A Survey Study of Public Awareness on Hand Sanitizer Recalls in Canada

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Abstract

Background: The Covid-19 pandemic has created a high demand for hand sanitizer to prevent the spread of pathogens. This resulted in a hand sanitizer shortage on the market and promoted more manufactures to produce and sell hand sanitizers. Meanwhile, Health Canada has recalled many hand sanitizers due to potential health risks for various reasons such as products that contain unauthorized ingredients. However, the general public in Canada might not notice hand sanitizer recalls and/or underestimate the risk of using recalled hand sanitizers. This research study was conducted to determine the general public awareness regarding hand sanitizer recalls.

Methods: An online self-administered survey was conducted on Survey Monkey to collect responses from participants recruited through Reddit and email invitations. NCSS software was used to perform statistical analyses of Chi-square tests on the collected data.

Results: 402 respondents completed most of the survey questions. 47.1% of the respondents had not heard of hand sanitizer recalls in Canada before taking this survey. 70.1% of the respondents were located in British Columbia. Respondents who were more likely to be aware of hand sanitizer recalls were female ($p = 0.0075$), people aged 25 or older ($p= 0.0001$), and people who have completed a higher level of education ($p=0.0018$). Respondents who were not aware of hand sanitizer recalls tend not to notice that there were risk statements on the labels of hand sanitizers ($p=0.0003$). 54.8% of the respondents strongly or somewhat agreed that it was difficult to check if their hand sanitizers are on the recall list. 62.2% of the respondents strongly agreed that they were concerned about the potential risks associated with using recalled hand sanitizers. Out of five methods to dispose recalled hand sanitizers, 46.6% respondents preferred to throw the whole bottle away into the garbage can.

Conclusions: The results from this research study revealed that a large proportion of participants are unaware of hand sanitizers recalls and did not know how to properly discard recalled hand sanitizers. Therefore, new policies and campaigns should be developed to raise the awareness of hand sanitizer recalls among the general public that emphasize potential health hazards and proper ways to discard recalled hand sanitizers.

Keywords: hand sanitizer, product recalls, Health Canada, consumer awareness, public health, Covid-19

Introduction

Due to the current COVID-19 pandemic, there has been a significant increase in usage/interest in hand sanitizers from the public to prevent pathogens spread through direct contact. This high demand for hand sanitizers had resulted in a hand sanitizer shortage on the market. Many new companies, including breweries and distilleries started to produce and sell hand sanitizer products. To increase the ABHSs supply, Health Canada has temporarily authorized the use of technical-grade ethanol use in hand sanitizer production. Since technical-grade ethanol contains more impurities compared to food- and pharmaceutical-grade ethanol, risk statements are required on technical-grade ethanol made products. Meanwhile, Health Canada has recalled many hand sanitizers for various reasons including missing risk statements and containing unauthorized ingredients. These recalled products may contain toxic chemicals of methanol, ethyl acetate and 1-propenol, which may cause skin and eye irritation, headaches, and upper respiratory system inflammation when used. Unlike food recalls that often get noticed by the general public, people may be less aware of hand sanitizer recalls. A survey research was conducted to identify the public awareness regarding hand sanitizer recalls.

Literature Review

Reasons for increased hand sanitizer recalls

Up until April 25, 2021, 160 hand sanitizers have been recalled by Health Canada (2021b). Meanwhile, The U.S. Food and Drug Administration (FDA) (2021) has issued 236 hand sanitizer recalls in the United States on April 25, 2021. The main reasons for the recall in Canada are products containing un-authorized ingredients, mis-labelled, and missing important risk statements. However, hand sanitizers recall has rarely occurred before the COVID-19 pandemic. There are only eight recalls associated with hand sanitizers issued by Health Canada between 2010 to 2019.

