

# Food safety knowledge, attitudes and self-reported practices among Ontario high school students

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## ABSTRACT

**OBJECTIVES:** To measure the food safety knowledge, attitudes and self-reported practices of high school students in Ontario.

**METHODS:** We administered a school-wide paper survey to the student body ( $n = 2,860$ ) of four Ontario high schools. We developed the survey by selecting questions from existing, validated questionnaires, prioritizing questions that aligned with the Canadian Partnership for Consumer Food Safety Education's educational messages and the food safety objectives from the 2013 Ontario High School Curriculum.

**RESULTS:** One in five students reported currently handling food in commercial or public-serving venues; of these, 45.1% had ever taken a course that taught them how to prepare food (e.g., food and nutrition classes, food handler certification). Food safety knowledge among respondents was low. For example, 17.3% knew that the best way to determine whether hamburgers were cooked enough to eat was to measure the temperature with a food thermometer. Despite low knowledge, most respondents (72.7%) reported being confident that they could cook safe, healthy meals for themselves and their families. Safe food handling practices were frequently self-reported. Most students (86.5%) agreed that being able to cook safe, healthy meals was an important life skill, although their interest in learning about safe food handling and concern about foodborne disease were less pronounced.

**CONCLUSION:** Our findings suggest that food safety knowledge is low, yet confidence in preparing safe, healthy meals is high, among high school students. Because work and volunteer opportunities put students in contact with both the public and food, this group is important to target for increased education about safe food handling.

**KEY WORDS:** Food safety; food handling; students; education; adolescent; Ontario

La traduction du résumé se trouve à la fin de l'article.

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Foodborne illness strikes an estimated one in eight Canadians annually.<sup>1</sup> Since such illnesses can be caused by mistakes in final food preparation and handling,<sup>2,3</sup> understanding the food safety-related knowledge, attitudes and practices of food handlers – both commercial and private – is key to identifying ways to minimize the risk of foodborne illness at the food handler step of the farm-to-fork continuum.

Youth and young adults represent a unique audience for interventions aimed at improving safe food handling and preparation. They are more likely to consume foods that pose a higher risk of foodborne illness than other ages;<sup>4-7</sup> they lack food preparation experience and food safety skills;<sup>4,6,8,9</sup> they are one of the groups most likely to mishandle food;<sup>2</sup> and they are less likely to read handling instructions for raw meat and poultry,<sup>6</sup> check refrigerator temperatures and know that processed meats should be refrigerated.<sup>7</sup> These risks are seriously compounded by this age group's high level of confidence in their ability to engage in safe food handling practices.<sup>10</sup>

High school youth are a group of particular interest. They are the age cohort (i.e., 14–18 years) immediately prior to the “second weaning” phenomenon, a hypothesized increase in foodborne illness that occurs when those in their early 20s are cooking for themselves for the first time.<sup>11,12</sup> They are also at an age when food preparation practices may not be fully established, such that appropriate teaching of safe food

handling at this age may help instill lifetime safe food handling habits.<sup>13,14</sup>

There are few Canadian studies of knowledge, attitudes and practices related to food safety among individuals<sup>4,15</sup> and none that has assessed these aspects in high school individuals specifically. Therefore, our objective was to measure

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**Conflict of Interest:** None to declare.

the food safety knowledge, attitudes and self-reported practices in a sample of high school students in the province of Ontario.

**METHODS**

We administered a school-wide, paper questionnaire to the student body of four Ontario high schools. We selected the four high schools from those (*n* = 79; 2014–2015 school year) participating in an existing longitudinal study on youth health behaviours (the COMPASS study), which invites all schools from all passive consent school boards across Ontario to participate.<sup>16</sup> Using this established research platform enabled us to administer our survey school-wide to all students in grades 9 to 12 inclusive with consent to participate in the COMPASS study. COMPASS “consent to participate” rates for the four selected high schools ranged from 97% to 100% (Table 1). An insert was included in the COMPASS questionnaire and completed by students during class time on a date selected by the school, between mid-November and mid-December 2014. Schools were eligible to be selected for our questionnaire if they had in-school kitchen facilities, an enrolment circa 750 students and were within roughly two hours’ driving distance of the University of Waterloo. Given average COMPASS survey completion rates of 80%,<sup>17</sup> we anticipated 2,400 survey participants. This study was reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee.

