COVID-19 protection measures from: 1) isolation from infected people, 2) wearing high quality masks, and 3) practicing hand hygiene (hand washing and use of alcohol-based sanitizer). Multiple selections were allowed in this question. Wearing high quality masks was the least selected. Only 81.5% and 81.4% of students from Punjab and SCC respectively selected wearing masks as a protection measure (**Figure 6**).

We included more questions in the survey to tackle which protective measure, wearing masks or practicing hand hygiene, the students best believed to be effective against COVID-19. There was more confidence in practicing hand hygiene (74.1% in Punjab and 76.3% in SCC) than wearing masks (56.5% in Punjab and 66.1% in SCC). About 36.1% of students in Punjab and 28.8% of students in SCC mentioned that they don't wear masks at all. We expected a majority to wear masks when interacting with a sick person but only 23.1% and 27.1% from Punjab and SCC respectively chose this answer (**Appendix**).

Comparison between the pandemic emergency period and the period after the emergency, the period during the survey mentioned as now in the survey, in terms of alcohol-based hand sanitizer usage or hand wash was investigated (**Appendix**). Students who reported increase in the use of alcohol-based hand sanitizer now presented 28.7% and 37.3% of the students in Punjab and SCC respectively. Meanwhile, 30.6% of Punjab and 8.5% of SSC students used less hand sanitizers. Overall, more students indicated an increase in handwashing frequency (50% and 52.5% of the students in Punjab and SCC, respectively) and time spent in each wash (41.7% and 40.7% of the students in Punjab and SCC, respectively). About half of the students mentioned that they have returned to their hand hygiene practice that they followed before the COVID-19 emergency (40.7–55.9%, **Appendix**). The students' use of liquid and bar soap showed use of both types of soaps during and after COVID-19

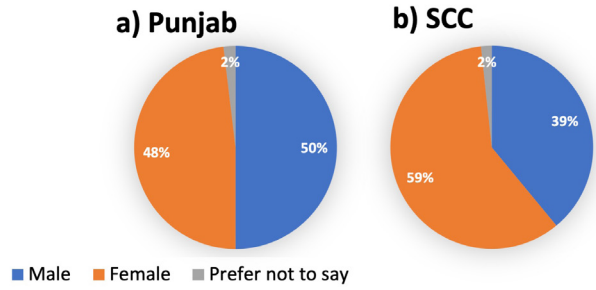


Figure 3. Gender distribution in a) Punjab students, and b) SCC students. The majority of the students identified themselves as males and females (n= 108 for Punjab and n=59 for SCC).

https://doi.org/10.59720/23-295

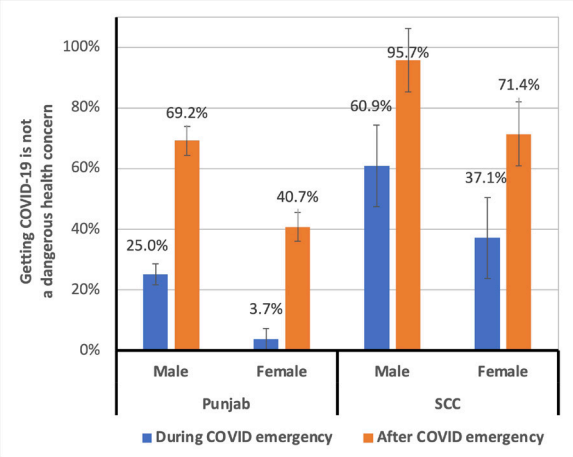


Figure 4. Effect of gender on the perception of considering COVID-19 as a dangerous health concern. The percentage indicate surveyee who answered yes on the "Getting COVID-19 is not a dangerous health concern" question ± SE. There was more confidence that COVID-19 is not dangerous within males than females and within SCC than Punjab students ($p<0.05$). n= 108 for Punjab and 59 for SCC.

emergency.

DISCUSSION

We conducted a study to investigate if the high school students in two different world regions, SCC and Punjab, are following COVID-19 protective measures. That would give us idea if they were looking for cues to escalate to a pandemic readiness state fast enough. We chose Google Forms to run the survey as the students were familiar with this platform since it was extensively used during the pandemic lockdown by the teachers. Reaching high school students and convincing them to take the survey was challenging. We focused our target areas on Punjab and Santa Clara County as they were the areas where the investigators reside, and they were able to gain the trust of the surveyee to take the survey and invest time to finish it. During the survey data collection period, the reported COVID-19 cases in SCC ranged between 57–164 per day which was low in comparison to the reported 6,815 cases per day during the peak COVID-19 period (7). We were not able to locate public data on COVID-19 reported cases in Punjab during the time we conducted the survey, but we assumed that it followed the same global trend of low rate of reported COVID-19 cases (8). Only individuals who were high school students and in the two targeted regions were directed to take the survey. Surveyee who didn't match the criteria were directed to end the survey. Most of the surveyee who took the survey completed it, which indicated that we were distributing the survey to the target population and the eligibility instruction at the beginning of the survey was clear.

There was a gender effect on COVID-19 danger perception. Males showed higher confidence that COVID-19 was and is not a health concern. This finding agrees with the data analysis showed by Metin, Ahmet, et al. (9). The lower sample size in SCC produced a higher standard error (SE) that contributed to a non-significant difference between Male and female SCC students considering COVID not dangerous during the emergency period. The higher confidence shown

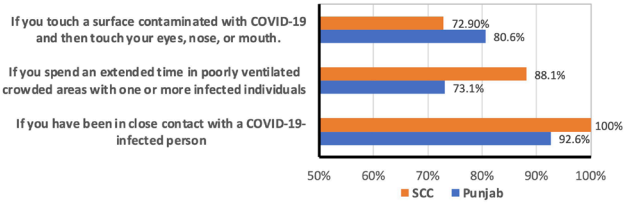


Figure 5. Agreement of the students on COVID-19 contraction methods. The percentage indicate surveyee who answered yes on the survey question on the y-axis. (n= 108 for Punjab and 59 for SCC).

in the SCC students compared to that of Punjab may be attributed to the difference in the healthcare infrastructure, which is more developed in SCC.

The allowance question was added to determine if there was a correlation between allowance and students' response on COVD-19 questions. Allowance can be considered as reflection of a mix of parenting style and social class. We didn't see a trend between allowance and perception on COVID-19 danger or perceived importance of protective measures in the Punjab Data or SCC data.

Wearing masks was not a personal habit before COVID-19 and, therefore, likely not to persist after the emergency ended as shown in the data. The decrease in use of alcohol-based hand sanitizer may be related to some students having skin sensitivity to alcohol-based hand sanitizers while some might be suffering from pandemic fatigue where the students are exhausted due to the prolonged COVID-19 pandemic period (10, 11). The Punjab students who use less alcohol-based sanitizer may rely on hand washing to sanitize their hands as 29.2% mentioned that they spend more time in each hand wash.

There was a common misperception among the public that liquid soaps were more hygienic than bar soaps, and this misconception was spread by numerous blogs and posts about better hygiene. During the COVID-19 emergency, this misconception was further emphasized. We didn't see any apparent change in soap usage in our analysis (12).