Due to the high demand for ABHSs and a worldwide shortage of pharmaceutical- and food-grade ethanol, Health Canada has temporarily authorized the use of technical-grade ethanol in hand sanitizer starting from April 15, 2020. Manufacturers must receive written authorization from Health Canada before proceeding with using technical-grade ethanol in hand sanitizers. However, this approval may increase the number of hand sanitizers being recalled. Since technical-grade ethanol contains more impurities compared to pharmaceutical- and food-grade ethanol, hand sanitizers containing technical-grade ethanol can pose health risks with frequent use. Health Canada's risk assessment indicates that acetaldehyde as the primary impurity concern is found in a concentration of 800 – 1000 ppm in the technical-grade ethanol (Health Canada, 2020a). In contrast, the maximum allowable level of acetaldehyde is 10 ppm for

pharmaceutical- and food-grade ethanol (Health Canada, 2020a). Although there is no evidence on acetaldehyde causing acute toxicity, irritation, and sensation, acetaldehyde has potential carcinogenicity to humans listed by the International Agency for Research on Cancer (IARC) (Burtney, 2020). High frequency of using hand sanitizer containing a high concentration of acetaldehyde may pose chronic health hazards from inhalation and dermal exposure. To mitigate this risk, Health Canada is requiring all manufacturers who use technical-grade ethanol in their products to have proper risk statements on their product labels. These risk statements required by Health Canada (2021b) include the following:

- Technical grade ethanol listed in the ingredient
- Specific direction for adult use only, not recommended for the pregnant women or who are breastfeeding, keep it out of reach for children
- Do not use this product on broken or damaged skin
- Report any incident to Health Canada or call 1-866-234-2345

Nevertheless, some companies are not properly labelling their products or missing these important risk statements. This has resulted in their products being recalled by Health Canada due to potential health risks.

Counterfeit hand sanitizers are also recalled by Health Canada. On October 1, 2020, Health Canada (2020c) posted a recall alert after discovering a fake version of Zytec Germ Buster hand sanitizer. These counterfeit products display the same name, lot, and NPN number as the authorized product, but they are packaged differently in the product label and volume size compared to the authentic products. Since counterfeit products may not contain enough active ingredients such as ethyl alcohol, they might be ineffective in destroying pathogens and pose serious health risks. These products may also contain dangerous additives or toxic contaminants because they are manufactured with an unknown formulation. Therefore, consumers need to be aware of the presence of counterfeit hand sanitizers and the risks associated with them.

How to check if hand sanitizer is being recalled or not

Health Canada is continuously updating a list of hand sanitizers that are being recalled on the online recalls and safety alerts website. Consumers can verify if their hand sanitizers are recalled or not by visiting the website and look up product name, reason for recall, recalling company, Natural Product Number (NPN) or Drug Identification Number (DIN), affected lot number, and product expiry date (Health Canada, 2021b).

What should consumers do for recalled products

ABHSs are usually containing more than 60% of ethyl alcohol concentrations and are flammable when near to sources of heat. Also, recalled products may contain toxic methanol that can contaminate

water sources. These issues made ABHSs as hazardous wastes that require proper disposal. Recalled hand sanitizers must not be poured down to drains or thrown away in garbage cans. Health Canada (2021b) has suggested that recalled hand-sanitizer products should be disposed properly as chemicals and hazardous waste by following municipal or regional guidelines. Health Canada also recommended consumers to return recalled products to local pharmacies for proper waste disposal.

Methanol and ethyl acetate toxicities

Hand sanitizers containing ethyl acetate and methanol are being recalled by Health Canada. In Canada, these two denaturants are listed as unauthorized ingredients and are not permitted in hand sanitizers. Health Canada (2021b) has announced that "frequent use of hand sanitizer containing ethyl acetate may cause dry skin, leading to irritation or cracking". Exposure to methanol from hand sanitizers can result in "dermatitis, eye irritation, upper respiratory system irritation and headaches" (Health Canada, 2021b). Methanol and ethyl acetate are impurities present in ethyl alcohol during hand sanitizer production. These two chemicals will not be listed in the ingredients list from hand sanitizers. In fact, hand sanitizers containing methanol and/or ethyl acetate will look and smell like regular ABHSs (Zuber, 2020).