We developed the survey by selecting questions from existing, validated questionnaires.<sup>15,18–21</sup> Because the survey was administered as an insert in a larger questionnaire, we prioritized key knowledge, attitude and self-reported practice questions that aligned with the Canadian Partnership for Consumer Food Safety Education’s educational messages (i.e., cook, clean, chill, separate), as well as expectations of food and nutrition courses under the Ontario High School Curriculum.<sup>22</sup> In addition to demographic questions, the questionnaire (available on request) contained questions about food safety knowledge (four questions), attitudes (four questions) and frequency of self-reported practices (seven questions; Table 2).

The survey insert was Scantron-formatted and machine-scanned into an electronic database. We cleaned the data by cross-checking the consistency of answers within individuals, deleting any discrepant data. For some analyses, we grouped Likert-scale

responses on agreement: “strongly agree” and “agree” responses were categorized as “agree”, and “strongly disagree” and “disagree” responses were categorized as “disagree”. Missing data for a given question were omitted from the analysis of that question.

Differences between means were tested using *t*-tests, with Duncan’s pairwise comparison used to test differences between multiple means. Differences between proportions were tested using Pearson’s chi-square test and Fisher’s exact test if necessary. Factors associated with the number of correct knowledge items and correct answers for individual knowledge items were identified using multivariable Poisson and logistic regression respectively; for these models, school was included as a fixed effect, and clustering of students within schools was accounted for using the clustered sandwich estimator of variance,<sup>23</sup> to adjust for non-independence of students within schools. Analyses were conducted in Stata/SE 14.0 for Mac (StatCorp LP, College Station, Texas).

**RESULTS**

In total, 2,860 students completed the survey. Questionnaire completion rates per school were high and are shown, along with school-specific and overall respondent demographics, in Table 1. Respondents ranged from 13 to 18 years old, and all grades were represented. As expected, grade and age were highly correlated (*R* = 0.96); age was used instead of grade in all further analyses. Approximately 16.8% (480/2,860) of respondents worked or volunteered in a restaurant, deli or other food service location; 11.7% (336/2,860) in a daycare or other place where they interact with children; 4.9% (141/2,860) in a retirement home, nursing home or long-term care facility; and 2.6% (74/2,860) in a hospital.

Handling food for the public was not limited to respondents working or volunteering in a restaurant, deli or other food service location. Overall, 18% (514/2,860) of respondents reported currently handling food in commercial or public-serving venues (shown by school in Table 1); the proportion of students currently handling food was greatest for those in a food service location like a restaurant or deli (75.6%; 363/480), followed by a day care or other location for children (39.9%; 134/336), and a hospital (32.4%; 24/74). Of these students, less than half (45.1%; 232/514) had ever taken a course that taught them how to prepare food, such as a high-school food and nutrition class, or

**Table 1.** Survey completion rates and demographic characteristics of survey respondents

	School 1	School 2	School 3	School 4	Total
Proportion of whole school participating in the COMPASS Study	100%	100%	98.7%	97.4%	–
Survey completion rate (no. of survey respondents/total school enrolment)	78.5% (766/976)	80.6% (701/870)	75.3% (488/648)	80.6% (905/1123)	79.1% (2860/3617)
Mean age in years (SD)	15.2 (1.13)	15.8 (1.34)	15.5 (1.20)	15.6 (1.18)	15.5 (1.23)
% female	54.0	51.2	51.7	53.2	52.7
% grade					
9	29.8	19.2	21.8	21.3	23.1
10	31.5	22.6	28.6	23.7	26.4
11	20.5	24.2	25.3	26.0	24.0
12	18.2	34.0	24.3	29.0	26.5
% currently handling food, as an employee or volunteer, in commercial or public-serving venues	14.9	20.7	24.2	15.1	18.0
% who had ever taken a course that taught them how to prepare food	30.9	49.8	30.5	29.2	34.9
Mean no. correct food safety answers out of four (SD)	1.84 (1.00)	1.77 (1.14)	1.88 (1.08)	1.93 (1.00)	1.86 (1.05)