Our study had a limitation as using Google Forms didn't allow us to reach less privileged students in Punjab. It would have been useful if we included questions about access to COVID-19 protection measures, COVID-19 vaccination status, and sources used by the students to learn about COVID-19. It seems from the students' answers on basic COVID-19 transmission information that it is either that the students do

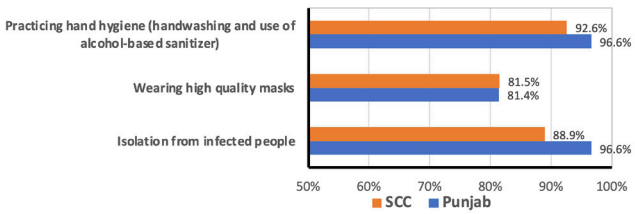


Figure 6. Agreement of the students on COVID-19 protection measures. The percentage indicate surveyee who answered yes on the survey question on the y-axis. (n= 108 for Punjab and 59 for SCC).

https://doi.org/10.59720/23-295

not have a full knowledge on this subject or that they have started to rely on their beliefs based on an experience they had. There may be pandemic fatigue showing less use of protection measures after a prolonged period of use. This may cause resistance to implement these measures if a new pandemic is announced and there may be need for additional enforcement.

MATERIALS AND METHODS

Population

Our population was high school students in Punjab, Pakistan and in Santa Clara County, California, USA.

Data Collection

The survey was drafted using Google Forms and was limited to one response per account. The survey was distributed through emails, social media platforms, and in-person interactions. The survey was anonymous, and the participants gave their consent beforehand. The inclusion criteria were being a high school student within the studied geographic regions (SCC or Punjab). The students were asked about their basic demographics such as their age and gender. There were also a few general questions related to COVID-19 to check what knowledge the surveyee had about COVID-19 and the guidelines related to it. We conducted correlation analysis to study the results of the survey. The survey distribution started on September 7th, 2023, and ended in September 22nd, 2023. English was chosen as the language of the Punjab's survey as English is the administrative language in that region.

Statistics

We performed two proportion Z-test to compare two binary independent groups on relevant data in the results and added SE bars. We considered $p<0.05$ to be statistically different.

Received: October 13, 2023
Accepted: February 28, 2024
Published: June 25, 2024

REFERENCES

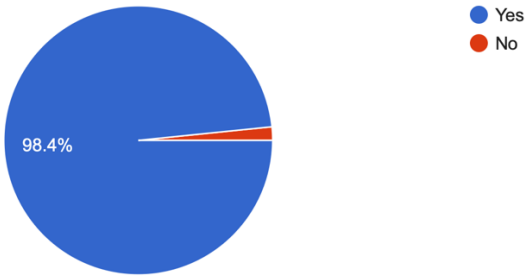
1. Zhu, Na, et al. "A Novel Coronavirus from Patients with Pneumonia in China, 2019". *New England Journal of Medicine*, vol. 382, no. 8, pp. 727–733, Feb. 2020, https://doi.org/10.1056/NEJMoa2001017.
2. World Health Organization. "Novel Coronavirus (2019-nCoV): situation report, 11." 2020. www.who.int/docs/default-source/coronaviruse/situation-reports/20200131-sitrep-11-ncov.pdf. Accessed 12 October 2023.
3. "Advice for the public on COVID-19 – World Health Organization" who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public. Accessed 12 October 2023.
4. Morawska, Lidia, et al. "It Is Time to Address Airborne Transmission of Coronavirus Disease 2019 (COVID-19)." *Clinical Infectious Diseases*, vol. 71, no. 9, pp. 2311–13, Nov. 2020, https://doi.org/10.1093/cid/ciaa939.
5. Lopez, Theresa K., et al. "Adult and Children's Use of Hand Sanitizer during a Pandemic – an Observational Study." *Journal of Exposure Science & Environmental Epidemiology*, vol. 33, no. 6, pp. 1004–12, Nov. 2023, https://doi.org/10.1038/s41370-022-00479-w.
6. "WHO chief declares end to COVID-19 as a global health emergency | UN News." news.un.org/en/story/2023/05/1136367. Accessed 12 October 2023.
7. "COVID Cases and Deaths Dashboard - Emergency Operations Center - County of Santa Clara." covid19.sccgov.org/dashboard-cases-and-deaths. Accessed 12 October 2023.
8. "WHO Coronavirus (COVID-19) Dashboard." covid19.who.int. Accessed 12 October 2023.
9. Metin, Ahmet, et al. "Gender and COVID-19 Related Fear and Anxiety: A Meta-Analysis." *Journal of Affective Disorders*, vol. 310, pp. 384–95, Aug. 2022, https://doi.org/10.1016/j.jad.2022.05.036.
10. Abuga, Kennedy, et al. "Alcohol-Based Hand Sanitizers in COVID-19 Prevention: A Multidimensional Perspective." *Pharmacy*, vol. 9, no. 1, 1, p. 64, Mar. 2021 https://doi.org/10.3390/pharmacy9010064.
11. Haktanir, Abdulkadir, et al. "Do We Experience Pandemic Fatigue? Current State, Predictors, and Prevention." *Current Psychology*, vol. 41, no. 10, pp. 7314–25, Oct. 2022, https://doi.org/10.1007/s12144-021-02397-w.
12. Choi, KeunOh, et al. "Changes in handwashing and hygiene product usage patterns in Korea before and after the outbreak of COVID-19." *Environmental Sciences Europe*, vol. 33, no. 79, 2021, https://doi.org/10.1186/s12302-021-00517-8.

Appendix

Santa Clara County Survey:

1. Are you a high school student? 62 responses

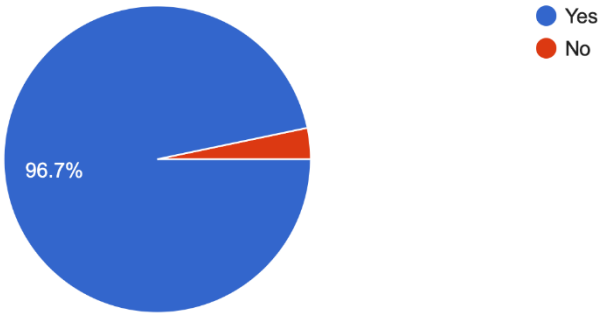
Yes /No



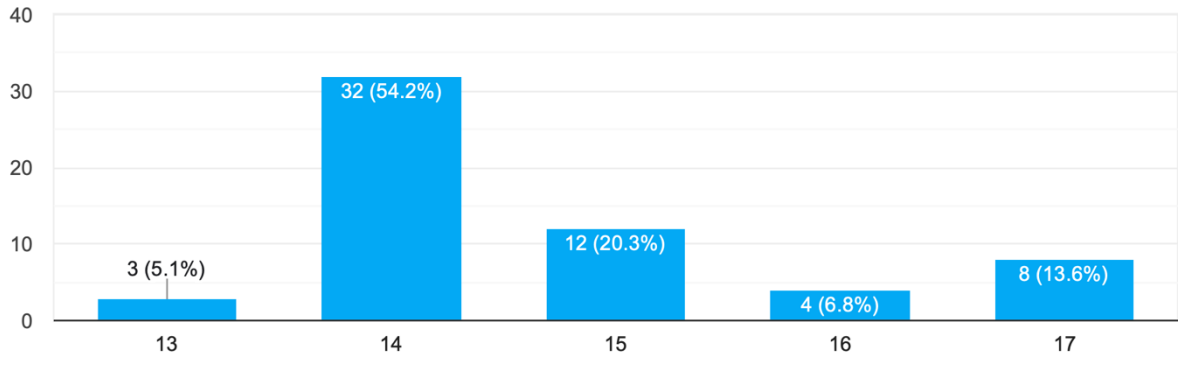
2. Do you live in Santa Clara County? 61 responses

Santa Clara County includes these cities: Campbell, Cupertino, Gilroy, Los Altos, Los Altos Hills, Los Gatos, Milpitas, Monte Sereno, Morgan Hill, Mountain View, Palo Alto, San Jose, Santa Clara, Saratoga and Sunnyvale.