Methanol is a highly poisonous substance that can cause severe system toxicity and deaths (Chan, 2018). A news article reported that four adults in the United States died after drinking hand sanitizers contain methanol in August 2020 (Rettner, 2020). A similar tragedy occurred in Canada back in 2013 where two deaths resulted from ingesting hand sanitizer containing methanol (Chan, 2018). Unintentional ingestion of ABHSs can occur by people mistakenly substituting ABHSs as alcohol. Therefore, consumers should understand the risks of methanol poisoning associated with recalled hand sanitizers. Especially for children that may be less tolerant to methanol poisoning and health care workers who are frequently using hand sanitizers.

Consumer responses to product recalls

There are no data available from previous studies regarding consumers' awareness and response to hand sanitizer recalls. Since hand sanitizer recalls have rarely occurred in Canada before the emergence of COVID-19 pandemic, the general public may not notice recalls on hand sanitizers. People may also underestimate the risks existed in recalled hand sanitizer or they may improperly dispose these recalled products. According to a report surveyed on European Union (EU) consumers, only 56.5% of EU consumers have been exposed to product recall information between 2016 to 2018 (Ipsos, 2019). The top three ways of knowing product recall are through traditional media (79.8%), online media (53.6%) and friend

or acquaintance (29.3%) (Ipsos, 2019). In conclusion, consumers may be more likely exposed to product recall information through traditional media such as TV, radio, and newspapers. However, recall fatigue may occur when excessive amounts of recall information are released by massive news media trying to increase consumer's awareness (Charlebois et al., 2019). Consumers may be overwhelmed by excessive information and take no actions in compliance with recalls.

Purpose of Study

The purpose of this research project was to determine if the general public across Canada is aware of hand sanitizer recalls and to assess their knowledge level on potential risks associated with this recall.

Materials and Methods

An online self-administrated survey was distributed through SurveyMonkey for two weeks from January 21st, 2021 to February 4th, 2021. Reddit (www.reddit.com), a social networking website based on different communities of interests was used to attract and collect responses for the survey. To increase the response rate and ensure a broad distribution of the survey, a cover letter for this study and a link to the survey were posted on various subreddits including different post secondaries such as Langara College, McMaster University, and McGill University. Subreddits for different cities in Canada such as Richmond, Abbotsford, and Yellowknife were also used. Meanwhile, the research supervisor, Dr. Helen Heacock had forwarded a survey invitation email to her contacts to help distribute the survey and gather more responses. Microsoft Excel and NCSS statistical tools (2021) were used to run Chi-square statistical analyses of data collected.

Inclusion and exclusion criteria

Since this research study examined the awareness of hand sanitizers being recalled in Canada, any individuals who are currently living in Canada were eligible to participate in the survey, including people less than 18 years old. Participants who were living outside of Canada were excluded from this study. Friends, family, and classmates of the researcher were also excluded.

Ethics

The BCIT Research Ethics Board granted study approval in January 2021.

Results

Descriptive data and Statistics

Since open-ended questions can be more challenging to analyze statistically, this survey only consisted of closed-ended questions. Binomial and multichotomous nominal/ordinal were collected from the survey for Chi squares tests. A total of 432 respondents

participated in this survey. 402 respondents completed most of the survey questions.

50.4% of the participant were female (n=202), 47.1 male (n=189), 1% other (n=4), and 1.5% (n=6) preferred no to answer (Figure 1).

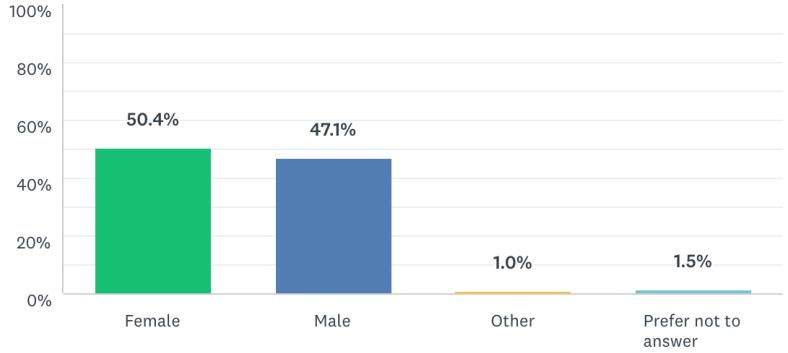

Figure 1. Gender of respondents

71.1% of the respondents were aged between 18 to 34 (n=285), 24.2% of the respondents were 35 and older(n=97), 4% of the respondents were under the age of 18 (n=16), and 0.7% of the respondents (n=3) preferred not to answer (Figure 2).