**Table 2.** Food safety knowledge, attitude and self-reported practice questions included in the survey

Question	Format
“Which is the most hygienic way to wash your hands?” 1 = Apply sanitizer, run water, rub hands together for 20 seconds, rinse hands, dry hands, rub on an antiseptic hand lotion 2 = Apply soap, rub hands together for 20 seconds, rinse hands under water, dry hands, apply sanitizer 3 = Run water, moisten hands, apply soap, rub hands together for 20 seconds, rinse hands, dry hands* 4 = Run water, moisten hands, apply sanitizer, rub hands together for 20 seconds, rinse hands, dry hands, rub on antiseptic hand lotion	Multiple choice
“Which of the following is considered the most important way to prevent food poisoning?” 1 = Spray for pests in the kitchen area at least every week 2 = Rarely or never serve leftovers 3 = Keep foods refrigerated until it's time to cook or serve them* 4 = Clean kitchen counters with sanitizing solutions weekly	
“Which method is the best way to determine whether hamburgers are cooked enough to eat?” 1 = Cut one to check the colour of the meat inside 2 = Check the colour of the juice to be sure it is not pink 3 = Measure the temperature with a food thermometer* 4 = Check the texture or firmness of the meat 5 = Measure the length of time the hamburgers cook	
“What are microorganisms?” 1 = Poisons that can contaminate our food and water 2 = Small living things that are too small to be seen with our eyes* 3 = Small insects that we can see 4 = Large bugs that can land on our food and surfaces	
“I like learning about how to keep my foods safe to eat.” “I am concerned about getting food poisoning.” “I am confident that I can cook safe, healthy meals for myself and my family.” “Being able to cook safe, healthy meals is an important life skill.”	5-point Likert scale (“strongly agree” to “strongly disagree”)
“I plan, or help plan, the meals in my household.” “Before preparing or handling food, I wash my hands with soap and warm running water.” “I wash my hands with soap and warm running water after working with raw meat or chicken.” “I keep raw meat and chicken away from ready-to-eat foods like raw vegetables.” “I use an ice pack when I take my lunch to school.” “I use an ice pack when I take my lunch with me for day trips (like a track and field day).” “When I cook or reheat meals, I use a microwave.”	5-point Likert scale (“always” to “never”)

\* Correct responses to multiple choice knowledge questions.

food handler certification. Previous food preparation courses were significantly less frequent among those not currently handling food in commercial or public-serving venues (32.5%; 707/2,176) than those currently doing so (45.1%; 232/514;  $p < 0.0001$ ). Overall, 34.9% (939/2,690) of respondents had ever taken a course that taught them how to prepare food. As expected, respondents who had taken such a course or who currently handled food in commercial or public-serving venues reported more advanced abilities to cook from basic ingredients (Table 3).

Food safety knowledge among respondents was low. Half of the respondents (50.3%; 1,439/2,860) correctly selected “keep foods

refrigerated until it’s time to cook or serve them” as the most important way to prevent food poisoning, but a third (34.1%; 975/2,860) selected “clean kitchen counters with sanitizing solutions weekly”. Less than half (45.5%; 1,301/2,860) knew that the most hygienic way to wash hands required moistening them with water and using soap, but a quarter believed the most hygienic methods to be those using sanitizer only, no soap (24.3%; 695/2,860). Of the 2,860 respondents, 17.3% ( $n = 496$ ) knew that the best way to determine whether hamburgers were cooked enough was to measure the temperature with a food thermometer; over half (56.7%; 1,623/2,860) incorrectly believed

**Table 3.** Self-described ability to cook from basic ingredients among Ontario high school students, by whether they a) currently handle food in commercial or public-serving venues\* or b) had ever taken a course<sup>†</sup> that taught them to prepare food

	Percentage of students				
	Neither previous training nor current food handling ( $n = 1437$ )	Currently handling food only ( $n = 276$ )	Previous training only ( $n = 692$ )	Both previous training and currently handling food ( $n = 226$ )	All students
“I don't know how to cook.”	7.4	4.7	2.6	5.3	5.7
“I can only cook food when the instructions are on the box (like Kraft Dinner®).”	14.0	5.8	7.1	5.3	10.4
“I can do the basics from scratch (like boil an egg or make a grilled cheese sandwich) but nothing more complicated.”	21.9	14.1	13.5	11.1	17.9
“I can prepare simple meals if I have a recipe to follow.”	41.7	48.9	48.8	41.1	44.4
“I can cook almost anything.”	15.0	26.5	28.0	37.2	21.6

\* Including working or volunteering in a food service location, hospital, retirement home, long-term care facility, day care or other location for children.