Yes/ No

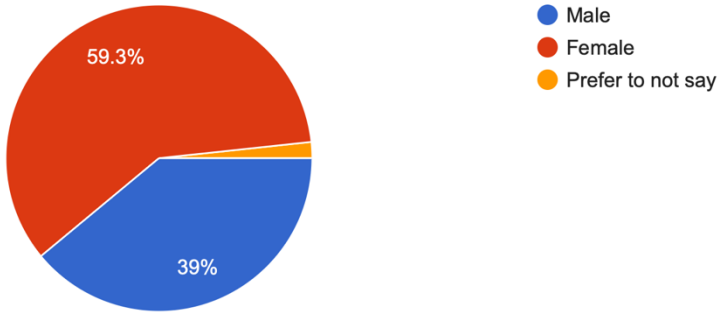


3. How old are you? (in years) * 59 responses



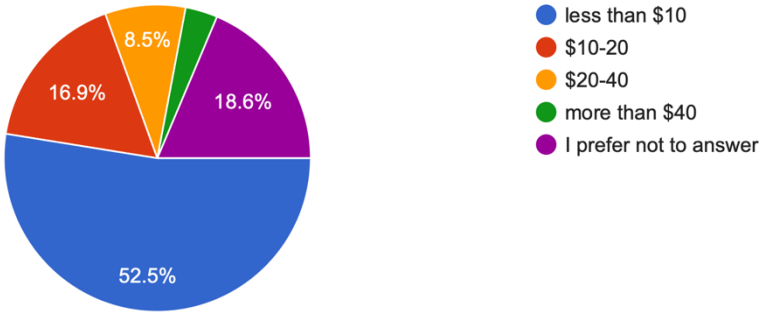
4. What gender do you identify as? * 59 responses

Male/Female/Prefer to not say/Other:



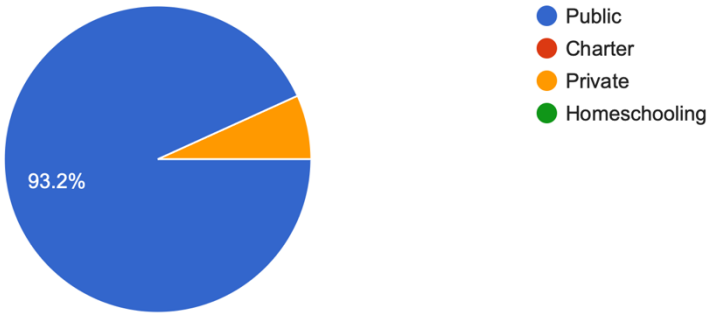
5. What is your weekly allowance amount as a high school student? * 59 responses

less than $10/$10-20/$20-40/more than $40/I prefer not to answer.



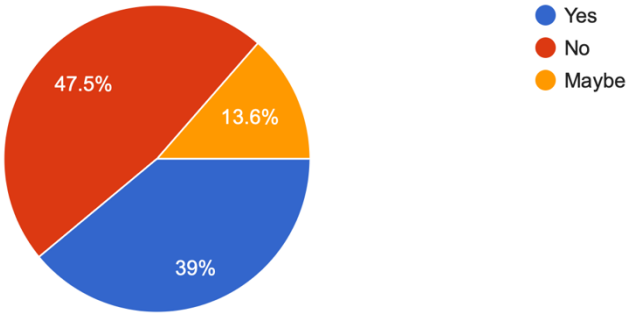
6. Type of your high school: * 59 responses

Public/Charter/Private Homeschooling/Other:



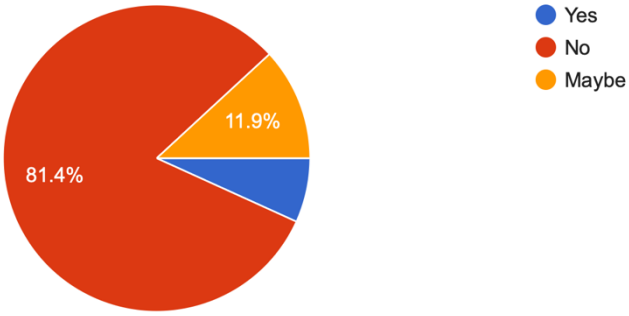
7. Did you consider getting COVID-19 **during the emergency lockdown** to be a serious health concern to yourself? 59 responses

Yes/No/Maybe



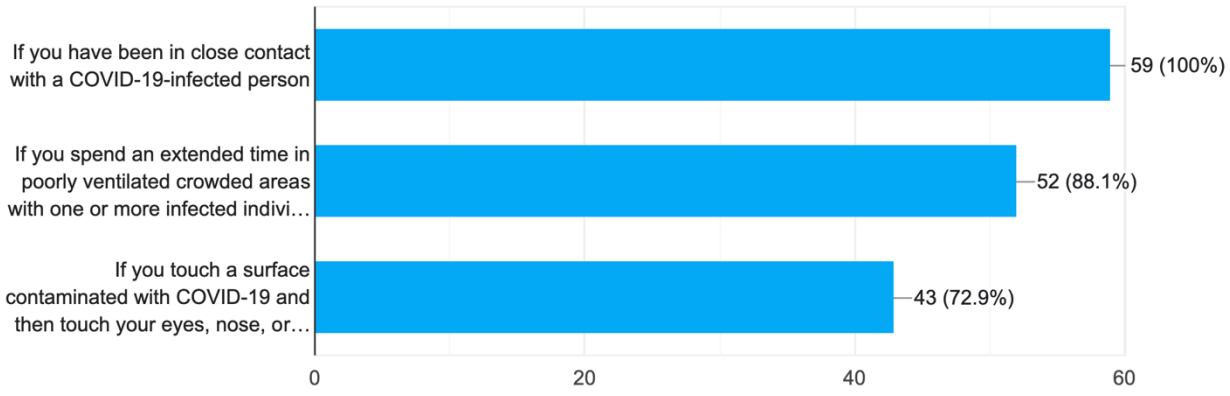
8. Do you believe that getting COVID-19 **now** is a significant health concern to yourself? 59 responses