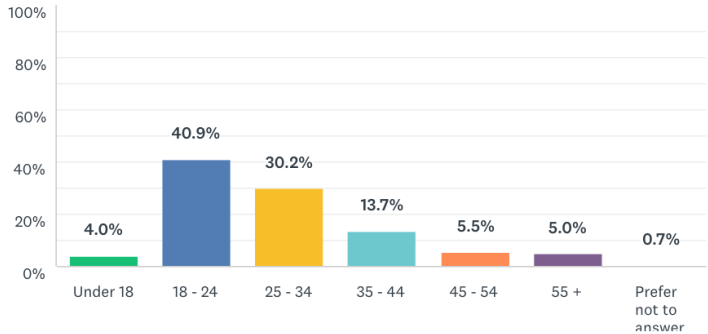

Figure 2. Age of respondents

70.1% of the respondents were located in the West Coast Region (n=282), 18.4% of the respondents (n=74) were located in Central Canada, 8% of the respondents (n=32) were located in the Atlantic Regions, 3% of the respondents (n=12) were located in the Prairie regions and the Northern Territories, and 0.5% of the respondents (n=2) preferred not to answer (Figure 3).

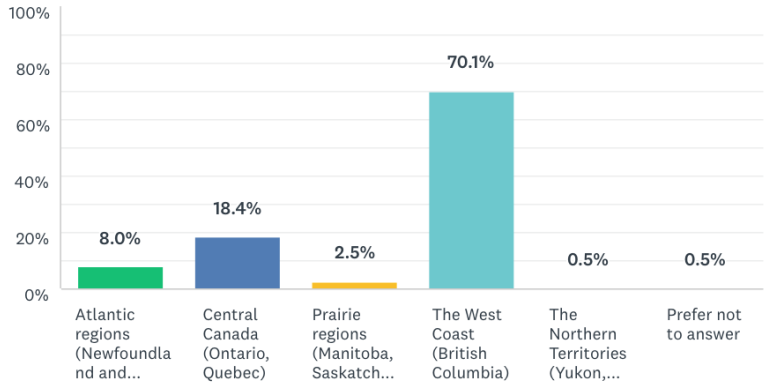

Figure 3. Region of residence of respondents

70.4% of the respondents have some or completed post-secondary school education, 16.7% of the respondents have some or completed graduate school education (n=67). 11.4% of the respondents have completed high school education or less (n=46). 1.5% of the respondents (n=6) preferred not to answer this question (Figure 4).

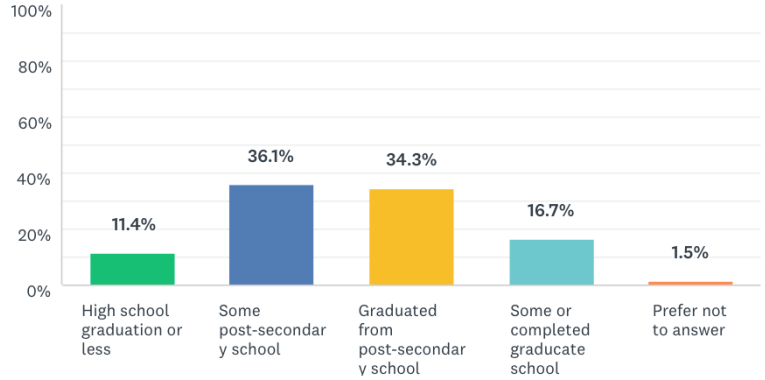

Figure 4. Level of education that respondents completed

Risks statements containing medicinal ingredients, directions of use, and warnings are required to be included on the product labels if hand sanitizers were produced from technical-grade ethanol, for the purpose of informing consumers about the potential risks due to elevated ethanol impurities. There were more respondents who have not noticed the risk statements on the labels of some hand sanitizers (58.2%; n=234) compared to respondents who have noticed (41.5%; n=167). 0.25% of the respondents (n=1) preferred not to answer this question (Figure 5).