<sup>†</sup> Including high school food and nutrition classes and food handler certification.

**Table 4.** Factors associated with the number of correct answers to the food safety knowledge multiple choice questions, with significant factors shown in bold

	Poisson regression coefficient	95% confidence interval
Age	<b>0.061</b>	<b>0.033, 0.089</b>
Sex	-0.073	-0.122, -0.024
School 1*	<b>0.054</b>	<b>0.032, 0.076</b>
School 3*	<b>0.048</b>	<b>0.035, 0.061</b>
School 4*	<b>0.098</b>	<b>0.083, 0.113</b>
Currently handle food in a commercial or public-serving venue <sup>†</sup>	0.030	-0.003, 0.064
Had ever taken a course <sup>‡</sup> that taught them to prepare food	-0.009	-0.066, 0.048
Currently work or volunteer in a restaurant, deli or other food service location	<b>0.062</b>	<b>0.018, 0.106</b>
Currently work or volunteer in a hospital	-0.182	-0.365, 0.006

\* School 2 is the referent group.

<sup>†</sup> Including working or volunteering in a food-service location, hospital, retirement home, long-term care facility, day care or other location for children.

<sup>‡</sup> Including high school food and nutrition classes and food handler certification.

that it was to cut the hamburger open and check the colour of the meat inside. The only knowledge item correct for the majority of respondents was knowing the definition of “microorganism” (72.8%; 2,083/2,860).

Of the 2,860 respondents, 4.6% (*n* = 132) answered all four knowledge questions correctly, whereas 11.0% (*n* = 315) answered none correctly. The average number of correct responses was 1.86 (SD 1.05); when the average number was compared among schools in the bivariate analysis, the only significant difference was between School 2 and School 4 (*p* = 0.004; Table 1). Factors associated with the number of correct responses from the multivariable model are shown in Table 4. Specifically, adjusting for the other variables in the model, females had 1.08 (95% confidence interval [CI] 1.02, 1.13) times as many correct answers as males; those currently working or volunteering in a food service location (e.g., restaurant, deli) had 1.06 (95% CI 1.02, 1.12)

times as many correct answers as those who did not work or volunteer in such locations; and for each additional year of age, respondents had 1.06 (95% CI 1.03, 1.09) times more correct answers. Respondents’ school was also significantly associated with the number of correct answers. Factors associated with specific correct answers are shown in Table 5.

Over half the respondents agreed that they like learning about how to keep their foods safe to eat (57.4%; 1,562/2,721) and that they are concerned about getting food poisoning (52.7%; 1,425/2,706). A large majority (86.5%; 2,345/2,712) agreed that being able to cook safe, healthy meals is an important life skill, and 3.3% (89/2,712) disagreed. Most respondents were also confident that they could cook safe, healthy meals for themselves and their families, 72.7% (1,976/2,717) agreeing and 10.4% (283/2,717) disagreeing. Respondents’ level of confidence was associated with the number of correct answers to the knowledge questions: those strongly disagreeing with the confidence statement averaged significantly fewer correct responses (1.43) than those who disagreed (2.01; *p* < 0.001), were neutral (1.82; *p* < 0.001), agreed (1.97; *p* < 0.001) or strongly agreed (1.84; *p* < 0.001) with the confidence statement. All other pairwise differences in the average number of correct responses by confidence level were not significant.

Respondents reported involvement in planning or helping to plan the meals in their household, with 10.6% (280/2,652) always, 25.5% (676/2,652) often, 34.2% (907/2,652) sometimes and 29.8% (789/2,652) rarely or never involved. Those who reported rarely or never being involved in meal planning were more likely to be male (odds ratio [OR]: 1.21; *p* = 0.037), older (OR: 1.09; *p* = 0.019), had a greater number of correct responses on the knowledge questions (OR: 1.13; *p* = 0.008), were less likely to be a current food handler (OR: 0.56; *p* = 0.001) and reported less advanced cooking abilities (OR: 0.53; *p* < 0.001), adjusting for school (*p* = 0.389) and whether the respondent worked or volunteered in a restaurant or other food service location (*p* = 0.798).