Yes/No/Maybe



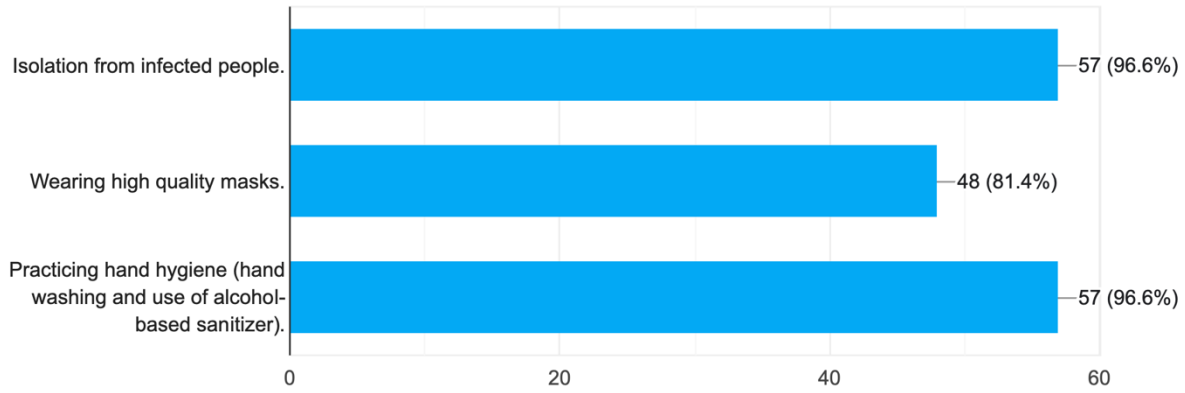
9. You can get COVID-19: * (**Choose all that you think applies**) 59 responses

If you have been in close contact with a COVID-19-infected person
If you spend an extended time in poorly ventilated crowded areas with one or more infected individuals
If you touch a surface contaminated with COVID-19 and then touch your eyes, nose, or mouth.



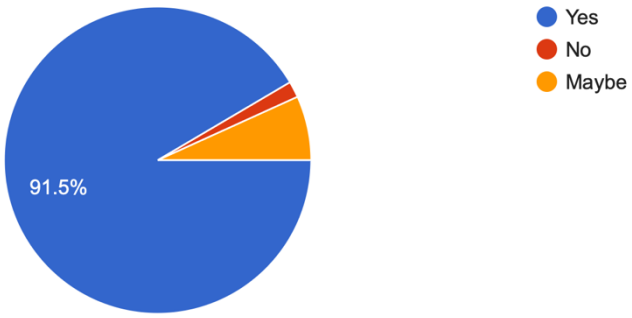
10. COVID-19 protective measures include: * (**Choose all that you think applies**) 59 responses

Isolation from infected people.
Wearing high quality masks.
Practicing hand hygiene (hand washing and use of alcohol-based sanitizer).



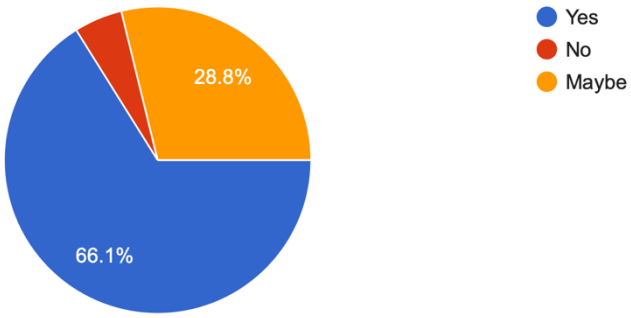
11. Do you believe that COVID-19 protective measures can reduce transmission and protect you from the virus? 59 responses

Yes/No/Maybe



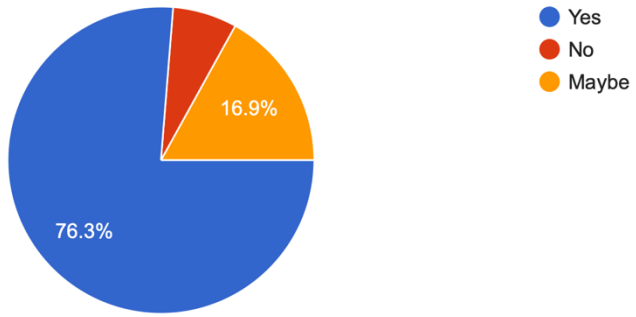
12. Do you think wearing a high quality mask can protect you from COVID-19? * 59 responses

Yes/No/Maybe



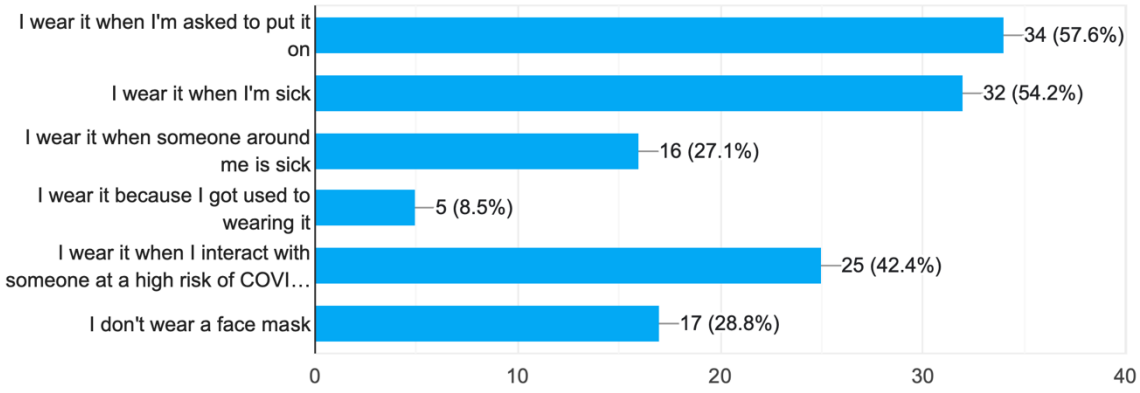
13. Do you think practicing hand hygiene (hand washing and use of alcohol-based sanitizer) can protect you from COVID-19? 59 responses

Yes/No/Maybe



14. When do you currently wear face masks? * (**Choose all that applies**) 59 responses

I wear it when I'm asked to put it on
I wear it when I'm sick
I wear it when someone around me is sick
I wear it because I got used to wearing it
I wear it when I interact with someone at a high risk of COVID-19 infection I don't wear a face mask