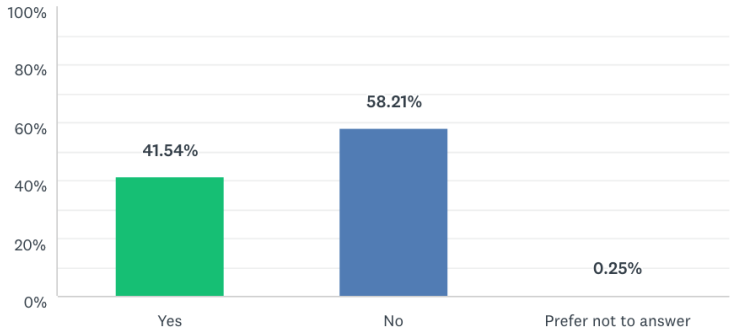

Figure 5. Respondents' knowledge of risk statements on labels of hand sanitizers

The majority of respondents (64.9%; n=261) used alcohol-based hand sanitizers. 20.4% of the respondents (n=82) have used both alcohol-based and alcohol-free hand sanitizers. 13.9% of the respondents (n=13.9) were unsure about the type of hand sanitizers they were using. Very few of the respondents have used alcohol-free hand sanitizers solely (0.5%; n=2) or never used any hand sanitizer products (0.2%; n=1) (Figure 6).

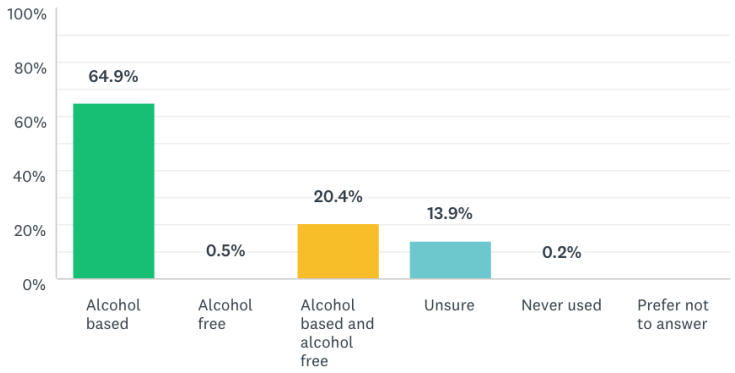

Figure 6. Type of hand sanitizer used by respondents

The number of respondents who have heard of hand sanitizer recalls (51.6%; n=234) were slightly higher than respondents who had not heard of the recalls (47.1%; n=167). 1.2% of the respondents (n=5) were unsure (Figure 7).

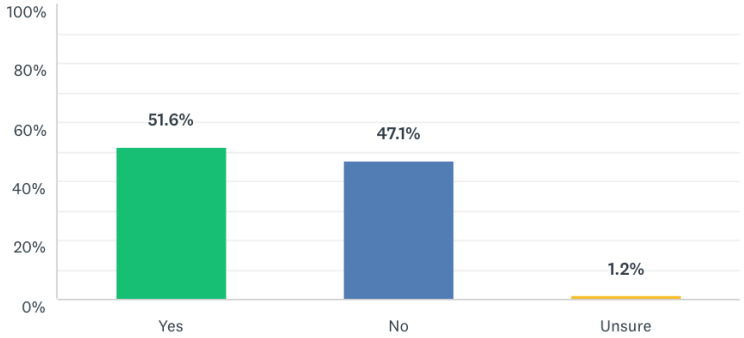

Figure 7. Respondents' awareness of hand sanitizer recalls in Canada

Most of the respondents have strongly or somewhat agreed that it was difficult to check if their hand sanitizers are on the recall list (54.8%; n=220). 33.3% of the respondents (n=134) have remained neutral that they neither agree nor disagree. Only 10.7% of the respondents (n=43) have strongly or somewhat disagreed. 1.2% of the respondents (n=5) preferred not to answer this question (Figure 8).