A majority of respondents reported always (56.1%; 1,480/2,638) or often (27.3%; 719/2,638) washing hands with soap and warm running water before preparing or handling food; 5.3%

**Table 5.** Odds ratios (with 95% confidence intervals) for factors associated with correctly answering the individual food safety knowledge multiple choice questions, with significant factors shown in bold

	Selecting the most hygienic way to wash hands	Selecting the most important way to prevent food poisoning	Selecting the best way to determine that hamburgers are cooked enough to eat	Selecting the correct definition of “microorganisms”
Age	<b>1.075 (1.030, 1.122)</b>	<b>1.100 (1.075, 1.127)</b>	<b>1.235 (1.027, 1.485)</b>	<b>1.260 (1.202, 1.320)</b>
Sex	<b>0.691 (0.630, 0.757)</b>	0.970 (0.740, 1.273)	0.806 (0.537, 1.210)	0.952 (0.749, 1.208)
School 1*	<b>1.104 (1.049, 1.164)</b>	<b>1.229 (1.199, 1.259)</b>	<b>0.645 (0.609, 0.772)</b>	<b>1.488 (1.453, 1.523)</b>
School 3*	0.972 (0.939, 1.007)	<b>1.215 (1.175, 1.256)</b>	1.058 (0.939, 1.193)	<b>1.223 (1.167, 1.282)</b>
School 4*	<b>1.216 (1.157, 1.278)</b>	<b>1.399 (1.353, 1.448)</b>	<b>0.689 (0.624, 0.761)</b>	<b>1.777 (1.746, 1.809)</b>
Currently handle food in a commercial or public-serving venue <sup>†</sup>	0.999 (0.738, 1.351)	1.035 (0.812, 1.319)	<b>1.486 (1.205, 1.833)</b>	0.931 (0.641, 1.351)
Had ever taken a course <sup>‡</sup> that taught them to prepare food	0.926 (0.762, 1.126)	0.882 (0.752, 1.034)	<b>1.755 (1.057, 2.914)</b>	<b>0.761 (0.619, 0.936)</b>
Currently work or volunteer in a restaurant, deli or other food service location	1.102 (0.935, 1.300)	1.213 (0.989, 1.488)	1.382 (0.955, 1.999)	0.981 (0.882, 1.092)
Currently work or volunteer in a hospital	0.801 (0.468, 1.372)	0.645 (0.357, 1.163)	1.189 (0.634, 2.070)	<b>0.411 (0.310, 0.545)</b>

\* School 2 is the referent group.

<sup>†</sup> Including working or volunteering in a food service location, hospital, retirement home, long-term care facility, day care or other location for children.

<sup>‡</sup> Including high school food and nutrition classes and food handler certification.

(141/2,638) reported rarely or never doing so. A majority of respondents also reported always (76.7%; 1,898/2,476) or often (14.4%; 356/2,476) washing hands with soap and warm running water after working with raw meat or chicken; 3.6% (89/2,476) reported rarely or never doing so. Providing a correct response to the hand washing knowledge question was not associated with reported hand washing frequency, adjusting for age and sex (data not shown). A majority of respondents reported always (65.8%; 1,552/2,359) or often (19.5%; 460/2,359) keeping raw meat or chicken away from ready-to-eat foods like raw vegetables; 5.7% (134/2,359) reported rarely or never doing so.

Respondents' use of ice packs in lunches was uncommon, with a majority rarely (14.0%; 333/2,375) or never (44.0%; 1,046/2,375) using ice packs when taking lunches to school and less than a third always (18.1%; 429/2,375) or often (10.4%; 246/2,375) doing so. Use of ice packs when taking lunch on day trips (e.g., track and field days) was more frequently reported, more than a third of respondents always (22.4%; 532/2,380) or often (15.4%; 367/2,380) doing so, but still 48.6% (1,157/2,380) reporting rarely or never doing so. Respondents' use of microwave ovens to cook or reheat meals was common, with a majority always (29.4%; 772/2,630) or often (37.3%; 981/2,630) doing so, and less than 10% rarely (6.1%; 161/2,630) or never (3.3%; 87/2,630) doing so.