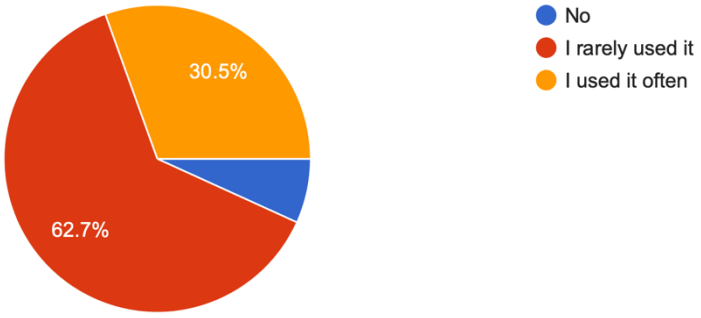


15. Did you use alcohol-based hand sanitizer **before** the COVID-19 emergency started[1]? *

[1]*refers to the time **before** COVID-19 was widespread*

59 responses

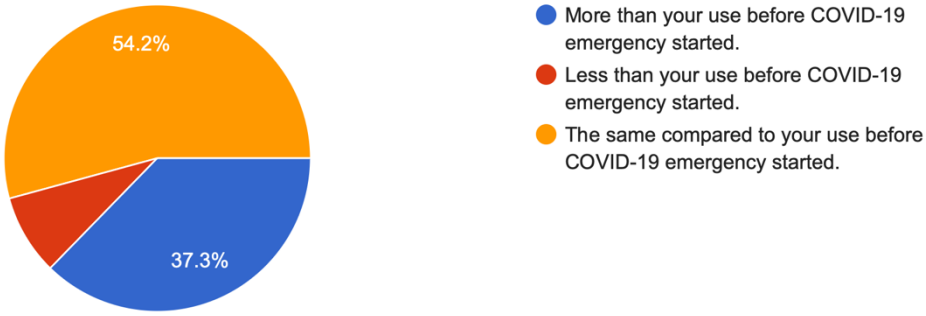
No/I rarely used it/I used it often



16. Your **current***1* use of alcohol-based hand sanitizer is: * *[1]refers to the time after COVID-19 is no longer a global health emergency*

59 responses

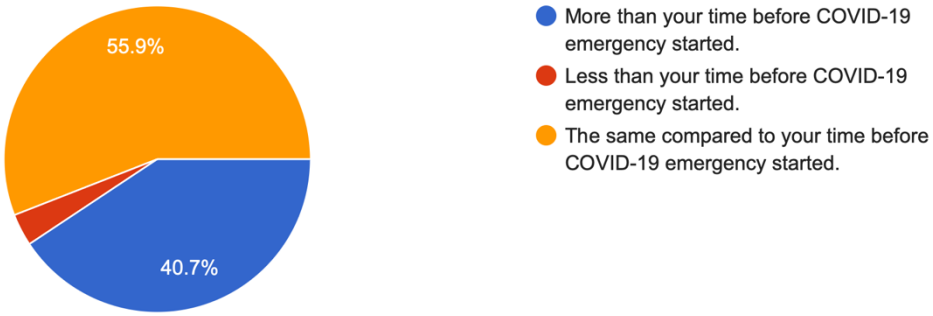
More than your use before COVID-19 emergency started.
Less than your use before COVID-19 emergency started.
The same compared to your use before COVID-19 emergency started.



17. Your **current***[1]* time for one hand-wash is: * *[1]refers to the time after COVID-19 is no longer a global health emergency*

59 responses

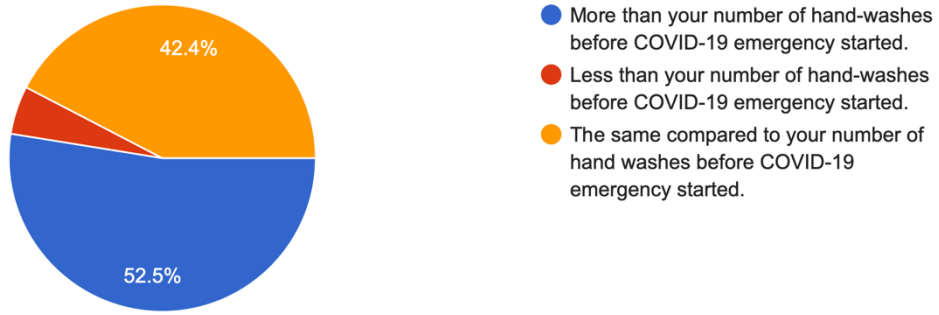
More than your time before COVID-19 emergency started.
Less than your time before COVID-19 emergency started.
The same compared to your time before COVID-19 emergency started.



18. Your **current**[1] number of hand-washes is: * [1]*refers to the time after COVID-19 is no longer a global health emergency*

59 responses

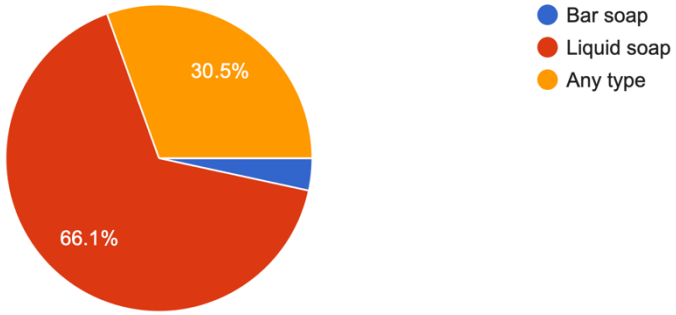
More than your number of hand-washes before COVID-19 emergency started.
Less than your number of hand-washes before COVID-19 emergency started.
The same compared to your number of hand washes before COVID-19 emergency started.



19. Which type of soap did you mostly use **before** the COVID-19 was a global health emergency? *refers to the time before COVID-19 was widespread*

59 responses

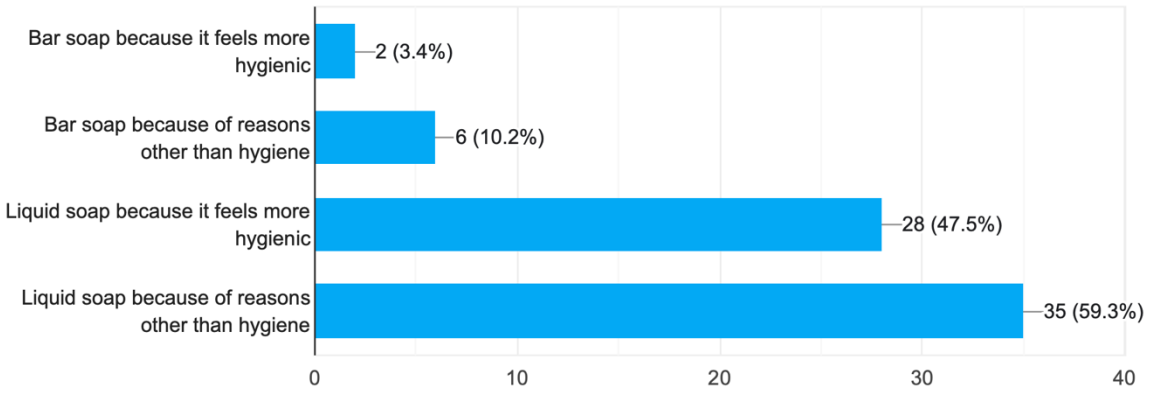
Bar soap/Liquid soap/Any type



20. **Currently**, what type of soap do you mostly use? * (**Choose what suits you best**)

59 responses

Bar soap because it feels more hygienic
Bar soap because of reasons other than hygiene Liquid soap because it feels more hygienic
Liquid soap because of reasons other than hygiene.