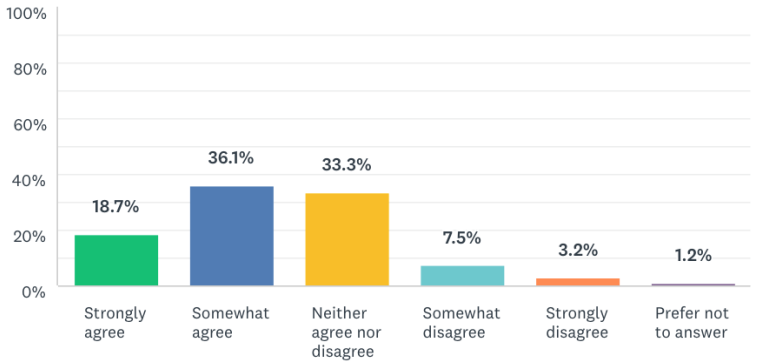

Figure 8. Respondents' perception of if it is difficult to look up the hand sanitizer recall list

Most of the respondents have strongly agreed or somewhat agreed that they were concerned of any potential risks associated with using recalled hand sanitizers (62.2%; n=250). 14.2% of the respondents (n=57) have remained neutral that they neither agree nor disagree. 23.7% of the respondents (n=95) have strongly or somewhat disagreed (Figure 9).

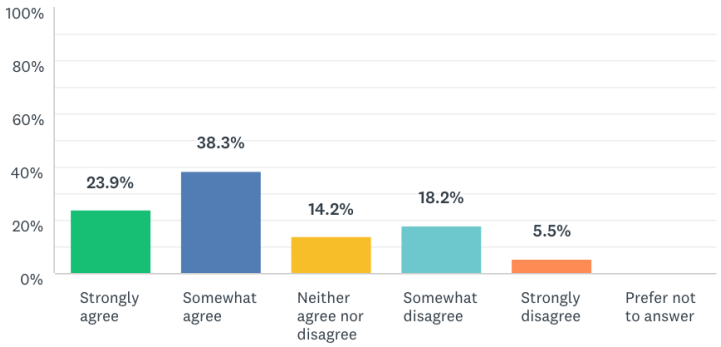

Figure 9. Respondents' perception of if they are concerned of any potential risks associated with using recalled hand sanitizers

The percentages were recalculated to only include respondents who have heard of hand sanitizer recalls before taking this survey. Respondents who have heard of hand sanitizer recalls mainly obtained this information from the social media and websites (50.6%; n=128). 22.1% of the respondents (n=56) heard of hand sanitizer recalls from government publications such as recalls and alerts from the Health Canada. 19.3% of respondents (n=49) have received the recall information from TV, radio, and newspaper. 6.3% of the respondents (n=16) have heard of the recall information by word of mouth such as from their friends or family. 1.6% of the respondents (n=4) were informed about hand sanitizer recalls from other sources (Figure 10).

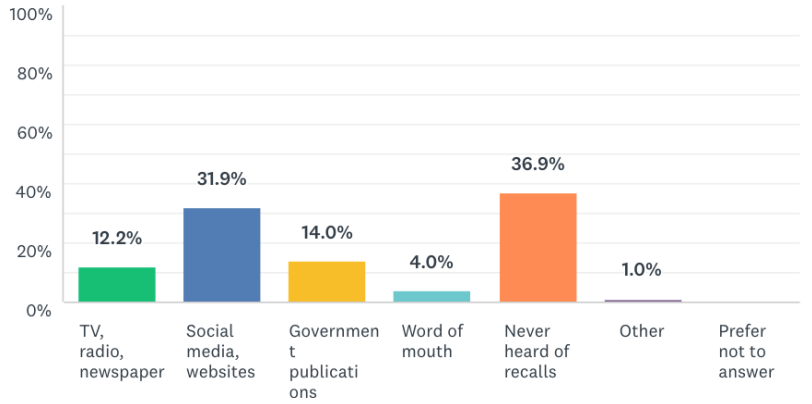

Figure 10. Respondents' sources of information about hand sanitizer recalls

Most of the respondents have chosen the option of throwing the whole bottle away to the garbage can (46.6%; n=187). 34.2% of the respondents (n=137) have chosen to return the recalled products to where they bought them or a pharmacy. 29.4% of the respondents (n=118) would look up municipal or regional guidelines on how to dispose of recalled products. 22.2% of the respondents (n=89) would empty the content of recalled products down to the drain then throw the containers away. 16.7% of the respondents (n=67) would contact their local health authority and ask how to dispose of recalled products. 3.5% of the respondents (n=14) would choose other ways to dispose of recalled hand sanitizers. 0.5% of the respondents (n=2) preferred not to answer this question (Figure 11).