## DISCUSSION

We investigated key food safety knowledge, attitudes and self-reported practices in a sample of Ontario high school students. Here, one in five students reported currently handling food in a public-serving venue, but only half of these students had ever taken a course in which they were taught how to prepare food. This, together with low safe food handling knowledge and high self-reported confidence in the ability to prepare safe, healthy meals, suggests that high school students should be a key target population for safe food handling and hygiene education. The involvement in food service, low knowledge and high confidence observed here are consistent with other similar studies,<sup>4,6,8-10</sup> supporting the need for additional targeted prevention support in this age group. One subgroup it may be particularly important to target is older, male high school students. Here, males had lower food safety knowledge than females (after adjustment for other factors), and older males were less likely to be involved in household meal planning than other students. Thus, this demographic may be a key subgroup to target for food safety education, and perhaps for food skills training in general.

With respect to both proper hand washing and ways to prevent foodborne disease, many students incorrectly selected options that involved sanitizers. Although this study did not explore the topic fully, choosing hand sanitizers as the best option within the hand hygiene continuum (i.e., as better than washing hands thoroughly with soap and running water) deserves further attention. This incorrect knowledge may be due to lack of exposure to proper hand and kitchen hygiene, either at home or through more structured education such as home economics courses or food handler certification, or it may be due to pervasive marketing of sanitizers in hand rubs, household cleaners and other products.

Knowing that use of a thermometer was the best way to check whether food was properly cooked was uncommon, although it

was the only knowledge item positively associated with both currently handling food in a public-serving venue and with having previous training around food preparation and handling. Interestingly, food safety knowledge was most strongly associated with school and with age, the older students providing more correct answers, even after adjustment for sex, previous training and other factors. The reason for this is unknown, but it is possible that age is a proxy for food handling experience or acquisition of knowledge from sources not measured in this study.

Student use of ice packs in lunches and when taking food on day trips was infrequent. However, the circumstances surrounding ice pack use were not assessed, and it is unknown whether students were taking lunches containing foods that did not require ice packs, using other methods for keeping hot foods hot and cold foods cold, or were not using ice packs when they should have. Future research examining whether unsafe practices are occurring specific to bagged lunches may be warranted.

We found half the students surveyed always or often used a microwave oven to cook or reheat meals. Inadequate reheating poses a foodborne disease risk and may be an area of particular concern related to microwave use.<sup>24</sup> Additionally, processed foods, such as chicken nuggets and strips, can falsely appear precooked or ready to eat.<sup>24,25</sup> This, combined with our observation that the majority of students selected cutting food (in our survey, hamburgers) open as the best way to determine whether it is cooked enough to eat, may mean that particular attention should be paid to educating students about safe cooking with microwaves (e.g., food safety, burns), how to read labels to determine the raw or cooked state of processed food and how to use thermometers to determine doneness.

This study is subject to several limitations. First, because of limited page space and class time available for the survey, we prioritized the most important knowledge, attitude and practice questions. Future studies should more fully capture the range of important food safety knowledge and practices to better characterize the particular risks for this demographic. Additionally, we had limited information on school-level variables that might affect our results; here, school had a significant impact on knowledge, independently of other relevant factors, warranting further investigation into school-level influences. Another limitation is the use of self-reported practices. Most students reported always or often doing the correct behaviour. However, respondents typically overestimate or provide favourably biased reports of desired behaviours,<sup>26-28</sup> such that future studies measuring actual behaviours are needed to generate accurate estimates. A final limitation was the presence of missing data, which, although not extensive in our dataset, does have the potential to affect our results. We chose to omit missing data from the analysis, as is typical, but future efforts to characterize the nature and impacts of missing data are warranted.