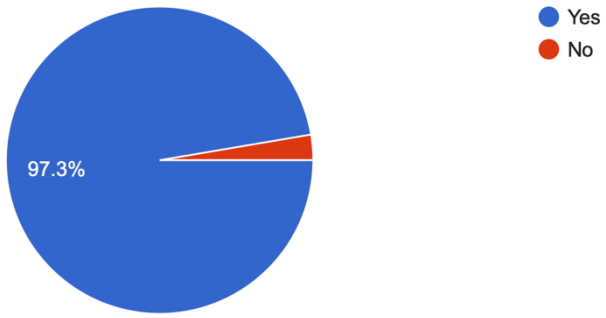

Bar soap because it feels more hygienic
2 (3.4%)
Bar soap because of reasons other than hygiene
6 (10.2%)
Liquid soap because it feels more hygienic
28 (47.5%)
Liquid soap because of reasons other than hygiene
35 (59.3%)
0
10
20
30
40

97

Punjab Survey:

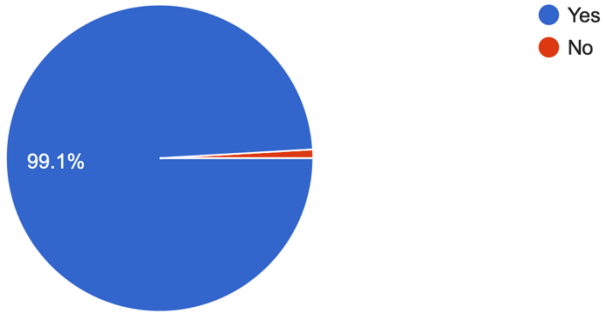
1. Are you a high school student (includes Matric/Fsc and O/A Levels)?
112 responses

Yes /No

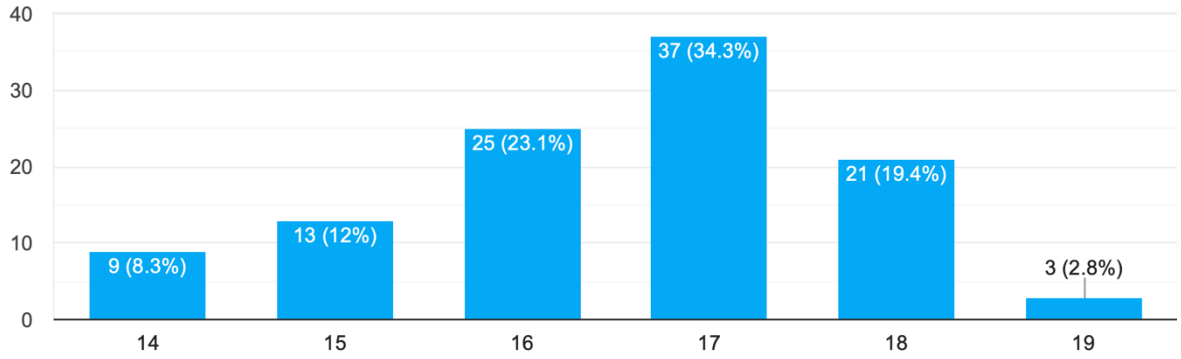


Do you live in Punjab, Pakistan?
109 responses

Yes/ No

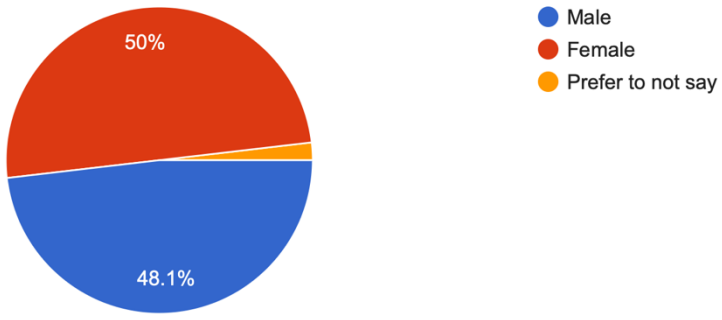


3. How old are you? (in years) *
108 responses



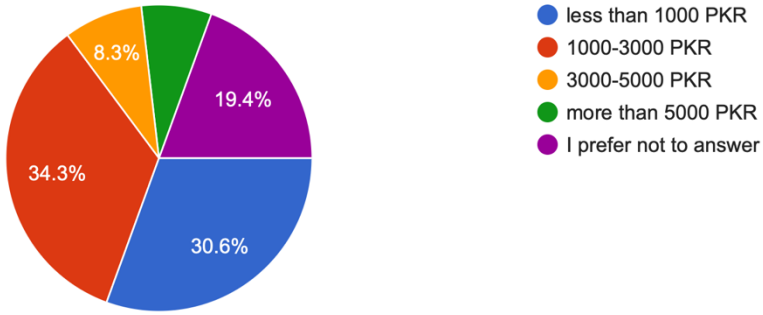
4. What gender do you identify as? *
108 responses

Male/Female/Prefer to not say



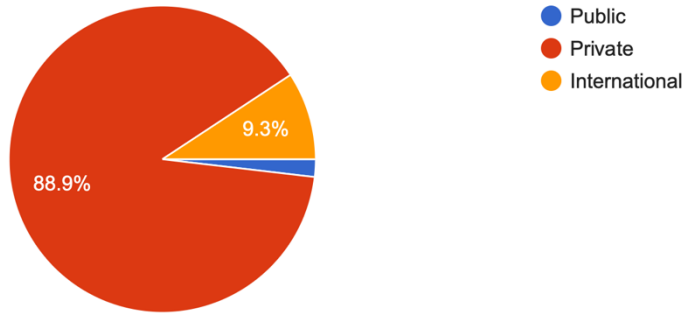
5. What is your weekly allowance amount as a high school student?
108 responses, 1 US Dollar = 279.18 Pakistani Rupee

less than 1000 PKR/1000-3000 PKR/3000-5000 PKR/more than 5000 PKR/I prefer not to answer



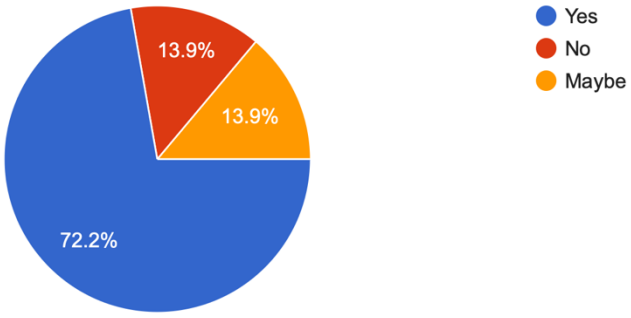
6. Type of your high school: *
108 responses

Public/Private/Internaitonal



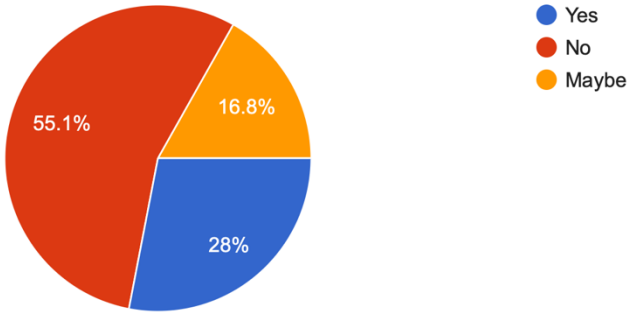
7. Did you consider getting COVID-19 **during the emergency lockdown** to be a serious health concern to yourself?
108 responses