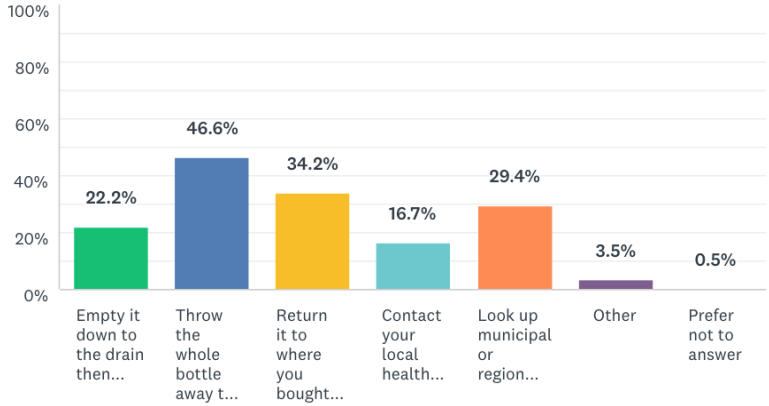

Figure 11. Respondent's preferred methods to dispose recalled hand sanitizers

Table 1. Inferential statics data

Ho and Ha	Result	Conclusion
Ho: There is no association between the respondents' awareness of hand sanitizer recalls and their level of education. **Ha:** There is an association between the respondents' awareness of hand sanitizer recalls and their level of education.	P = 0.0018	Reject Ho and conclude that there is statistically significant association between the respondents' awareness of hand sanitizer recalls and their level of education. We can further conclude that the respondents who had a higher level of education were more likely to be aware of hand sanitizer recalls.
Ho: There is no association between the respondents' awareness of hand sanitizer recalls and their age. **Ha:** There is an association between the respondents' awareness of hand sanitizer recalls and their age.	P = 0.0001	Reject Ho and conclude that there is an association between the respondents' awareness of hand sanitizer recalls and their age. We can further conclude that the respondents aged 25 or older were more likely to be aware of hand sanitizer recalls than people aged 24 or younger.
Ho: There is no association between the respondents' awareness of hand sanitizer recalls and their gender. **Ha:** There is an association between the respondents' awareness of hand sanitizer recalls and their gender.	P = 0.0075	Reject Ho and conclude that there is an association between the respondents' awareness of hand sanitizer recalls and their gender. We can further conclude that females were more likely to be aware of hand sanitizer recalls than males.

Ho: There is no association between the respondents' awareness of hand sanitizer recalls and their awareness of risk statements on the product label of hand sanitizers. **Ha:** There is an association between the respondents' awareness of hand sanitizer recalls and their awareness of risk statements on the product label of hand sanitizers.	P = 0.0003	Reject Ho and conclude that there is an association between the respondents' awareness of hand sanitizer recalls and their awareness of risk statements on the product label of hand sanitizers. We can further conclude that respondents who were not aware of hand sanitizer recalls tend to not notice that there were risk statements on the product labels of hand sanitizers.

Discussion

The results from descriptive statistics data showed that approximately 47% of the survey participants had never heard about hand sanitizer recalls before taking the survey. This indicated that there might be a large proportion of the population in Canada who did not notice the existence of hand sanitizer recalls. Thus, there might be potential risks and health hazards associated with people using recalled hand sanitizers unknowingly. Moreover, 58% of the participants did not recognize that there are risk statements on the label of some type of hand sanitizer. This implied that many people may ignore some important warning messages and directions regarding the use of hand sanitizers from not reading the label of hand sanitizers carefully.