In addition to the above limitations, we recognize that our results, drawn from four high schools, may have limited generalizability to other Ontario high school students, both within and outside of our study area. Study logistics limited data collection to schools within the Greater Golden Horseshoe and southwestern regions of Ontario, meaning that our findings may

not be generalizable to other regions (e.g., northern Ontario), particularly if students' involvement in, and knowledge about, food preparation and food safety vary geographically. Given geographic variation in the types of food available and retail food environments, students in other geographic areas than ours may interact with food in substantially different ways, leading to different levels of knowledge, attitudes and behaviours. Our participating schools were in small towns (population <40,000) surrounded by rural and agricultural areas, larger suburban areas (population >120,000) and larger cities (population >350,000), capturing a good range of urban and rural school environments. However, as stated, whether our results are representative of students outside our study schools is unclear.

In conclusion, these results show that high school students are an important group to target for safe food handling education, since work and volunteer opportunities put them in contact with both the public and food, and since food safety knowledge is low yet confidence is high. Older male students may be a subgroup who could particularly benefit. Additionally, instilling food safety behaviours at this age may be key to achieving proper food handling as youth transition into adulthood. Food safety is now explicit in food and nutrition courses in the Ontario 2013 Revised High School Curriculum;<sup>22</sup> however, these classes are electives that only reach some students. Given that youth employment in the accommodation and food service industry is increasing<sup>29</sup> and that the Government of Ontario encourages high school students to undertake food preparation activities as part of their mandatory 40 hours of volunteer work, for example "offer to cook dinner for an elderly, sick or just really-busy neighbor" or "[prepare] food at a shelter, crisis centre, seniors or community centre",<sup>30</sup> it is prudent to ensure that students engaging in such activities employ safe food handling, particularly when food is being prepared for vulnerable individuals. Interventions such as the food handler certification offered by local public health units and certified third-party private enterprises and the use of municipal bylaws requiring all food handlers be food safety certified may be additional ways to ensure that high school students practise safe food handling. However, evidence of the effectiveness of such educational activities, including the effectiveness in youth, is limited. Future studies should evaluate whether such education is an effective way to improve students' food safety knowledge and practice.

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## RÉSUMÉ

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**OBJECTIFS :** Mesurer les connaissances, les attitudes et les pratiques autodéclarées d'élèves du secondaire de l'Ontario en matière de salubrité des aliments.

**MÉTHODE :** Nous avons administré un sondage sur papier à tous les élèves ( $n = 2\ 860$ ) de quatre écoles secondaires de l'Ontario. Nous avons élaboré le sondage en choisissant des questions de questionnaires validés existants, en privilégiant les questions conformes aux messages éducatifs du Partenariat canadien pour la salubrité des aliments et aux objectifs de salubrité des aliments des programmes d'études secondaires de l'Ontario en 2013.

**RÉSULTATS :** Un élève sur cinq a déclaré manipuler des aliments dans des établissements commerciaux ou de service à la clientèle; de ce nombre, 45,1 % avaient déjà suivi un cours de préparation des aliments (classes sur l'alimentation et la nutrition, formation des préposés à la manipulation des aliments). Les connaissances en salubrité des aliments chez les répondants étaient faibles. Par exemple, seulement 17,3 % savaient que le meilleur moyen de déterminer si des hamburgers sont assez cuits pour être mangés

est d'en mesurer la température avec un thermomètre de cuisson. Malgré leur manque de connaissances, la plupart des répondants (72,7 %) ont dit être sûrs de pouvoir cuire des repas sains et salubres pour eux-mêmes et leur famille. Ils ont souvent déclaré avoir des pratiques de manipulation hygiénique des aliments. La plupart des élèves (86,5 %) convenaient que d'être capables de cuire des repas sains et salubres était une compétence essentielle, mais leur intérêt pour l'apprentissage de la manipulation hygiénique des aliments et leur préoccupation pour les intoxications alimentaires étaient moins prononcés.

**CONCLUSION :** Nos constatations montrent que les connaissances sur la salubrité des aliments sont faibles chez les élèves du secondaire, mais que ces élèves sont très sûrs de pouvoir préparer des repas sains et salubres. Étant donné que les occasions d'emploi et de bénévolat mettent les élèves en contact avec le public et les aliments, il est important de cibler ce groupe pour accroître leurs connaissances de la manipulation hygiénique des aliments.

**MOTS CLÉS :** salubrité des aliments; manipulation des aliments; étudiants; enseignement; adolescent; Ontario