Yes/No/Maybe



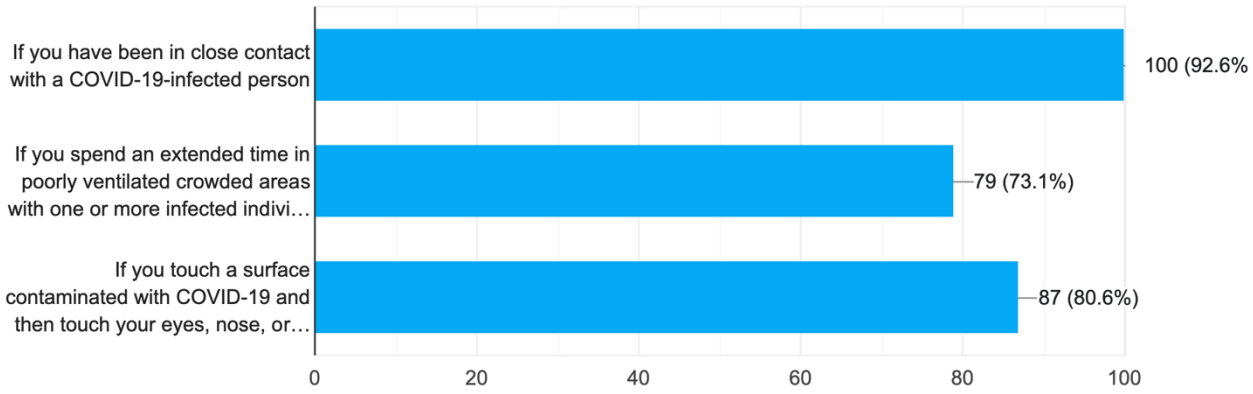
8. Do you believe that getting COVID-19 **now** is a significant health concern to yourself?
108 responses

Yes/No/Maybe



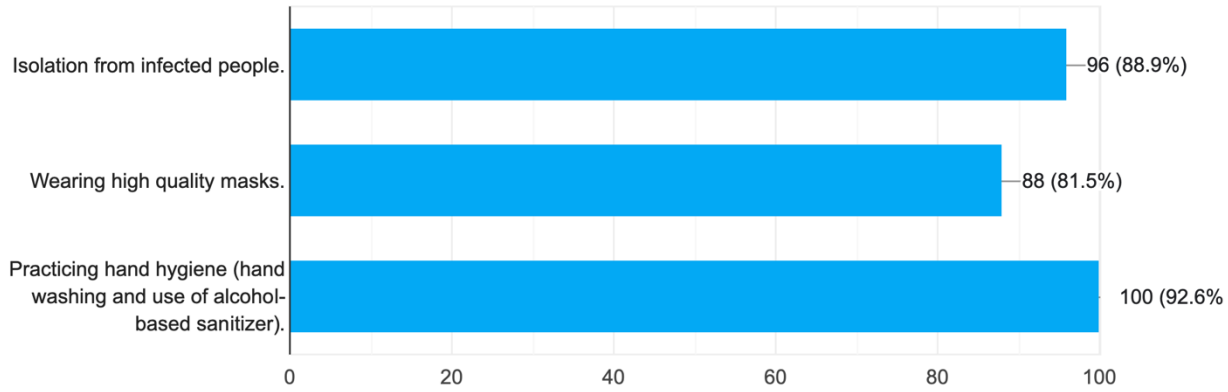
9. You can get COVID-19: * (**Choose all that you think applies**)
108 responses

If you have been in close contact with a COVID-19-infected person
If you spend an extended time in poorly ventilated crowded areas with one or more infected individuals
If you touch a surface contaminated with COVID-19 and then touch your eyes, nose, or mouth.



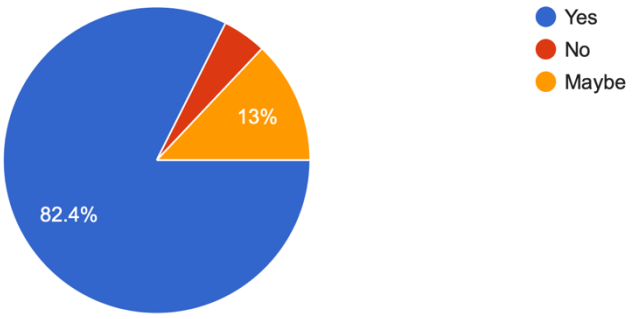
10. COVID-19 protective measures include: * (**Choose all that you think applies**)
108 responses

Isolation from infected people.
Wearing high quality masks.
Practicing hand hygiene (hand washing and use of alcohol-based sanitizer).



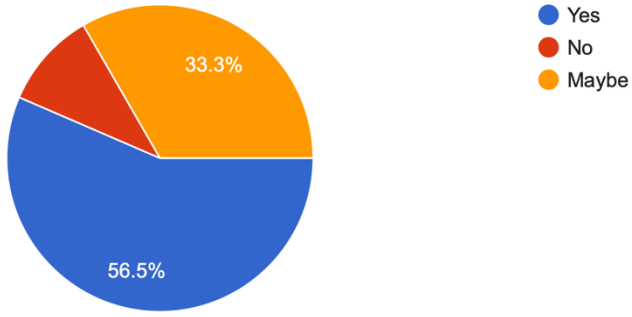
11. Do you believe that COVID-19 protective measures can reduce transmission and protect you from the virus? 108 responses

Yes/No/Maybe



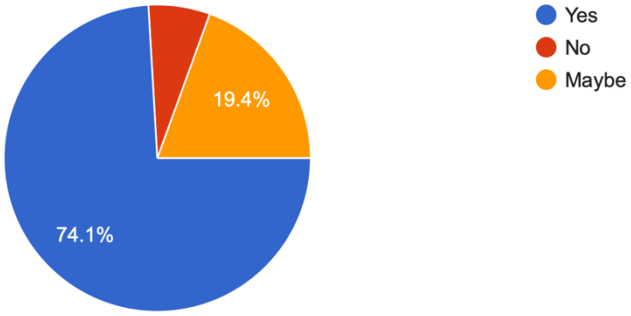
12. Do you think wearing a high quality mask can protect you from COVID-19? * 108 responses

Yes/No/Maybe



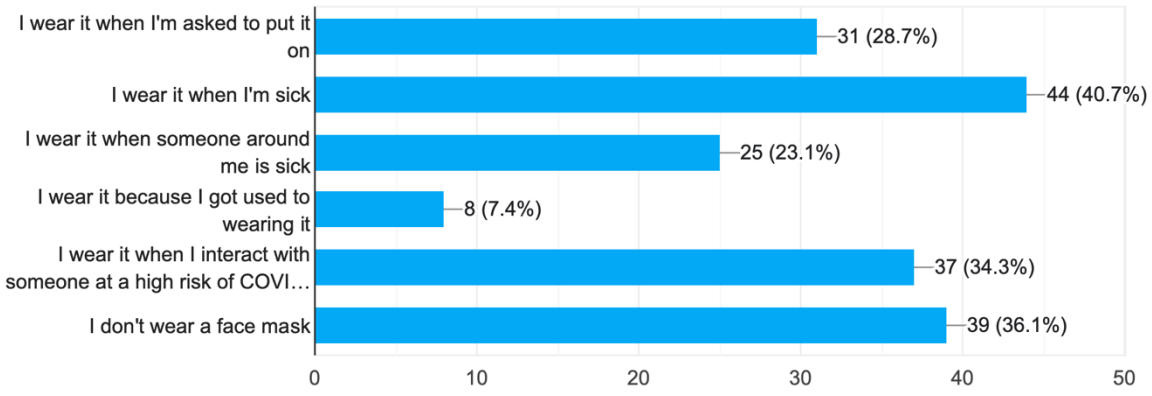
13. Do you think practicing hand hygiene (hand washing and use of alcohol-based sanitizer) can protect you from COVID-19? 108 responses