Furthermore, 62% of the respondents were concerned about potential risks associated with using hazardous hand sanitizers that have been recalled. However, 55% of the respondents have agreed that it was difficult to check if the hand sanitizers they are using are on the recall list. These results suggested that many people may not know how to look up information on hand sanitizer recalls. Therefore, information regarding hand sanitizer recalls should be made more visible and available for the general public.

Results from the question asking how the participants would prefer to dispose of recalled hand sanitizers indicated that 22% of participants would empty the hand sanitizers down to the drain and throw away the empty bottles while 47% of participants would throw the whole bottle away in the garbage can. These two methods are not the proper ways to dispose of recalled hand sanitizers as alcohol-based hand sanitizers are flammable near a source of heat and may contain toxic methanol that can contaminate water sources. These results revealed that more public education and media coverage are required to educate the public on the risk of using recalled hand sanitizers and proper ways to dispose of recalled products.

There were some similarities and differences when comparing the results of this research study to previous studies. A food recall study done by Charlebois et al. (2019) in Canada showed that respondents who were least aware of food recalls were under the age of 21, and have a high school diploma as their highest level of education. Comparing to this study, female, people aged 25 or older, and people who have a higher level of education were more likely to be aware of hand sanitizer recalls. These similarities indicated that younger generations and people with lower level of education may be less aware of food and hand sanitizer recalls.

Knowledge Translation and Recommendations

More programs and policies are necessary to allow information regarding hand sanitizer recalls to become more visible, available, and accessible for the general public. This research study will be useful as a reference document for implementing new policies and guidelines regarding hand sanitizer recalls. For instance, BCCDC and/or NCCEH can help create an eye-catching poster with hand sanitizer recall information and precautions. The poster can be posted near the hand sanitizer shelves in stores to increase awareness, a QR code can be also included in the poster to make Health Canada's website of recalls and safety alerts more easily accessible.

Limitations

The limitations of this online self-administrated survey study include: a limited time frame for the study, certain populations that were harder to reach, and potentially biased data. This survey was open to collect responses for only two weeks between January 21st, 2021 and February 4th, 2021. The time constraint of the survey may have resulted in fewer responses being collected. A longer survey duration would permit more responses and improve the external validity of this study.

Fewer responses were collected from middle-aged and older adults, as well as people who lived in the prairie regions and the Northern territories. A way of resolving this issue is narrowing the inclusion qualification for survey respondents such as only surveying people of a certain age group or residents of certain region such as British Columbia. This survey was distributed mainly through Reddit, which selectively filtered out people who are not using Reddit. As such, the data collected may be biased and not representative of the general public. To ensure more unbiased data, this survey could be distributed to a broader population through different types of social media such as Facebook, Instagram, and Twitter.

Future Research

Some research ideas for future student projects are listed in the following:

- Conduct a survey study on public awareness of other product recalls such as medical masks and respirators
- Repeat a similar survey study on hand sanitizer recalls analyzing if there are increases in the public awareness on hand sanitizer recalls after implantation of new policies and guidelines on hand sanitizer recalls or after the Covid-19 pandemic.
- Conduct a survey study on the public knowledge of handling and discarding hazardous wastes like hand sanitizers
- Conduct a research study on the reasons for hand sanitizers being recalled and providing ways to allow safer manufacturing of hand sanitizer and eliminating unqualified hand sanitizers from being released in the market in the future.

Conclusions

Health Canada has recalled many hand sanitizers due to various reasons such as counterfeit products, products containing toxic methanol, and products missing risk statements. Recalled hand sanitizer products may cause risks and health hazards including skin irritation, headaches, and upper respiratory system irritation. Therefore, the general public should recognize and be aware of hand sanitizer recalls in order to prevent potential health hazards associated with using recalled products. This research study showed that a large proportion of participants are unaware of hand sanitizer recalls and did not know how to properly discard recalled hand sanitizers. This suggests that the development of policies and programs regarding hand sanitizer recalls are essential to raise public awareness on hand sanitizer recalls and educate the public on how to check the list of hand sanitizers being recalled and proper ways to discard of recalled products.

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Competing Interest

The authors declare that they have no competing interests for the study conducted.

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