Yes/No/Maybe



14. When do you currently wear face masks? * (**Choose all that applies**) 108 responses

I wear it when I'm asked to put it on
I wear it when I'm sick
I wear it when someone around me is sick
I wear it because I got used to wearing it
I wear it when I interact with someone at a high risk of COVID-19 infection I don't wear a face mask

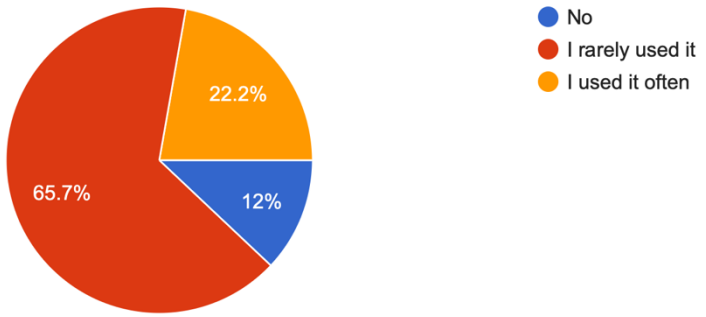


15. Did you use alcohol-based hand sanitizer **before** the COVID-19 emergency started[1]? *

[1]*refers to the time **before** COVID-19 was widespread*

108 responses

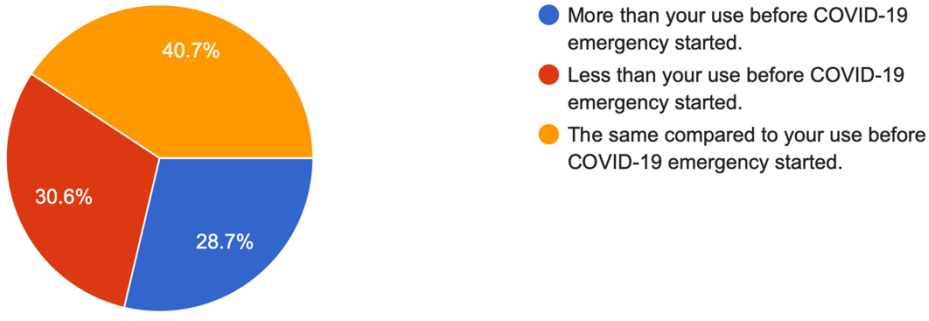
No/I rarely used it/I used it often



16. Your **current**[1] use of alcohol-based hand sanitizer is: * [1]*refers to the time after COVID-19 is no longer a global health emergency*

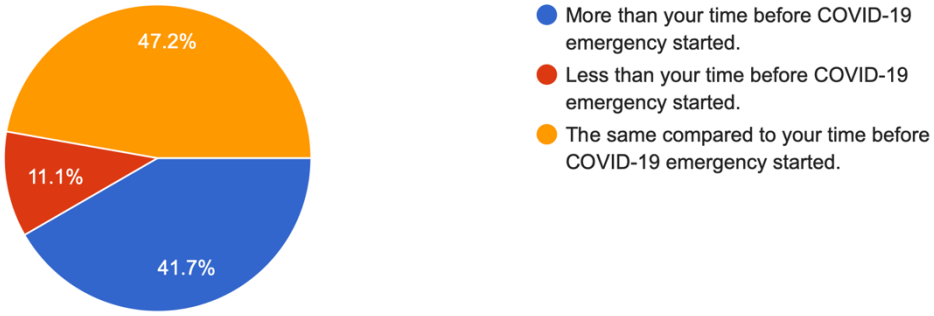
108 responses

More than your use before COVID-19 emergency started.
Less than your use before COVID-19 emergency started.
The same compared to your use before COVID-19 emergency started.



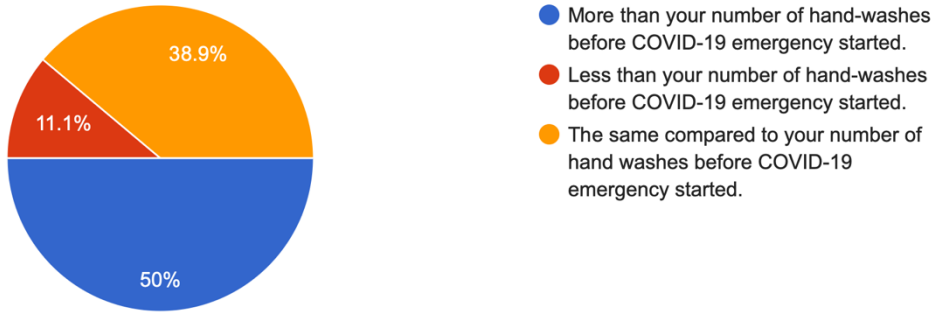
17. Your **current**[1] time for one hand-wash is: * [1]*refers to the time after COVID-19 is no longer a global health emergency*
108 responses

More than your time before COVID-19 emergency started.
Less than your time before COVID-19 emergency started.
The same compared to your time before COVID-19 emergency started.



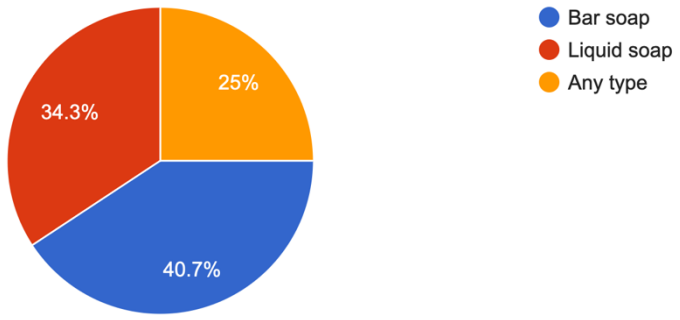
18. Your **current**[1] number of hand-washes is: * [1]*refers to the time after COVID-19 is no longer a global health emergency*
108 responses

More than your number of hand-washes before COVID-19 emergency started.
Less than your number of hand-washes before COVID-19 emergency started.
The same compared to your number of hand washes before COVID-19 emergency started.



19. Which type of soap did you mostly use **before** the COVID-19 was a global health emergency? *refers to the time before COVID-19 was widespread*
108 responses

Bar soap/Liquid soap/Any type



20. **Currently**, what type of soap do you mostly use? * (**Choose what suits you best**)
108 responses

Bar soap because it feels more hygienic
Bar soap because of reasons other than hygiene Liquid soap because it feels more hygienic
Liquid soap because of reasons other than hygiene.